El láser de dióxido de carbono en Dermatología, 15 años de investigación clínica

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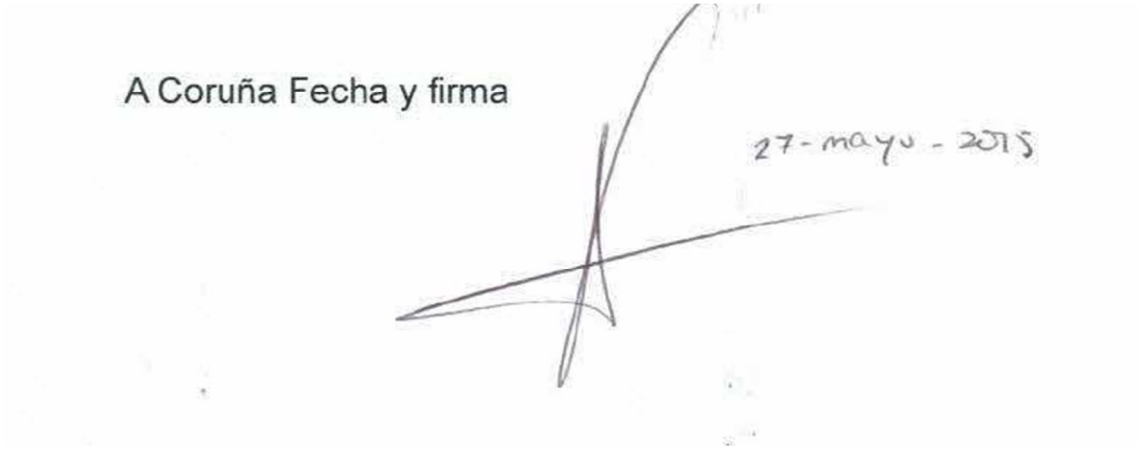
CERTIFICA:

Que ha examinado la memoria titulada "EL LASER DE DIOXIDO DE CARBONO EN DERMATOLOGÍA, 15 AÑOS DE INVESTIGACIÓN CLÍNICA", realizada bajo su co-dirección por el Dr Jesús del Pozo Losada y que a su juicio reúne los requisitos de originalidad y rigor metodológico para ser presentada en la Universidad de A Coruña, con objeto de aspirar al grado de Doctor.

A Coruña Fecha y firma



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A Coruña Fecha y firma 27/05/15.

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DR. MANUEL ALMAGRO
SÁNCHEZ 15/1506389-5

A Manu, Ani y Ana

A mis padres

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1. A mis pacientes, la base de nuestra práctica médica, sin los cuales este, ni otros trabajos, no podrían haberse realizado.
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RESUMEN

En 1964, Patel en los laboratorios "*the bell telephone company*", desarrolló el primer láser de dióxido de carbono (CO_2) y posteriormente, en 1967, Polanyi y colaboradores, demostraron la aplicación quirúrgica de este láser, desarrollando un sistema para tratamiento médico. En la actualidad el láser de CO_2 es el más quirúrgico de todos los láseres creados para uso dermatológico.

Desde los años 70 las indicaciones de tratamiento con láser de CO_2, con mayor o menor éxito, no han dejado de crecer y en la actualidad continúa siendo una herramienta de gran utilidad en los departamentos y consultas de Dermatología a lo largo de todo el mundo.

Sus indicaciones han ido de forma paralela a su uso, pero su utilización en un Centro Hospitalario del Sistema Público en muchas ocasiones se ha puesto en entredicho. En los últimos 15 años hemos realizado tratamientos con láser de CO_2 en el Servicio de Dermatología del CHU de A Coruña, a una media de 500 tratamientos por año. En este tiempo, hemos revisado las indicaciones ya existentes de tratamiento con láser de CO_2 comparando sus resultados con otras modalidades terapéuticas, se ha hecho una investigación en cuanto a nuevas indicaciones de tratamiento con láser de CO_2, y se han minimizado en lo posible los efectos secundarios. Gran parte de este trabajo ha sido recogido en la literatura dermatológica a través de diversos artículos en publicaciones internacionales, y comunicado en Congresos como comunicaciones y ponencias.

De esta forma nos planteamos como objetivos Revisar las indicaciones de tratamiento con láser de CO_2 y exponer nuestra experiencia personal para comparar los resultados propios obtenidos con los previamente publicados en la literatura, aportar nuevas indicaciones del láser de CO_2 en la que se demuestra su eficacia y desarrollar estrategias para mejorar la seguridad del paciente y minimizar los posibles efectos adversos de su aplicación.

Nuestra búsqueda bibliográfica demuestra que las indicaciones de láser de CO2 han crecido con los años de forma exponencial.

Nuestros resultados aportan nuevas indicaciones de tratamiento con láser de CO2 como son el nevus ecrino ductal porqueratósico, la hipertrofia labial que acompaña a las manchas en Vino de Oporto, el angioqueratoma circunscrito neviforme, el tratamiento paliativo del xantogranuloma necrobiótico

de los párpados, el tratamiento paliativo de las malformaciones venosas localizadas en la cavidad oral, el tratamiento paliativo de la mucinosis nodular, los hemangiomas arteriovenosos asociados a insuficiencia hepática crónica y el tratamiento combinado de láser de CO_2 y presión lateral de los quistes vellosos eruptivos.

El láser de CO_2 continúa siendo el tratamiento de elección en los hidrocistomas apocrinos y en las tuberosidades asociadas a las manchas en Vino de Oporto, y continúa siendo una opción importante en los lagos venosos, en la eritroplasia de Queyrat con afectación uretral, la enfermedad de Bowen, los diferentes tipos de Milia y en los carcinomas basocelulares de tipo superficial y nodular.

Al incluir un número importante de casos nuestras series aportan que el factor pronóstico más importante para el tratamiento de los nevus epidérmicos con el láser de CO_2, es el grosor que presenten las lesiones en el momento del tratamiento, y al hacer un seguimiento largo de los pacientes, vemos que el desarrollo de carcinoma epidermoide de labio inferior tras el tratamiento de las queilitis actínicas con láser de CO_2 y un seguimiento medio de 29,4 meses es de un 4,6% de los casos.

El desarrollo de satelitosis tras un tratamiento de un granuloma piogénico con láser de CO_2, es una complicación no descrita de estos sistemas de láser.

Para los que habitualmente utilizamos el láser de CO_2, se convierte en una herramienta de trabajo prácticamente imprescindible.

INDICE DE ACRONIMOS

1. CO2: dióxido de carbono
2. CHU: Complejo Hospitalario Universitario
3. Nd:YAG: neodimio: ytrio, aluminio, garnet
4. Nm: nanómetros
5. Mm: milímetros
6. TRT: tiempo de relajación térmica
7. Seg: segundos
8. Mseg: milisegundos
9. V2 y V3: segunda y tercera ramas del trigémino, quinto par craneal
10. ISSVA: " International Society for Study of Vascular Anomalies"

INTRODUCCIÓN

1. ANTECEDENTES HISTÓRICOS

Los tratamientos de láser han supuesto una revolución en la Medicina de las últimas décadas, sobre todo en algunas especialidades como la Dermatología Médico-Quirúrgica y Venereología. Hoy su complejidad es tal, que constituye una subespecialidad dentro de la Dermatología y sus indicaciones se han incrementado de forma exponencial.

El láser, desde un punto de vista teórico, se conoce desde principios del siglo XX, fue descrito por Albert Einstein en 1917. Pero la primera utilización en clínica fue realizada por Leon Goldman (Children's Hospital Research Foundation, Cincinnati, Ohio) en 1962. El primer paciente tratado tenía un melanoma maligno que previamente a su exéresis fue tratado con láser de rubí y Nd:YAG. El estudio histopatológico reveló necrosis térmica en las zonas tratadas con láser.

Inicialmente sólo fueron posibles láseres en el espectro de luz visible o infrarrojo cercano, que se utilizaban para el tratamiento de lesiones pigmentadas, pero en 1964 Patel en los laboratorios "*the bell telephone company*", desarrolló el primer láser de dióxido de carbono (CO_2). Polanyi y colaboradores demostraron la aplicación quirúrgica de este láser en 1967, desarrollando un sistema para tratamiento médico.

Desde entonces las indicaciones de tratamiento con láser de CO_2, con mayor o menor éxito, no han dejado de crecer y en la actualidad continúa siendo una herramienta de gran utilidad en los departamentos y consultas de Dermatología a lo largo de todo el mundo.

Con las modificaciones lógicas que impone la técnica a lo largo del tiempo, en estos 50 años de existencia:

- El láser de CO_2 ha sabido adaptar su evolución a los tiempos
- Ha respondido a las exigencias de la clínica
- Ha sobrevivido a la fototermólisis selectiva de Anderson y Parrish
- Es el láser quirúrgico por excelencia donde la experiencia del cirujano supera los parámetros
- Genera extremos: defensores acérrimos o detractores

2. IDENTIFICACIÓN DEL PROBLEMA: INDICACIONES DE TRATAMIENTO CON LÁSER DE CO_2

Cada nueva herramienta que vamos incorporando al arsenal médico, tras una primera fase de explosión, en que parece que va a resolver de forma definitiva gran parte de los retos terapéuticos planteados, poco a poco va colocándose en el lugar que le corresponde y las indicaciones, ventajas e incovenientes centrándose de forma adecuada.

Con el láser de CO_2 no ha sido diferente. Cuando nos convertimos en usuarios de este sistema de láser, revisamos la bibliografía existente, y comenzamos a tener experiencia clínica, pronto nos damos cuenta de que muchas de las indicaciones que se describieron para este láser en la actualidad están totalmente superadas por otros sistemas de láser u otras modalidades terapéuticas. Del mismo modo, hay otras indicaciones que no habiendo sido descritas parecen lógicas con un conocimiento teórico adecuado de las posibilidades de la técnica, y sobre todo de la patología que vamos a tratar. Y además, existen pocos trabajos con un número suficiente de pacientes como para avalar algunas indicaciones que en algunos casos están sustentadas por casos aislados. Finalmente hay pocos estudios en los que se realice un seguimiento de la respuesta y complicaciones a largo plazo.

3. MARCO TEÓRICO

3.1. CARACTERÍSTICAS FÍSICAS DEL LÁSER DE CO_2

El medio activo de este laser es una mezcla de dióxido de carbono, nitrógeno y gases de helio. Inicialmente fue creado en modo continuo y emite a 10.600 nm (infrarrojo medio).

Es absorbido por el agua, su cromóforo, y tiene una mínima reflexión y difusión (2-3%) de modo que la mayor parte de su energía es absorbida por el tejido diana. Como todas las células tienen gran cantidad de agua, la penetración en la piel está limitada entre 0.1 y 0.2 mm a bajas fluencias. Por tanto el láser de CO_2 destruye el tejido por un calentamiento rápido y vaporización del agua intracelular, es un láser ablativo. Son ablativos aquellos láseres que al contactar con la epidermis van a realizar una ablación de la misma, una destrucción por calor.

La luz infrarroja es invisible, por ello este láser conlleva un sistema coaxial de helio-neón de color rojo (632.8 nm) que sirve de guía para saber donde estamos realizando el tratamiento. El diámetro de incidencia en la piel (spot) de la guía no corresponde con el del haz de CO_2 que depende de la focalización, como se expondrá posteriormente.

No hay fibra óptica que pueda conducir 10600nm, por ello se dirige por un brazo articulado de espejos y termina en una pieza de mano de pequeño tamaño.

El sistema refrigeración es un circuito cerrado de agua.

3.2. PROPIEDADES DEL LÁSER DE CO_2. INTERACCIONES CON LA PIEL

El haz de luz puede usarse con un haz muy pequeño de incidencia en la piel, spot de 0.1-0.2 mm) de modo que así concentrando toda la energía en este punto vamos a utilizarlo como sistema de corte, para cirugía. Esto se denomina tratamiento focalizado. Pero también puede utilizarse como con un spot más elevado entre 2 y 5 mm. De este modo aumentamos el área de interacción láser-tejido. La energía se reparte por la superficie del área tratada, y así vaporiza los tejidos, profundizando mucho menos. Este aumento del spot

se consigue simplemente separando la pieza de mano del láser de la superficie sobre la que la vamos a aplicar. Esto se llama tratamiento desfocalizado. De este modo el corte y la vaporización son los dos sistemas de trabajo que podemos utilizar con el láser de CO_2.

El láser de CO_2 sella las pequeñas terminaciones nerviosas en vez de dejar terminaciones deshilachadas como ocurre con la cirugía con bisturí frío. Se piensa que esto induce también una disminución del dolor postoperatorio.

Los pequeños vasos linfáticos son también sellados por el procedimiento quirúrgico con láser de CO2 lo que lleva a un menor edema postoperatorio.

También es importante saber que los vasos sanguíneos de 0.5 mm de diámetro o menores son también sellados, dejando un campo quirúrgico generalmente bastante exangüe y limpio. Sin embargo cuando tenemos vasos de mayor calibre, el sangrado operatorio inunda el campo y dificulta en gran medida el tratamiento.

El láser CO2 produce una contracción tisular inmediata y difusión térmica periférica. La contracción del colágeno ("heat induced collagen contracture") aumenta con la fluencia (cantidad de energía) y número de pases pero es saturable (máximo hasta 40%)[1].

La difusión térmica a los tejidos circundantes también llamada "daño térmico adyacente" es la difusión del calor más allá de la zona de ablación. Cuando es controlado es un efecto deseable pero cuando es muy elevada induce necrosis de los tejidos periféricos, retraso de la cicatrización y formación cicatrices[2]. Este era el principal problema de los primeros láseres de CO_2.

El daño térmico controlado bajo la zona de ablación induce remodelación del colágeno a través de una contracción mediada por calor. Este se cree que es el mecanismo del importante estiramiento de la piel que observamos tras un tratamiento de "*resurfacing*" con CO_2 en piel fotodañada. Se ha demostrado que esta difusión controlada de calor induce neocolagenogénesis, aumenta el grosor de la capa de fibras de colágeno dérmico que mejoran además su estructuración y se repara la red tridimensional de fibras elásticas de la dermis[3].

El daño térmico no controlado induce neocolagenogénesis desordenada y excesiva, formación de cicatrices, cicatrices hipertróficas y queloides[4].

Todas estas propiedades del láser de CO_2 le dan un importante potencial quirúrgico.

3.3. EVOLUCIÓN DE LOS SISTEMAS DE LÁSER DE CO_2

El uso temprano del láser de CO_2 en cirugía dermatológica fue como un instrumento destructivo o incisional para el tratamiento de enfermedades malignas, en el manejo de quemaduras o para el desbridamiento de úlceras de decúbito[5,6,7,8].

Posteriormente sin embargo se generalizó su utilización para vaporizar lesiones cutáneas de modo que la mayoría de los tratamientos quirúrgicos con láser de CO_2 que se realizan en la actualidad se hacen para vaporizar lesiones.

El láser de CO_2 ha sido considerado a menudo como el caballo de carga de los láseres dermatológicos, pero algunos dermatólogos así como otros especialistas disienten al opinar que el daño térmico inducido por el láser de CO_2 es poco controlado. Muchos láseres de CO_2 han sido abandonados por la producción de cicatrices inaceptables tras su tratamiento, debidos a la difusión del calor al tejido circundante. Los primeros láseres de CO_2 eran utilizados solamente en modo continuo.

El hecho trascendental para la evolución fulgurante de la terapia láser fue la aparición de la “fototermólisis selectiva” formulada por Anderson y Parrish en el año 1983[9]. Según esta teoría, el láser nos permite la destrucción de estructuras diana en la piel de forma selectiva produciendo un daño mínimo en los tejidos adyacentes.

El tiempo de relajación térmica (TRT) es el tiempo que tarda una estructura en calentarse hasta el punto en que el calor empieza a escaparse de ella hacia estructuras contiguas. Es aproximadamente, en segundos, el diámetro de la estructura en mm al cuadrado y por tanto, a mayor tamaño del objetivo, mayor es el tiempo de relajación y viceversa. La utilización de pulsos demasiado cortos conduce a un infracalentamiento de la estructura objetivo, fotocoagulación insuficiente y por tanto a escasa eficacia. Pulsos demasiado largos ocasionan un sobrecalentamiento de la estructura objeto, por lo que el calor puede escapar y dañar tejidos adyacentes.

Así los láseres de CO_2 comenzaron a variar para intentar cumplir la teoría de la fototermólisis selectiva y de este modo minimizar el daño térmico y así los efectos secundarios. Se crearon así los sistemas pulsados que permiten pulsos entre 0.1 y 1 seg, pero sus efectos eran similares a los láseres en modo continuo. Se crearon los sistemas superpulsados con altos picos de energía (10-100 veces superior) para mantener la capacidad de vaporización pero tiempos muy cortos para minimizar el daño térmico (1-20 mseg). Aunque el daño térmico con estos sistemas puede controlarse mejor, la difusión térmica a los tejidos periféricos seguía siendo considerable, y con ella los efectos secundarios. Algunos investigadores intentaron entonces controlar el daño térmico con la utilización de bajas fluencias de energía, pero esto desde un punto de vista clínico se ha demostrado ineficaz porque precisa para obtener un resultado adecuado más tiempo de exposición con lo que la difusión térmica a los tejidos adyacentes sigue siendo muy alta. De este modo "*Coherent Medical Lasers*" introduce un nuevo sistema que se denominó ultrapulsado. Este sistema permite hacer picos de energía de 500w, que resultan en 5 Jul/cm_2 por pulso, con un spot de 2.5 mm. La duración del pulso es de milisegundos, menor que el tiempo de relajación térmica de la piel con lo cual se minimiza de la manera mejor posible el daño térmico.

Con la mejoría de estos sistemas y la adición de un escáner el láser de CO_2 comenzó a utilizarse de forma generalizada a parte de las indicaciones puramente médicas, sobre todo para el rejuvenecimiento facial. Los efectos secundarios sin embargo en muchos pacientes, por la mala utilización de l mismo, fueron devastadores.

Se crearon entonces los sistemas fraccionados de láser de CO_2 que realmente crean columnas de necrosis en la dermis pero sin destruir totalmente la epidermis. De esta forma, se minimizan los efectos secundarios aunque también la eficacia es menor. Es la forma de tratamiento más extendida en la actualidad.

Recientemente se utilizan las columnas de coagulación creadas por el láser de CO_2 fraccionado para la introducción de sustancias en la dermis, salvando de esta forma la barrera epidérmica.

JUSTIFICACIÓN DEL ESTUDIO

La expansión del uso de esta técnica en los últimos años ha sido tal, que en la actualidad cuando se introduce el término “carbon dioxide laser” en el sistema de búsqueda de “*Pub-Med*”, aparecen más de 5000 publicaciones.

El láser de CO_2 es el más quirúrgico de todos los láseres creados para uso dermatológico. Sus indicaciones han ido de forma paralela a su uso, pero su utilización en un Centro Hospitalario del Sistema Público en muchas ocasiones se ha puesto en entredicho

En los últimos 15 años hemos realizado tratamientos con láser de CO_2 en el Servicio de Dermatología del CHU de A Coruña, a una media de 500 tratamientos por año, y este se ha convertido en un arma terapéutica imprescindible en nuestra práctica clínica diaria.

Con esta experiencia, hemos ido revisando las indicaciones ya existentes de tratamiento con láser de $CO_{2,}$ comparando nuestros resultados con los datos publicados asi como con otras modalidades terapéuticas, se ha hecho una investigación en cuanto a nuevas indicaciones de tratamiento con láser de CO_2, y se han minimizado en lo posible los efectos secundarios.

Gran parte de este trabajo ha sido recogido en la literatura dermatológica a través de diversos artículos en publicaciones internacionales, y comunicado en Congresos como comunicaciones y ponencias.

HIPÓTESIS Y OBJETIVOS

HIPÓTESIS

El uso del laser CO_2 en patología dermatológica es adecuado y beneficioso para los pacientes. Es una herramienta terapéutica fundamental en un centro hospitalario del Sistema Público de Salud.

OBJETIVOS

Principal: Revisar las indicaciones de tratamiento con láser de CO_2

Secundarios:

1. Exponer mi experiencia personal en el uso del láser de CO_2
2. Comparar los resultados propios obtenidos con los previamente publicados en la literatura
3. Aportar nuevas indicaciones del láser de CO_2 en la que se demuestra su eficacia
4. Desarrollar estrategias para mejorar la seguridad del paciente y minimizar los posibles efectos adversos de su aplicación.

MATERIAL Y MÉTODOS

1. ÁMBITO DEL ESTUDIO

El estudio ha sido realizado en el Servicio de Dermatología del Complejo Hospitalario Universitario de A Coruña, perteneciente al Servicio Galego de Saúde (SERGAS).

Los pacientes pertenecen al Sistema Nacional de Salud enviados para valoración en el Servicio de Dermatología desde atención primaria o enviados desde otros servicios de Dermatología de Galicia.

Tras la primera valoración por parte del dermatólogo correspondiente son redirigidos para tratamiento con láser. Por tanto las indicaciones de tratamiento con láser han sido realizadas por los dermatólogos del citado Servicio de Dermatología excepto un pequeño grupo de pacientes enviados desde otros Servicios de Dermatología de la Comunidad Autónoma.

2. PERIODO DEL ESTUDIO

El estudio fue realizado durante un periodo de 15 años. Los primeros 4 años del estudio están centrados fundamentalmente en el tratamiento de pacientes y recogida de datos para posteriormente analizarlos y elaborar las publicaciones.

3. TIPO DE ESTUDIO

El estudio es de revisión de la literatura propia relacionada con el tratamiento de los pacientes. En él se recogen todos los trabajos relacionados con láser de CO_2 que han sido valorados, admitidos y publicados en revistas científicas en estos años.

4. ESTRATEGIA DE BÚSQUEDA BIBLIOGRÁFICA

Para realizar la búsqueda bibliográfica de este estudio se han utilizado las bases de datos de Pubmed, Cochrane e Índice médico español. Las palabras y términos MESH utilizadas han sido: “carbon dioxide laser” ó láser de dióxido de carbono.

5. MEDICIONES E INTERVENCIONES

En todos los pacientes se recoge el diagnóstico, las sesiones necesarias de tratamiento con láser así como los parámetros utilizados en cada una de ellas, y un periodo de seguimiento que varía según la patología revisada pero que en todos los casos es superior a 6 meses.

Se valoran a través de las fotografías clínicas el resultado estético del tratamiento, los efectos secundarios, y el índice de recidivas tras el seguimiento comentado.

6. TAMAÑO MUESTRAL

El tamaño muestral elegido para cada una de las patologías varía en relación con la prevalencia de cada una de ellas de modo que pueda resultar significativo, excepto en varios casos aislados presentados por lo excepcional de los mismos.

La población sobre la que se ha realizado el estudio es el área sanitaria del CHU A Coruña, y en gran parte de los casos la población de Galicia, ya que la unidad de láser de nuestro centro es de referencia para la Comunidad Autónoma.

7. LIMITACIONES DEL ESTUDIO

El estudio realizado es retrospectivo y comparativo sobre todo con otros resultados obtenidos sobre la misma patología tratada.

En este estudio se recogen un conjunto de **series de casos.** Estos estudios describen la experiencia de un paciente o un grupo de pacientes con un diagnóstico similar. En estos estudios frecuentemente se describe una característica de una enfermedad o de un paciente, que sirven para generar nuevas hipótesis. Estos estudios aunque son muy útiles para formular hipótesis, no sirven para evaluar o testar la presencia de una asociación estadística. La presencia de una asociación puede ser un hecho fortuito. La gran limitación de este tipo de estudios es en definitiva la ausencia de un grupo control.

8. ASPECTOS ÉTICO LEGALES

Todos los pacientes antes de recibir el tratamiento han recibido y firmado un consentimiento informado en el que se explican las principales compicaciones que pueden surgir tras el uso de esta técnica.

CONSENTIMIENTO INFORMADO DE LÁSER DE CO2

SERVIZO GALEGO de SAÚDE | **Complexo Hospitalario Universitario Juan Canalejo** A Coruña

DOCUMENTO DE INFORMACIÓN Y CONSENTIMIENTO

LASERTERAPIA CUTANEA

Los tratamientos con láser utilizan energía procedente de la luz, con diversas longitudes de onda. Las aplicaciones más habituales del láser de C02 en Dermatología emplean esta energía para destruir células o material celular, eliminando tumores benignos o malignos, así como lesiones premalignas y algunos tipos de lesiones infecciosas e inflamatorias de otra naturaleza. También se usa para la corrección de malformaciones y efectos del fotoenvejecimiento.

Las principales ventajas del láser de C02 con respecto a otras técnicas quirúrgicas son un mejor control de la profundidad en la destrucción de tejidos y evitar o disminuir la hemorragia.

La realización de tratamientos con láser de C02 suele exigir el uso de anestesia. La empleada con mayor frecuencia es la anestesia local, similar a la que se administra para las extracciones dentarias. En un pequeño porcentaje de pacientes, los anestésicos locales pueden provocar reacciones alérgicas de diversa gravedad. Su médico le informará si en su caso se requiere otro tipo de anestesia. En el postoperatorio puede persistir dolor en la zona tratada, requiriendo tratamiento con analgésicos durante algunos días.

La cicatrización de las lesiones tras el tratamiento puede plantear problemas, sobre todo de tipo estético y que dependen de la respuesta del paciente. Estos incluyen hiperpigmentación, hipopigmentación, cicatrices hipertróficas y queloides, que pueden aparecer también si se emplean otras técnicas terapéuticas alternativas. Su médico le indicará, si fueran necesarias, las medidas a tomar para disminuir estos riesgos, así como el de infección de la herida.

Los tratamientos con láser exigen medidas de protección ocular (de los ojos) del paciente y del personal que realiza el tratamiento, en el transcurso de la intervención. Su médico le indicará las que deben adoptarse en su caso.

Haga constar a su médico si usted padece alguno de los siguientes procesos, situación que podría hacer necesario tomar medidas especiales:

- **Trastornos de la coagulación sanguínea** (hemofilia, trombopenia, tratamiento con anticoagulantes, etc.).
- **Alergia a anestésicos locales o medicamentos de otro tipo**.
- **Alergia por contacto**.
- **Trastornos del ritmo cardiaco, portadores de marcapasos**.
- **Anomalías de la cicatrización** (queloides).
- **Trastornos circulatorios** (isquemia distal, claudicación intermitente, gangrena, etc.).
- **Inmunodeficiencia** (incluyendo infección por VIH, SIDA).
- **Hepatitis aguda o crónica**.
- **Enfermedades digestivas** (úlcera gástrica o duodenal, hemorragias digestivas, diverticulosis, etc.).

Si usted, o algún familiar desea mayor información, no dude en consultar a cualquiera de los médicos del Servicio.

RIESGOS PERSONALIZADOS:

.....

.....

DERCIE06-(Rv.:7/98). *Consentimiento al dorso.*

CONSENTIMIENTO INFORMADO

(Ley 3/2005, de 7 de marzo, de modificación de la ley 3/2001, de 28 de mayo, reguladora del consentimiento informado y de la historia clínica de los pacientes)

D/Dña. ..... mayor de edad, con D.N.I: .....
vecino/a de ..... calle ..... nº.....
teléfono ....., historia clínica nº .....

MANIFIESTO:

Que he sido informado/a por el Dr./Dra .....
en fecha ...../...../..... (y que me ha sido entregada copia de la información) del procedimiento .....
e igualmente de los beneficios que se esperan y del tipo de riesgos que comporta su realización (complicaciones más frecuentes) y su no realización, así como de las posibles alternativas según los medios asistenciales de este Centro.

He comprendido toda la información que se me ha proporcionado y mis dudas han sido aclaradas satisfactoriamente.

HOSPITAL
ABENTE Y LAGO
C. EXT. DERMATOLOXÍA

CONSIENTO:

A los facultativos del Servicio de .....
a que me practiquen el procedimiento referido (descrito en el anverso) y las pruebas complementarias necesarias. Soy conocedor/a de que en caso de urgencia o por causas imprevistas podrán realizarse las actuaciones médicas necesarias para mantenerme con vida o evitarme un daño.

Sé que en cualquier momento puedo revocar mi consentimiento.

Por incapaciadad o renuncia a la toma de decisión:
Nombre de la persona que autoriza (tutor legal o familiar).....
.....
D.N.I ..... en calidad de .....

Firmo dos ejemplares en: ..... a ..... de ..... de .....

Firma paciente o persona autorizada: Firma Facultativo:

RESULTADOS y DISCUSIÓN

1. INDICACIONES DE TRATAMIENTO CON LÁSER DE CO2. BÚSQUEDA BIBLIOGRÁFICA

A continuación se exponen las principales indicaciones de tratamiento con láser de CO_2 recogidas en la literatura. Se hace de forma agrupada y con las principales referencias referidas a esa indicación.

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    d. Carcinoma verrucoso mucosa oral[27,28]
    e. Ulcera de Marjolin[29]
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e. Nevus intradérmicos[64]
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d. Triquilemomas[75]
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f. Siringomas eruptivos[77,78]

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l. Plasmoacantomas en ángulos de la boca[85]
m. Reticulohistiocitosis multicéntrica[86]
n. Dermatofibromas faciales[87,88]
o. Osteoma cutis[89]
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p. Enfermedad de Cowden[129]
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s. Liquen mixedematoso[36]
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14. CELULITIS[186]
15. FOTOBIOMODULACIÓN[187]

2. EXPERIENCIA PERSONAL

2.1. PUBLICACIONES EN REVISTAS CIENTÍFICAS

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Porokeratotic eccrine ostial and dermal duct naevus: treatment with carbon dioxide laser

SIR, Porokeratotic eccrine ostial and dermal duct naevus (PEODDN) was described by Abel and Read in 1980.[1] It is usually classified among the adnexal tumours with eccrine differentiation. Congenital hyperkeratotic lesions are the most common presentation, but some cases develop within the first days of life, and adult onset has been also reported.[2] The lesions are usually localized on palms and soles, but may occur at other distal areas of the extremities, and may be multiple.[3] Histopathologically, PEODDN is characterized by a comedo-like dilatation and hyperplasia of the acrosyringium, absence of the granular layer, parakeratotic cornoid lamella-like plugs exclusively associated with the sweat gland pores and ducts, and hamartomatous changes of the eccrine dermal ducts.[4] We report a case of adult-onset PEODDN in which treatment with the carbon dioxide laser achieved an excellent result.

A 35-year-old woman presented with a hyperkeratotic lesion of 10 years duration, localized on the dorsum of the fifth finger of her right hand (Fig. 1a). The lesion had slowly extended distally. The differential diagnosis included viral warts, PEODDN, linear epidermal naevus and verrucous tuberculosis. A cutaneous biopsy of the lesion showed dilatation of the intraepidermal portion of the eccrine sweat ducts, with hyperkeratotic plugs containing a parakeratotic column with dyskeratotic cells in the deep area (Fig. 1b). The granular layer was practically absent. A diagnosis of PEODDN was made.

The lesion produced moderate itching and interfered with normal activity. Topical keratolytics and cryosurgery resulted in no improvement. Treatment with a carbon dioxide laser was therefore started using a 'Kaplan Pendulaser System', a portable laser system with maximal power density of 20 J/cm^2, that permits pulses of 90 ms. As the lesion affected the deep dermis, we used the following laser values: continuous and lightly defocused mode, spot of incidence 2 mm and power density 10 J/cm^2. We vaporized the superficial component, removed the crusting and then again vaporized the deep area. The lesion healed by secondary intention in 3 weeks. Four sessions of treatment at monthly intervals were necessary to obtain complete resolution, because the hyperkeratotic mass relapsed in focal areas. The cosmetic and functional result was excellent (Fig. 1c). Nine months after the completion of therapy no recurrence was observed.

The clinical appearance of the verrucous and hyperkeratotic lesion, and the histopathological features of a cornoid lamella-like change in the intraepidermal portion of the eccrine sweet ducts, confirmed the diagnosis of PEODDN in our case.

Reports on PEODDN usually refer to its clinical features, origin or histopathological characteristics.[5,6] In only a few cases have the authors included data on the treatment or evolution of these lesions. In view of the clinical and histopathological similarities between porokeratosis and PEODDN, and the fact that some cases of porokeratosis have

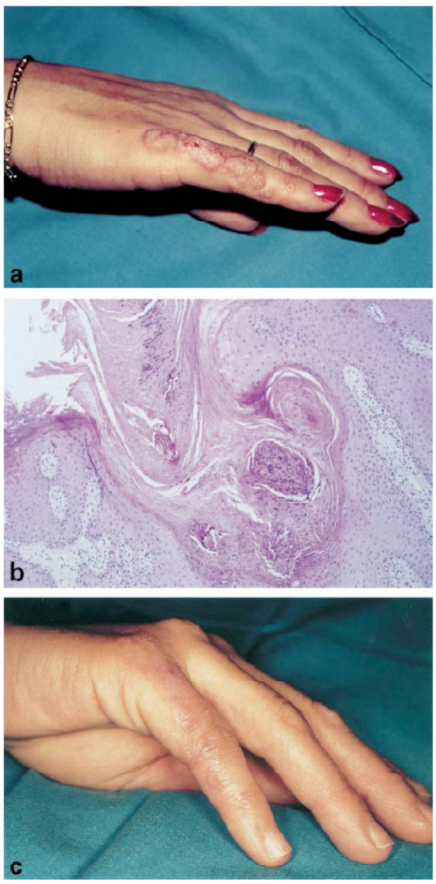

Figure 1. (a) A hyperkeratotic lesion is seen on the dorsum of the fifth finger of the right hand. (b) Dilatation of the intraepidermal portion of the eccrine sweat ducts with hyperkeratotic plugs. A parakeratotic column is observed in one hyperkeratotic plug (haematoxylin and eosin). (c) The fifth finger of the right hand shows the final result after treatment with the carbon dioxide laser.

been treated with carbon dioxide laser with good results,[7,8] we tried laser therapy.

Infection, hypertrophic scarring and cicatricial retraction are possible complications of this treatment, but adequate postoperative care and an early mobilization of the finger, minimized the risk of secondary effects. In our case the result of treatment with the carbon dioxide laser was excellent and no recurrence was observed after a 9-month follow-up.

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Kawasaki disease associated with varicella: a rare association

Sir, A 5-year-old boy, previously well, was admitted to hospital with a 7-day history of unremitting pyrexia and anorexia and a 1-day history of a blistering eruption over the trunk. Examination revealed bilateral cervical lymphadenopathy, dry red lips, a reddened ulcerated tongue (Fig. 1a), mild bilateral conjunctival injection, peeled skin around the tip of the right middle finger and a vesicular eruption over the trunk (Fig. 1b). Investigations showed an erythrocyte sedimentation rate of 56 mm in the first hour, C-reactive protein

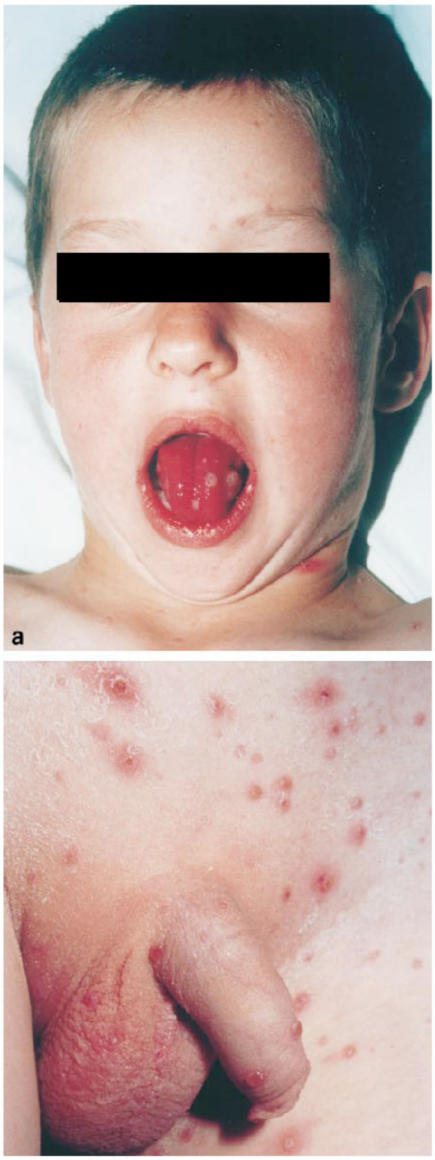

Figure 1. (a) The patient shows a reddened tongue in keeping with Kawasaki disease and ulcers due to varicella. (b) A vesicular eruption consistent with varicella is evident over the lower abdomen.

Comentario:

El nevus ecrino ductal poroqueratósico es una entidad de muy rara presentación, que precisa diagnóstico diferencial de forma fundamental con la poroqueratosis lineal y con verrugas vulgares de disposición lineal. Este cuadro no tiene un tratamiento de elección que obtenga resultados satisfactorios. Al tratarse de lesiones clínicamente similares a una verruga vulgar nos planteamos la posibilidad de realizar tratamiento con láser de CO_2. Se realizaron varias sesiones de tratamiento de bastante intensidad, llegando al tejido celular subcutáneo para obtener resultados adecuados. Tras terminar el tratamiento la lesión no recidivó y el resultado cosmético fue excelente.

Creemos por tanto que se trata del tratamiento electivo en este tipo de lesiones que no había sido descrito con anterioridad.

2. Del Pozo J, García Silva J, Peña-Penabad C, Fonseca E. MULTIPLE APOCRINE HIDROCYSTOMAS: TREATMENT WITH CARBON DIOXIDE LASER VAPORIZATION. **Journal of Dermatological Treatment 2001; 12: 97-100**[189]**.**

Journal of Dermatological Treatment (2001) 12, 97–100 ISSN 0954–6634

Multiple apocrine hidrocystomas: treatment with carbon dioxide laser vaporization

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BACKGROUND: Apocrine hidrocystoma is a benign cystic tumour with apocrine differentiation. Although most cases are solitary tumours, multiple tumours may occur. Surgical removal is the usual treatment for apocrine hidrocystoma, but it may be troublesome and disfiguring in cases with multiple tumours.

OBJECTIVE: To determine the efficacy and cosmetic outcome of carbon dioxide laser vaporization in the treatment of multiple apocrine hidrocystomas.

PATIENTS AND METHODS: A total of 11 lesions in three adult patients were treated with carbon dioxide laser vaporization using a continuous and defocused mode, with a power density of 5 J/cm². The lesions were localized lateral to the outer canthus, on the free edge of the eyelids, and on the ear. Only a single session of treatment was performed for each lesion. Photographic controls were taken before and after treatment.

RESULTS: The lesions cleared after laser treatment without residual changes, and a successful cosmetic result was obtained.

CONCLUSION: Carbon dioxide laser is an efficient method of the treatment for multiple apocrine hidrocystomas. (*J Dermatol Treat* (2001) **12:** 97–100)

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Keywords: *Apocrine hidrocystoma — Carbon dioxide laser vaporization*

Introduction

Apocrine hidrocystoma or apocrine cystadenoma is a benign tumour produced by cystic proliferation of apocrine secretory glands.[1] This uncommon lesion is most often seen on the head and neck, usually in ophthalmic areas, lateral to the outer canthus. Rarely, it may present on other areas, including chest, shoulder, axilla, umbilicus, anal region, and prepuce.[2,3] Apocrine hidrocystoma may be an occasional feature of naevus sebaceous,[4] and multiple apocrine hidrocystomas may be an important marker for two rare inherited diseases: Schöpf-Schulz-Passarge syndrome and a peculiar form of Goltz's syndrome.[5]

A solitary, well-defined, dome-shaped, translucent nodule with smooth surface and variable colour, from skin colour to greyish or blue-black, is the usual clinical presentation. Nevertheless, multiple lesions on the cheek, ophthalmic and ear areas may occur.[6] The lesions are asymptomatic and increase slowly in size over time. Although they usually measure less than 15 mm, a lesion of 5 × 7 cm has been described.[7]

If puncture of a lesion is performed, a fluid secretion is obtained and it becomes flattened within a few days. In contrast to eccrine hidrocystoma, it shows no seasonal variation.

Surgical removal is the most utilized treatment for apocrine hidrocystoma. Nevertheless, in cases with multiple lesions, mainly in exposed areas, it may be troublesome and result in cosmetic disfiguration. We report the results of carbon dioxide laser vaporization as an alternative treatment in three cases of multiple apocrine hidrocystomas.

Patients and methods

Three patients, two women aged 55 and 56 years, and a 34-year-old man, with biopsy proved multiple apocrine hidrocystomas were selected to treatment with carbon dioxide laser vaporization. A total number of 11 lesions in these three patients were treated. Apocrine hidrocystomas

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were localized lateral to the outer canthus, on the free edge of the eyelids, and on the ear. The medical history of our three patients as well as their physical examination revealed no other relevant features.

After therapeutic options were explained to the patients, informed consent for laser treatment was obtained in all cases. Prior to laser treatment, intralesional anaesthesia was performed, using lidocaine without epinephrine. A carbon dioxide laser (Kaplan Pendulaser System, Optomedic Medical Technologies Ltd, Or-Yeyuda, Israel; a portable laser with maximal power density of 20 J/cm^2, with pulses of 90 ms) was used to treat all lesions by means of a continuous and defocused mode, with a power density of 5 J/cm^2. After the first pass, when the superficial area of the lesions was removed, the fluid content of the lesions appeared on the surface. The fluid secretion and the partially desiccated tissue were manually removed with a saline-soaked gauze and a second pass was performed, using the same parameters, in order to achieve vaporization to the deep part of the lesions.

Following the laser treatment, topical antibiotic ointment with mupirocin was applied to the wound, and the area was covered with a bandage. Patients were instructed to clean the area daily with mild soap and water for 4–7 days, followed by the application of an antibiotic ointment, until total healing was achieved. Patients returned for physician evaluation 6 weeks postoperatively.

Initial and final photographs were taken to evaluate the response of lesions to treatment. All photographs were taken with a Nikon FM-2 camera system (Tokyo, Japan) using identical parameters and processing techniques.

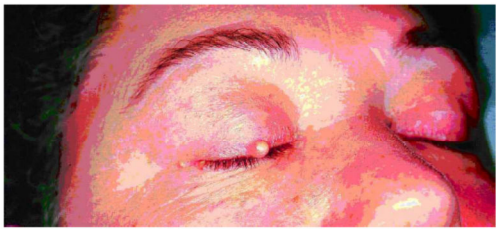

Figure 1
Apocrine hidrocystomas localized laterally to the outer canthus and on the free edge of the upper right eyelid.

Figure 2
Aspect of lesions after carbon dioxide laser vaporization.

Results

The lesions disappeared after laser treatment without residual changes, and the normal surface of the treated skin was closely recovered. The results are presented in Figures 1–6. Cosmetic outcome was considered excellent by our three patients. No secondary effects and no recurrence of lesions were observed within the 1-year follow-up in all cases.

Discussion

Apocrine hidrocystoma is an asymptomatic benign tumour. Solitary lesions may cause cosmetic problems, which are usually resolved by surgical removal. This treatment is also indicated to obtain histopathological confirmation of the diagnosis. Cosmetic disturbance is obviously a greater problem in multiple apocrine hidrocystomas located on exposed areas. Repeated surgical excision may be considered as a treatment for multiple tumours but is limited because the results are troublesome and disfiguring. Bickley et al,[8] in 1989, considered carbon dioxide laser vaporization as an alternative treatment for multiple apocrine hidrocystomas with successful results. Nevertheless, no further reports on this topic were provided.

The main problem with carbon dioxide laser treatment for cutaneous tumours is that no diagnostic histopathologic studies and clear margins evaluation are possible because of the complete destruction of the lesion.[9,10] This limitation reduces the indications to tumours in which the clinical diagnosis, the biology and the depth of the lesions can be clearly established, and to when the treatment can be performed by surgeons with adequate experience to remove lesions by carbon dioxide laser vaporization.

Differential diagnosis of multiple apocrine hidrocystomas includes other adnexal tumours, such as eccrine hidrocystomas, syringomas, trichoepitheliomas and vellus hair cysts, but pitfall diagnostic becomes unlikely when one of the multiple tumours has been histopathologically

Figure 3
Apocrine hidrocystoma localized on the left ear.

Figure 4
Two weeks after treatment, only a slight erosion was present with excellent cosmetic result.

Figure 5
Two apocrine hidrocystomas localized on the free edge of the upper right eyelid.

Figure 6
After carbon dioxide laser vaporization the lesion disappeared without pigmentary or scarring changes.

identified. In addition, all these lesions have also been successfully treated by carbon dioxide laser vaporization.[11–14]

Secondary effects of carbon dioxide laser treatment are not uncommon. Textural changes, as depressed or hypertrophic lesions, and discolouration, as hypo or hyperpigmentation, may be observed. Nevertheless, the complications are minimized by good technical management, careful selection and instruction of the patients, and adequate postoperative care.

In our three patients with multiple apocrine hidrocystomas, the cosmetic disturbances were the main cause to claim for treatment. Resolution of the lesions after laser treatment was obtained without residual changes or secondary effects. We think that carbon dioxide laser vaporization may be a safe and effective treatment for multiple apocrine hidrocystomas.

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Comentario:

Los hidrocistomas apocrinos son lesiones tumorales de infrecuente presentación que se localizan de forma fundamental cercanas a los párpados, en muchos casos en el borde libre de los mismos. Dada la difícil localización que suelen presentar, el tratamiento de elección probablemente sea al láser de CO_2 aunque no haya sido descrito de forma amplia en la literatura. En el trabajo que presentamos cabe destacar una localización totalmente inusual en estas lesiones como son los pabellones auriculares y se hace énfasis a que el láser de CO_2 probablemente es el tratamiento de elección de los mismos. Posteriormente se describió el tratamiento de estas lesiones con otros sistemas de láser como un diodo de 1450 nm[190] y el láser de colorante pulsado[191].

3. Del Pozo J, Fonseca E. PORT WINE STAIN NODULES IN THE ADULT: REPORT OF TWENTY CASES TREATED BY CARBON DIOXIDE LASER VAPORIZATION. **Dermatology Surgery 2001; 27 (8): 699-702[192].**

Port-Wine Stain Nodules in the Adult: Report of 20 Cases Treated by CO_2 Laser Vaporization

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BACKGROUND. Port-wine stain (PWS) is a congenital vascular malformation of the superficial dermal vessels. These vessels become progressively ectatic, with development of nodular and hypertrophic areas on the surface of the lesions.

OBJECTIVE. To determine the efficacy of CO_2 laser vaporization in the treatment of nodules in PWS.

METHODS. Twenty adult patients with PWS who developed nodules and hypertrophy on the surface of the lesions were treated by CO_2 laser vaporization. Only one pass was performed to each area of the lesions, using a continuous and defocused mode, with a power density of 10 W/cm^2. When the treated lesion was very large, several sessions of treatment were necessary to vaporize its entire surface. Photographic controls were performed before and after treatment.

RESULTS. The nodules and hypertrophy were removed and the smooth surface of the lesions was reestablished. The color, usually violaceous, was transformed in a slight erythema.

CONCLUSION. CO_2 laser is a good method for treatment of nodules and hypertrophy in PWS. With adequate precautions, excellent cosmetic results can be obtained. Other more-specific laser systems may be successively used to treat the remaining erythema.

Port-wine stain (PWS) is a congenital malformation of the superficial dermal capillaries.[1] In the natural history of PWS, the vessels become progressively ectatic. This results in gradual darkening, thickening, and development of nodules.[2] In one study two-thirds of patients developed hypertrophy and nodules by the age of 46 years, with a mean age for hypertrophy of 37 years.[3] Therefore the nodules on these lesions are usually a feature in adults.

Cosmetic considerations, hypertrophy, hemorrhage, and infection comprise the medical reasons to treat these lesions. Nodular lesions are best treated by CO_2 laser. With this laser the lesion can be sculpted to reestablish a normal outline. Other more-specific laser systems can be further used to lighten the remaining erythema.[4]

Materials and Methods

Twenty patients (9 men, 11 women; age range 33–66 years; mean age 51.5 years) with PWS and nodular and hypertrophic areas on the surface of the lesions were enrolled in this prospective study. None of the patients had ever received treatment for PWS. Nineteen lesions were localized on the face and one on the scapular area.

Prior to laser treatment, intralesional or regional (when lesions were localized on the second branch of the trigeminal nerve) anesthesia was performed using lidocaine without epinephrine. A CO_2 laser (with a maximal power density of 20 W/cm^2 that permits pulses of 90 msec) was used to treat the entire surface of all lesions. We used a continuous wave and a defocused mode, sparing approximately 3 cm of the skin, with a spot size of 10 mm. The power density used was 10 W/cm^2. After the first pass the partially desiccated tissue was manually removed with a saline-soaked gauze. A second pass was performed using the same parameters in order to achieve visible collagen contraction and smoothing of the lesion.

Following laser treatment, a topical antibiotic ointment (mupirocin) was applied to the wound and the area was covered with a bandage. Patients were instructed to clean the area daily with mild soap and water, followed by application of antibiotic ointment and a bandage for a period of 1 week. Patients returned for physician evaluation 6 weeks postoperatively.

One pass was performed on the surface of all lesions. When the lesion was very extensive, the treatment was performed with a single laser pass during multiple treatment sessions on different dates.

Initial and final photographs were taken and the response was evaluated based on comparisons with baseline photographs. All photographs were taken with a Nikon FM-2 camera system (Tokyo, Japan), using identical parameters and processing techniques. Clinical grading was made using a numeric scale with scores based on the observed improvement from baseline (<25% = 1; 25–50% = 2; 50–75% = 3; >75% = 4).

Results

All lesions improved more than 75% after laser irradiation. Representative results are shown in Figures 1–6.

J. del Pozo, MD and E. Fonseca, MD have indicated no significant interest with commercial supporters.

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Figure 1. A 63-year-old woman with PWS mainly located on the first branch of the trigeminal nerve.

In all cases the nodules and the hypertrophy of the lesions were removed, obtaining a smooth surface and lightening of the lesions. The facial outline was reestablished and the usual violaceous aspect of lesions was changed to a slightly erythematous color.

No relevant secondary effects were observed. Postinflammatory hyperpigmentation was observed in one patient, and slight hypertrophic scars were observed in two patients that resolved within 3 months with pressure therapy by a silicone bandage on the affected area.

Figure 2. Aspect of PWS after CO_2 laser vaporization.

Figure 3. PWS on the second branch of the trigeminal nerve in a 47-year-old man. Note the hypertrophy of the upper lip.

Figure 4. The lesion after treatment with CO_2 laser vaporization. The hypertrophy of the lip was corrected.

Figure 5. A 52-year-old woman with a prominent, tuberous, hypertrophic PWS on the first and second branches of the trigeminal nerve.

Figure 6. Improvement of the lesion after cutaneous CO_2 laser vaporization.

Relevant patient data are summarized in Table 1. A specific laser system for vascular superficial cutaneous lesions was then used to improve the remaining discoloration (results not presented).

Discussion

CO_2 lasers can be used as continuous wave or as an ultrapulsed system. Continuous wave lasers produce a continuous beam of light that does not vary in power with time. By holding the laser handpiece at a distance from the skin greater than the focal length of the lens, the laser beam is defocused and produces a large spot size of 1–2 mm or more. This reaction, which is called vaporization, occurs so quickly that there is minimal transfer of thermal energy to adjacent tissue. The rapid vaporization of superficial cutaneous lesions is the main purpose for which the CO_2 laser has been used in dermatologic surgery.[5]

By 1984 the argon laser was generally accepted as the treatment of choice for PWS.[6] Later, CO_2 laser received considerable interest and it was utilized to treat vascular lesions.[7,8] Although CO_2 laser has been successfully used in the treatment of PWS, the epidermis and superficial papillary dermis must be vaporized to reach the vessels to be eliminated by laser interaction, resulting in a wound with a much higher risk of adverse healing than the wounds resulting from treatment with other lasers. Currently lasers with selective vessel injury are used to treat PWS and CO_2 lasers are used to treat nodules and hypertrophy. Nodules in PWS can be treated with different laser systems, including argon laser, CO_2 laser, pulsed dye laser, and continuous wave Nd:YAG laser.

Two systems of CO_2 laser are used, the ultrapulsed and continuous wave systems. With the ultrapulsed system, high-irradiance pulses with short duration are used in order to minimize the thermal damage.[9] With continuous wave CO_2 laser systems the appearance of scarring and hypertrophic healing is relatively common, but with good technical management, adequate selection and instruction of patients (adult patients have a lower incidence of secondary effects[8]), and adequate postoperative cares, continuous wave laser vaporization may be an effective and safe method for treatment of these lesions.

In our patients the psychological impact of the lesions, in spite of the years of evolution, was the cause of treatment. Relevant cosmetic improvement was obtained with minimal secondary effects (only 2 of our 20 patients developed slight hypertrophic scarring in localized areas).

Table 1. Relevant Patient Data and Response to Treatment

Patient	Sex	Age (years)	Localization	Extension	Number of Sessions	Secondary Effects	Overall PWS Improvement After CO_2 Laser
1	Female	52	1st, 2nd trigeminal branches	>40 cm^2	5	Slight hypertrophic scar	50%
2	Female	65	2nd trigeminal branch	15 cm^2	2	no	60%
3	Female	60	1st trigeminal branch	15 cm^2	2	no	70%
4	Male	52	Right cheek	2 cm^2	1	no	85%
5 (Figures 5 and 6)	Female	52	1st, 2nd trigeminal branches	>40 cm^2	5	no	50%
6	Male	48	1st, 2nd trigeminal branches	>40 cm^2	4	no	50%
7	Female	47	2nd trigeminal branch	3 cm^2	1	no	75%
8	Male	38	Left frontal area	2 cm^2	1	no	50%
9	Female	41	Left scapular area	9 cm^2	1	no	40%
10	Male	43	1st, 2nd trigeminal branches	>40 cm^2	3	no	30%
11	Female	47	1st, 2nd trigeminal branches	>40 cm^2	6	Slight hypertrophic scar	60%
12	Male	33	Frontal area	3 cm^2	1	no	70%
13	Female	63	Lower right eyelid	1.5 cm^2	1	no	70%
14	Female	50	Upper left eyelid	1 cm^2	1	no	80%
15	Male	50	2nd, 3rd trigeminal branches	>40 cm^2	4	no	40%
16 (Figures 1 and 2)	Female	63	1st, 2nd trigeminal branches	30 cm^2	3	no	60%
17	Male	37	1st, 2nd trigeminal branches	>40 cm^2	4	no	30%
18 (Figures 3 and 4)	Male	47	2nd trigeminal branch	>40 cm^2	4	no	20%
19	Female	66	Left frontal area	2 cm^2	1	no	80%
20	Male	65	2nd trigeminal branch	20 cm^2	4	Postinflammatory hyperpigmentation	80%

Early treatment of PWS prevents the development of hypertrophy and nodules. These nodular lesions probably will be less common in the future, due to the treatment of port-wine stains in patients at an early age.

Our results, obtaining relevant cosmetic improvement and minimal secondary effects, suggest that continuous CO_2 laser vaporization is a safe and effective treatment for nodules and hypertrophy in PWS.

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Comentario:

Las manchas en vino de oporto en su evolución natural, a partir sobre todo de la 3ª ó 4ª décadas de la vida, desarrollan un engrosamiento de la piel que las cubre y aparecen sobre ellas nodularidades que en ocasiones llegan a ser de gran tamaño. Esta formación de nódulos que por motivos desconocidos sólo se desarrolla en la cara, complica el tratamiento de estas lesiones con los láseres vasculares específicos o fuentes de luz pulsada, porque son necesarias muchas sesiones de tratamiento para lograr que remitan. En nuestra serie tratamos 20 pacientes con nódulos sobre manchas en vino de oporto con láser de CO_2 con excelente resultado, en pocas sesiones de tratamiento. Se trata por tanto de un tratamiento inicial de estas lesiones para luego continuar con láseres vasculares específicos. Nuestro trabajo constituye la primera referencia de tratamiento con láser de CO_2 de esta patología y ha sido refrendado posteriormente por otras publicaciones[193]. A pesar del aspecto de estas lesiones es llamativa la facilidad con que se realiza este tratamiento, el poco sangrado que conlleva y el escaso tiempo de recuperación.

4. Del Pozo J, Peña C, García-Silva J, Goday JJ, Fonseca E. VENOUS LAKES: A REPORT OF 32 CASES TREATED WITH CARBON DIOXIDE LASER VAPORIZATION. **Dermatology Surgery 2003; 29: 308-310[194].**

COMMUNICATION

Venous Lakes: A Report of 32 Cases Treated by Carbon Dioxide Laser Vaporization

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Venous lakes (VL) are acquired venous ectasies of the superficial dermal venules, usually observed in older people. Thirty-two adult patients with VL in several localizations were treated by carbon dioxide laser vaporization. Two passes were performed to each lesion within the same session. A continuous and defocused mode, with a power density of 5 W/cm^2, was used in the first pass, and a continuous focused mode with the same power density was in the second pass. Photographic controls were performed before and after treatment. VLs were removed, and the smooth surface of the treated area was re-established by a single laser session. Only one case recurred after the treatment. No significant secondary effects were observed. Carbon dioxide laser is a good and safe method for treatment of skin VL. With adequate cautions, excellent cosmetic results can be obtained with a single session of treatment.

JESÚS DEL POZO, MD, CARMEN PEÑA, MD, JESÚS GARCÍA SILVA, MD, JOSE JAIME GODAY, MD, AND EDUARDO FONSECA, MD HAVE INDICATED NO SIGNIFICANT INTEREST WITH COMMERCIAL SUPPORTERS.

VENOUS LAKES (VL) are common venous ectasies of dilated venules in the upper dermis[1] and are formed from a thin layer of endothelial cells and supported by a strong fibrous wall.[2]

VL present as asymptomatic sharply demarcated, usually round or oval, dark-blue elevated nodules with a smooth surface. They usually become flattened by digital compression because they are blood filled. Profuse bleeding may appear after minimal trauma. They may be multiple and vary in size from 5 to 15 mm in diameter. The most frequent localization of VL is on the lips, when they are named in several forms, including blueberry on the lips and senile hemangioma on the lip. Nevertheless, it may occur in other localizations, such as ears,[3] cheeks, hands, eyelids, mucous membranes, and nose.

Treatment of VL is demanded for cosmetic reasons or because of recurrent bleeding. Different treatment systems have been performed to remove VL, including excision,[3] cryosurgery,[4] electrodesiccation, infrared coagulation,[5] continuous mode argon laser,[6–8] pulsed mode argon laser,[9] flashlamp pulsed dye laser,[10,11] intense pulsed light source,[12] and carbon dioxide laser vaporization.[13,14]

We conducted a prospective study of 32 patients with VL treated with carbon dioxide laser vaporization.

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Case Reports

Thirty-two patients (9 males and 23 females, age range of 31 to 81 years, mean age of 59.9 years) with VL were enrolled in this prospective study. All patients never had received treatment for VL. Nineteen lesions were localized on the lower lip, five on the upper lip, two on the hands, two on the oral mucous membrane, one on the vermilion margin, one on the cheek, one on the nose, and one on the upper eyelid. Thirty patients presented with single lesions and two with two lesions. The size of lesions rose from 2 to 10 mm in diameter. In 10 patients, the lesions had been present for more than 10 years.

Before laser treatment, informed consent was obtained in all cases. Intralesional anesthesia was performed using mepivacaine without epinephrine. A carbon dioxide laser (Kaplan Pendulaser System; Optomedic Medical Technologies Ltd., Or-Yehuda, Israel) (a portable laser with maximal power density of 20 W/cm^2 that permits pulses of 90 ms) was used to treat the entire surface of all lesions. In this portable laser system, the beam laser may be manually defocused.

Two laser passes were performed on each lesion within a single session. In the first pass, we used a continuous wave and a defocused mode, approximately 3 cm spared to the skin, with a spot of incidence of 10 mm and a power density of 5 W/cm^2. This pass resulted in a contraction of the tissue with blanching of the lesion. After the first pass, the partially desiccated tissue was manually removed with a saline-soaked gauze. A second pass was then performed using a focused mode

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Figure 1. Venous lake on the upper lip.

Figure 2. Aspect of the upper lip after carbon dioxide laser vaporization.

with a power density of 5 W/cm^2. The superficial and deep areas of VL were vaporized.

After the laser treatment, topical antibiotic ointment (mupirocine) was applied to the wound, and the area was covered with a dressing. Patients were instructed to daily clean the area with mild soap and water, followed by application of antibiotic ointment and a dressing for a period of 2 week. Patients returned for physician evaluation 6 weeks postoperatively.

One session was performed in each lesion except in one patient who required two sessions by recurrence of VL.

Initial and final photographs were taken, and a response was evaluated based on comparisons with baseline photographs. All photographs were taken with a Nikon FM-2 camera system (Tokio, Japan) using identical parameters and processing techniques.

Thirty-one of the 34 lesions disappeared after one laser session treatment. Only a case localized in lower lip relapsed immediately after the healing of laser injury. Another session of treatment was necessary to eliminate this lesion. Representative results are exposed in the Figures 1–4.

Figure 3. Venous lake on the lower lip.

Figure 4. Good cosmetic aspect of the lower lip after carbon dioxide laser treatment.

In all cases, the cosmetic outcome was excellent, with clearance of vascular nodules. No relevant secondary

effects were observed. In three cases, a temporal induration on treated area was observed. No pigmentary, hypertrophic, or atrophic textural changes were noted.

After a medium follow-up of 22 months (a range of 4 to 41 months), no recurrence of the lesions was observed.

Discussion

The clinical picture of VL is characteristic, and a biopsy specimen is not usually necessary to confirm the diagnosis.

The treatment of VL by excision, cryosurgery, or electrocoagulation may obtain good cosmetic results.[3,4] Nevertheless, they may be complicated by bleeding, swelling, and pain, and the appearance of secondary effects, such as pigmentary or textural changes, is not rare. These problems were minimized with the appearance of laser system treatments.

Laser treatment of VL may be performed by vaporization with infrared laser systems and by visible light laser. Infrared lasers (when the chromophore is the water), like a carbon dioxide laser, achieve a total destruction of VL tissue with minimal surrounding thermal damage. Visible light lasers (when the chromophore is the hemoglobin), such as argon laser, pulsed dye laser, and intense pulsed light source systems, destroy VL by the high content of erythrocytes in these lesions.

Visible light laser systems produce purpura lasting several weeks, and two to four sessions of treatment are necessary to clear VL. Carbon dioxide laser vaporization requires only one session to treat these lesions, and a crust appears over the treated lesions that is eliminated after 7 to 10 days by antibiotic ointment. The VL treatment by visible light lasers may be performed without anesthesia, but this is not possible with carbon dioxide laser. The appearance of pigmentary and/or textural changes on treated areas is more frequent with carbon dioxide laser than with visible light lasers, but these risks are minimized by good technical management, adequate instruction of patients, and adequate postoperative cares.

The recurrence of one of our lesions after carbon dioxide laser treatment was due to an incomplete vaporization of deeper areas of VL. In these cases, the recurrence appears immediately after the healing of surgical bound, and usually, it has a lower size than the initial VL.

Our results, obtaining relevant cosmetic improvement with a single session, low morbidity, and minimal secondary effects, suggest that continuous carbon dioxide laser vaporization is a safe and effective treatment for VL. The higher availability and the lower cost of carbon dioxide laser systems should be taken into account in the comparison between these results and those obtained by other laser systems.

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Comentario:

Los lagos venosos son dilataciones venosas adquiridas que normalmente aparecen en la edad adulta y se localizan en los labios sobre todo en los labios inferiores. Se deprimen fácilmente a la presión manual excepto cuando son lesiones de muchos años de evolución ya que pueden formarse trombos en su interior y la subsiguiente fibrosis los transforman en lesiones induradas. Inicialmente el tratamiento con láser de estas lesiones se describió con el láser de argón[195], el láser de colorante pulsado[196], y hay algunos casos publicados en el contexto de artículos generales sobre indicaciones de tratamiento con láser de CO_2[40,41]. Nuestro trabajo recoge por primera vez una serie en excusiva de lagos venosos y plantea la eficacia y seguridad del tratamiento con láser de CO_2 aunque coincide en el tiempo con otro trabajo similar[42]. El tratamiento con láser de CO_2 de estas lesiones se realiza con una sesión, tiene poco índice de recidivas, el resultado estético es generalmente excelente y con pocos efectos secundarios. Sin embargo en la mayoría de los lagos venosos existe una vena de bastante calibre de forma subyacente que en ocasiones es difícil de coagular dada la capacidad de coagulación limitada de este sistema de láser. Por ello y porque se realiza sin realizar una ablación de la superficie cutánea en la actualidad de forma general prefieren tratarse con sistemas de Nd:YAG de pulso largo[197].

5. Del Pozo J, Pazos JM, Fonseca E. LOWER LIP HYPERTROPHY SECONDARY TO PORT-WINE STAIN. COMBINED SURGICAL AND CARBON DIOXIDE LASER TREATMENT. **Dermatology Surgery 2004; 30: 211-214**[198]**.**

Lower Lip Hypertrophy Secondary to Port-Wine Stain: Combined Surgical and Carbon Dioxide Laser Treatment

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BACKGROUND. Port-wine stains (PWSs) are capillary malformations that usually show progressive stasis of the vascular channels and cause slow hyperplasia of the soft and hard tissues. When these lesions involve the lower lip, macrocheilia may be developed along the time. Vascular-specific lasers are not adequate to correct these three-dimensional tissue deformities, and surgical management becomes necessary, resulting in considerable morbidity and aesthetic disturbances.

OBJECTIVE. To report a case of macrocheilia secondary to PWS treated by combination of surgery and carbon dioxide laser.

METHODS. A 51-year-old man with macrocheilia of the lower lip and severe functional impairment, secondary to long evolution PWS, received treatment with carbon dioxide laser vaporization and minimal surgical correction, resulting in significant improvement of the lower lip hypertrophy, good aesthetic and functional status, and preservation of the muscular function.

CONCLUSIONS. Combined carbon dioxide laser and surgery treatment may constitute a valuable alternative in treatment of macrocheilia secondary to PWS because bleeding risk is minimized and improves the preservation of muscular function and aesthetic results in relationship to conventional surgical approaches.

J. DEL POZO, MD, J. MANUEL PAZOS, MD, AND E. FONSECA, MD HAVE INDICATED NO SIGNIFICANT INTEREST WITH COMMERCIAL SUPPORTERS.

A PORT-WINE stain (PWS) is a macular capillary malformation present at birth that persists throughout life. The lesions are comprised by dilated, thin-walled capillary to venular size channels, located into the papillary and upper reticular dermis.[1]

The progressive stasis of these vascular channels results in slow hyperplasia of soft and hard tissues, clinically manifested as tuberous lesions or hypertrophy of the involved structures.[2–4]

Some areas on PWS, as distal zones, have a tendency to a higher hypertrophy degree. The lower lip is an example of this feature, and hypertrophy is relatively frequent in capillary malformations on this area, where an uncontrolled enlargement of the free-edge may occur. Nevertheless, although slight, slow lower lip hypertrophy secondary to a PWS is not a rare event, severe enlargement resulting in functional lip disturbance is uncommon.

Soft-tissue hypertrophy shows no good response to vascular-specific lasers, and surgical correction may be necessary. Two surgical procedures may be performed for lower lip reconstruction after excision of vascular malformations, local or distant flaps, and skin grafting.[5] Both techniques have severe surgical morbidity (surgical management may be difficult because of hemorrhagic complications) and rarely provide identical color and texture of the skin, and a border effect is frequently noticeable. In addition, surgical treatments usually cause muscular lower lip dysfunction.

We report a case of PWS on third right branch of trigeminus nerve and neck, resulting in severe hypertrophy of soft tissues with main involvement of the lower lip. A combined surgical and carbon dioxide laser vaporization treatment was performed, obtaining preservation of the muscular function and good aesthetic and functional results.

Case Report

A 51-year-old man presented by a port-wine color of lesion located on third, right branch of trigeminus nerve, with involvement of right ear, neck, lower lip, gums, and mucous oral membrane (Figure 1). Twenty years ago, the lesion was red and smooth. Currently, severe hypertrophy of the lower lip with nodular lesions on the free edge, lip ptosis, and spontaneous loss of saliva was observed. An imaging magnetic resonance study showed enlargement of soft tissues of the lower lip by a vascular masse without infiltration of deep structures (the muscle and bone) or presence of calcifications.

A selective angiography was performed in order to evaluate the possibilities of treatment. A slow-flow

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Figure 1. Capillary malformation with lower lip hypertrophy.

lesion without abnormal vascularization or nidus was demonstrated.

The patient refused surgical treatment, and carbon dioxide laser treatment was performed according to the objectives explained in Figure 2. After several laser sessions, a minimal surgical correction of the lower lip free edge was performed to improve the aesthetic aspect and the functional status of lower lip.

Before laser treatments, regional anesthesia on mentonian nerves with supplements in vermilion lip margins was performed using lidocaine without epinephrine. The tuberous masses of the free-edge lower lip were vaporized by a carbon dioxide laser (Kaplan Pendulaser System; Optomedic Medical Technologies Ltd., Or-Yehuda, Israel, a portable laser with maximal power density of 20 W/cm^2 that permits pulses of 90 ms) on continuous wave and focused mode, with a power density of 10 W/cm^2. Hemorrhage was resolved by the same laser beam in defocused mode.

In a second time, approximately holes that were 1 cm deep and in diameter were performed with the carbon dioxide laser from the internal surface of lower lip (in focused mode and 10 W/cm^2 power density) (Figure 2a) in order to decrease the hypertrophic masse. Bleeding was resolved with the same power density in defocused mode. No muscular layer were vaporized by the laser in order to preserve the muscular function of the lower lip. Approximately 20 sessions spared 6 weeks were performed on the surface of the hypertrophic lower lip; the retraction of cicatrizal tissue tractioned the upper part of lip toward the oral cavity.

In a third time, a surgical correction of the distal area of the lip, similar to a vermilionectomy, was performed (Figure 2b). The hemorrhage was not significative, perhaps because of the fibrous tissue

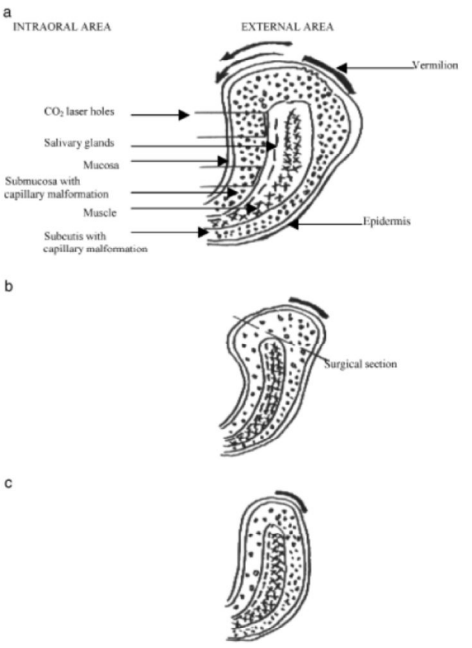

Figure 2. A scheme of transversal section of lower lip shows the objectives of treatment. (a) The increased volume of subcutis and submucosa by the capillary malformation as well as the localization of CO_2 laser holes performed from intraoral area without destruction of muscular layer. The resolution by secondary intention of laser holes induces traction of vermilion toward the oral cavity, indicated by the arrows of the figure. (b) The discontinued line shows the point of chirurgic treatment, similar to a classic vermilionectomy. (c) The ideally final aspect of transversal section of lower lip.

induced by the successive sessions of carbon dioxide laser.

A significant improvement of lower lip hypertrophy was achieved (Figure 2c) with a good functional status (Figure 3); the muscular function was preserved, and the salivary leakage was corrected. Currently, an intense pulsed light system is being used to treat the superficial component of PWSs.

Discussion

Three types of vascular malformations may induce disfiguring enlargement of lower lip, including venous malformations, arteriovenous malformations, and long-evolution PWSs.

Venous malformations usually appear in infancy and cause severe enlargement of the affected area that

Figure 3. Final aspect of lower lip. Currently, PWS is treated by an intense pulsed light system.

produces a progressive anatomic disturbance and involvement of deep structures (muscle, joint, and bone). The radiologic study reveals a slow flow lesion with calcified masses named flebolites, typical of these lesions. Venous malformations are probably the most deforming vascular malformations. Percutaneous embolization, surgery, or both treatments are usually necessary.[1]

Arteriovenous malformations[6] may present as red, blue violaceous maculae, or subcutaneous masses with or without superficial telangiectasia. Usually after the puberty, the affected area may show an increase of temperature, thrill, and pulsation as consequence of the development of high-flow lesions. Laser treatment, inadequate embolization, traumatisms, or spontaneously triggered high-flow changes may result in color alterations, recurrent bleeding, ulceration, intractable pain, or sudden enlargement. Magnetic resonance imaging shows a fast-flow vascular mass with a tendency to deep involvement, and arteriography studies show the presence of a central stuffed area named nidus. Embolization previous to surgical treatment is usually the elective therapeutic option. Arteriovenous malformations are probably the vascular malformations with more possible severe complications.

PWSs show a slow hypertrophy during its evolution, usually manifested after the 4th or 5th decades of life. Arteriographic studies are normal, and no calcifications are detectable by radiologic study. PWSs are the most frequent but usually the less deforming vascular malformations that affects lower lip. Severe hypertrophy with dysfunction of the lower lip, as occurred in our case, is a rare event.

Soft-tissue hypertrophy in PWS supposes a therapeutic challenge because it has not good response to vascular-specific lasers. Laser treatment is unable to correct three-dimensional tissue deformities such as macrocheilia.[7] Embolization of these lesions is not possible, and surgical correction may be required. The removed lip must be ideally reconstructed with a tissue similar in color and texture and must be innervated to have functional ability. In addition, the preservation of the normal contour of the lip so that function of the oral aperture becomes no compromised is recommended.[8]

The type of reconstruction will depend on the defect and its localization. When the defect is lower than one third, direct closure is recommended, either in V or W shapes. Nevertheless, it is slightly limited when the resection is near 50% because the new lip receives rather high tension. When the resection is higher than 50%, a surgical reconstruction is necessary.[5]

In all cases, surgical procedures have significant morbidity and rarely provide identical color and texture of skin. A border effect is frequently noticeable, and a loss of muscular lower lip function usually occurs.[9]

These surgical techniques have usually been described to treat malignant lower lip diseases. The indication of these techniques with a high morbidity for the surgical treatment of a benign condition, like PWSs, is controversial. Transfixion techniques[10] for the treatment of vascular anomalies have been also described.

In our case, carbon dioxide laser vaporization treatment reduced the vascular mass of lower lip and probably decreased the possibility of hemorrhagic complications during the surgical procedure. In addition, the color and texture of skin and normal border effect, as well as the muscular function of the lower lip, were preserved.

The treatment was very prolonged because of the intervals between carbon dioxide laser sessions. Nevertheless, the morbidity was quite a bit lower than the referred by surgical procedures, and the aesthetic results were probably better.

Residual scars and pigmentary changes are the main possible secondary events of carbon dioxide treatment. Nevertheless, the treatment performed throughout the oral mucosa minimizes these problems.

In the future, with the generalization of the laser use, the early treatment of lower lip PWSs probably avoids the development of these hypertrophic masses.

In summary, we report an alternative therapy for lower lip hypertrophy secondary to PWS, with minimal morbidity, good cosmetic results, and muscular function preservation.

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Comentario:

La hipertrofia labial asociada a las manchas en vino de Oporto es un hecho observado con cierta frecuencia en las lesiones que asientan sobre V2 en el caso del labio superior y V3 en el caso del labio inferior. Normalmente cuando ésta se presenta suelen ser lesiones extensas, con afectación transmural, es decir desde la piel de la superficie cutánea hasta la mucosa, y hay casos asociados a afectación de V1 y Síndrome de Sturge Weber. El tratamiento de esta hipertrofia labial desde un punto de vista quirúrgico es de gran dificultad y con grandes secuelas en gran parte porque se corre el riesgo de perder la función muscular del labio. El tratamiento con láser de CO_2 que presentamos en nuestro paciente, es un tratamiento paliativo que pretende corregir en la medida de lo posible la deformidad estética del labio pero que no va a ser curativo para la malformación capilar de base. Tiene la gran ventaja sobre la cirugía, que es mucho más fácil de realizar, una morbilidad mucho menor y conserva la función muscular del labio. En nuestro paciente la hipertrofia labial era de gran magnitud y le producía pérdida de saliva de forma espontánea. Se realizó un tratamiento combinado con láser de CO_2 primero desde la mucosa realizando agujeros en el labio que cicatrizaban por segunda intención y finalmente una pequeña corrección quirúrgica. Este manejo de la hipertrofia labial con láser probablemente se había descrito con anterioridad[199] pero con una terminología inadecuada a la clasificación actual de anomalías vasculares de la ISSVA (International Society for Study of Vascular Anomalies).

6. Del Pozo J, Fonseca E. MACROCHEILIA SECONDARY TO A PORT WINE STAIN. COMBINED CHIRURGIC AND CARBON DIOXIDE LASER TREATMENT. **Dermatology Surgery (Letter) 2004; 30: 1601-1602[200].**

Excision of Hemangioma and Sculpting of the Lip Using Carbon Dioxide Laser

To the Editor:

We read "Lower Lip Hypertrophy Secondary to Port-Wine Stain: Combined Surgical and Carbon Dioxide Laser Treatment" by Del Pozo and colleagues[1] in the February 2004 issue of *Dermatologic Surgery* with great interest.

In the article, Drs Del Pozo, Pazos, and Fonseca treated the subject in three stages, first vaporizing the tuberous masses of the free-edge lower lip with a carbon dioxide laser, followed by creating holes on the internal surface of the lower lip with carbon dioxide laser to decrease the hypertrophic mass, and finally performing a surgical correction of the distal area of the lip. We agree with Drs Del Pozo and coworkers that the carbon dioxide laser is an excellent means of reducing the vascular mass of lower lip with good aesthetic results and simultaneously decreasing the possibility of hemorrhagic complications during the surgical procedure. Their method, as the authors acknowledge, however, requires a very prolonged treatment time because of the intervals between carbon dioxide laser sessions. In their case report, approximately 20 sessions of the laser treatment with 6-week intervals were required, which would take about 4 months for the second stage alone.

We experienced excellent functional and cosmetic results in four subjects with lip hemangiomas using a carbon dioxide laser excision technique, and we published the results, in Korean, in *Korean Journal of Dermatology* in 1998.[2] Since then, we have accumulated six more cases with excellent results, and we present the method here as an alternative method of removing labial hemangioma, which requires only one treatment session. Three female and one male subjects with nevus flammeus of hemiface and accompanying hemangioma of the upper and/or lips, ranging in ages from 20 to 37 years, were treated. All four subjects had hypertrophy of the lip(s) resulting from the hemangioma. After marking the areas to be excised with gentian violet, local anesthesia was performed with 2% lidocaine and 1:100,000 epinephrine mixture. Excision of the hemangioma was performed using focused beam of carbon dioxide laser (Illumina 730, Heraeus Lasersonics Inc.) in continuous-wave, superpulse mode, with a power density of 5 W/cm^2. After cutting the labial skin along the free edge or vermilion border of the involved lip, an incisional plane was created at the junction of the dermis and subcutaneous fat from the inner surface of the lip (Figure 1). In the process of excising the hemangioma, we left enough hemangioma tissue to be able to reconstruct the lip. Hemorrhage was not significant during the surgery,

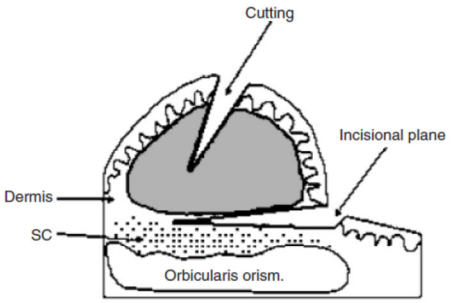

Figure 1. Schematic diagram of laser excision of hemangioma tissue.

Figure 2. Hypertrophy and irregularity of upper lip secondary to nevus flammeus in a 37-year-old woman (left). Correction of the lip hypertrophy with good symmetry 3 months after CO_2 laser excision (right).

and when it occurred it was resolved by the same laser beam in defocused mode or by electrocautery. Asymmetrical dermal suture was placed, leaving more dermis on the labial side than on the facial side. Skin was closed so that the vermilion border was mildly elevated, reconstructing the lip to a near normal shape.

Excellent to good results were achieved with minimal blood loss in all four subjects (Figure 2). In all four subjects, a major portion of the hemangioma was removed. Minimal scarring was observed in three subjects and acceptable scarring in one. Three subjects were satisfied with the cosmetic result and one was moderately satisfied. Postoperative pain was observed in none of the subjects, and minimal edema was observed in only one subject. No functional complications were observed.

The most significant problem in operating on a labial hemangioma is hemorrhage. When carbon dioxide laser is used as an excisional tool, it also produces effective intraoperative hemostasis by closing blood and lymph vessels, and hemorrhage from larger blood vessels can be resolved by defocused beam of the laser.[3,4] Consequently, one can obtain a clear visual field of operation, making the surgical procedure rapid and accurate, enabling it to be done on an outpatient basis under local anesthesia. In addition, postoperative pain and edema are minimized because small superficial

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nerves are destroyed along with the blood and lymph vessels.[5] In conclusion, the carbon dioxide laser excision technique is an effective way to remove labial hemangioma and sculpt the lip because it renders less textural change, greater volume reduction, hemostasis with excellent lesional visualization, and an overall good cosmetic outcome than defocused mode or conventional scalpel surgery.

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Response to Letter to the Editor:

I agree with Whang et al. that our treatment technique for lip hypertrophic vascular lesions is prolonged, requiring several sessions of laser surgery. We also consider their proposal as an excellent alternative for labial vascular masses treatment.

Nevertheless, Whang et al. use a confuse terminology, which can difficult to associate their technique with its concrete scope. According to Mulliken and Glowacki classification,[1] completed by the ISSVA (International Society for Study of Vascular Anomalies) meetings, the term hemangioma should be restricted to true vascular tumors with tendency to evolution after the first year of life. Whang et al. reported three patients with age between 20 and 37 years and vascular lesions that probably were hypertrophic masses associated with port wine stains. These hypertrophic masses sometimes observed in port wine stain patients are no true hemangiomas and some authors consider them as hamartomatous lesions with multiple germ layer defects.[2]

In conclusion, in our opinion the Whang et al. technique and the proposed by ourselves should be evaluated, according the characteristics of the each case, in the treatment of hypertrophic vascular lip lesions, which constitutes a therapy challenge. The utilization of internationally validated nomenclature is essential to improve the knowledge of new developments in this difficult field of dermatology surgery.

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Comentario:

En una carta al director remitida con posteriodad sobre nuestro trabajo se nos refiere que este tratamiento puede realizarse no en muchas sesiones como en nuestro caso sino en un único procedimiento. Con posterioridad hemos realizado otros tratamientos de hipertrofia de labio superior en una sola sesión de láser de CO_2 con excelentes resultados.

7. Del Pozo J, Fonseca E. ANGIOKERATOMA CIRCUMSCRIPTUM NAEVIFORME: SUCCESSFUL TREATMENT WITH CARBON DIOXIDE LASER VAPORIZATION. **Dermatology Surgery 2005; 31: 232-236[201].**

Angiokeratoma Circumscriptum Naeviforme: Successful Treatment with Carbon-Dioxide Laser Vaporization

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BACKGROUND. Angiokeratoma circumscriptum naeviforme (ACN) is an unusual type of localized angiokeratoma that occurs more frequently in females and is usually located on the buttocks or thighs, showing a unilateral distribution. ACN usually causes large lesions, which may require laser ablation because they often are too extensive to perform surgical excision. Carbon-dioxide laser is a known alternative for treating angiokeratomas.

OBJECTIVE. Report of two cases of ACN treated with carbon-dioxide laser vaporization.

PATIENTS AND METHODS. A 28-year-old woman with a hyperkeratotic, violaceus plaque on her left buttock and a 24-year-old woman with a similar lesion on her right buttock were treated with a carbon-dioxide laser. Two laser passes were performed on each lesion within a single session.

RESULTS. A successful cosmetic aspect of treated areas was obtained, with minimal pigmentary or textural changes. After a 2-year follow-up in the first patient and a 6-month follow-up in the second patient, no recurrence of the lesions was observed.

CONCLUSIONS. Our results, obtaining relevant cosmetic improvement after a few sessions of treatment, with low morbidity and minimal secondary effects, suggest that continuous-wave carbon-dioxide laser vaporization is a safe and effective treatment for ACN.

JESÚS DEL POZO, MD, AND EDUARDO FONSECA, MD, HAVE INDICATED NO SIGNIFICANT INTEREST WITH COMMERCIAL SUPPORTERS.

ANGIOKERATOMAS ARE vascular lesions defined by ectasia of the papillary dermis vessels with secondary epidermal reaction changes, such as acanthosis and/or hyperkeratosis. Clinically, they appear as one or several dark red papules, mostly with a verrucous surface.[1]

Angiokeratomas may present as solitary, localized, or widespread lesions. Based on the clinical appearance and historical aspects, the current classification of localized forms includes solitary angiokeratoma, Fordyce's angiokeratoma, angiokeratoma circumscriptum naeviforme (ACN), and angiokeratoma of Mibelli, which occurs symmetrically in perniotic hands and feet.[2]

In 1915, Fabry described circumscribed nevoid angiokeratoma or ACN. Typically, it is noticed at birth but occasionally does not appear until childhood or even adulthood. ACN presents as a large, mostly linear, and unilateral hyperkeratotic plaque, which is composed of confluent keratotic papules. The size varies from a few centimeters to large enough to cover the major part of the body surface. In other cases, the lesions initially present as multiple reddish macules, clinically similar to nevus flammeus. Within several years, they develop into acanthokeratotic papules and by aggregation become plaques, which may have a hyperkeratotic surface, sometimes with a monstrous aspect.[3]

ACN seems to be more frequent in women. Some reported cases were associated with underlying vascular malformation and/or atrophy or hypertrophy of the regional soft tissue and bone.[4] The sites of predilection on the skin are the buttocks and the thighs, with unilateral distribution.[5]

Nevoid malformations of underlying deeper vasculature seem to be the general cause of ACN.[5] Posttraumatic arteriovenous fistula is another condition leading to this type of angiokeratoma.[6]

The coexistence of ACN with other types of angiokeratoma and other vascular disorders, including Fordyce's angiokeratomas,[7] Cobb syndrome,[8,9] Klippel–Trénaunay syndrome,[5,10] nevus flammeus,[5] cavernous hemangioma,[11,12] and traumatic arteriovenous fistula,[6] has been described.

Small lesions may be treated by diathermy, curettage and cautery, cryosurgery, and surgical excision. Larger lesions may require laser ablation[13,14] because they often are too extensive to perform surgical excision.

Carbon-dioxide laser vaporization has been used as a treatment for Fordyce's angiokeratomas,[15] and argon laser treatment of extensive angiokeratoma circum-

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scriptum has been described,[13,16] but to our knowledge, there are no specific references to ACN treatment by carbon-dioxide laser.

We report two cases of ACN treated by carbon-dioxide laser vaporization resulting in excellent cosmetic results and without secondary effects or recurrence after treatment.

Patients and Methods

The first patient was a 28-year-old woman who presented with an asymptomatic, hyperkeratotic, violaceus plaque on her left buttock, with a surface area of more than 20 cm^2. The lesion appeared approximately at the end of the first decade of life, showing a slow increase in diameter over time. The patient asked for this lesion to be treated for cosmetic reasons.

The second patient was a 24-year-old woman who presented with a hyperkeratotic and violaceus plaque on her right buttock. Bleeding was occasionally present. The lesion appeared in the second decade of life. The treatment, similar to our other case, was demanded for cosmetic reasons.

Both patients had never received treatment for ACN. There was no associated varicosity of the superficial veins or hemangiectatic hypertrophy of the affected areas.

Before laser treatment, informed consent was obtained in both cases. The treatment was performed in several sessions under local anesthesia, using mepivacaine without epinephrine. A carbon-dioxide laser (Kaplan Pendulaser System, Optomedic Medical Technologies Ltd, Or-Yehuda, Israel) was used to treat both patients. In this portable laser system, the beam laser may be manually defocused.

Two laser passes were performed on each lesion within a single session. In the first pass, we used a continuous wave and focused mode, with a power density of 10 W/cm^2, to eliminate the hyperkeratotic and hypertrophic epidermis. After this pass, the partially desiccated tissue was manually removed with a saline-soaked gauze, disclosing the superficial dermis with several hemorrhagic points. The second pass was performed with a defocused mode at the same power density to achieve a slight contraction of tissue and coagulation of the dermal vessels.

After laser treatment, topical antibiotic ointment (mupirocin) was applied to the wound, and the area was covered with a dressing. A daily cleansing of the treated area with mild soap and water, followed by application of the same antibiotic ointment for a period of 2 weeks, was performed. The new physician evaluation of the patient was made after 6 weeks of treatment.

Because of the extension of the lesions, the treatment of their complete surface was performed in several sessions, four sessions in patient 1 and five sessions in patient 2. After the treatment, persistent erythema on the treated area was observed. Minimization of this erythema occurred over time, within the following months.

Initial and final photographs were taken, and the response was evaluated based on comparisons with baseline photographs. All photographs were obtained with a Nikon FM-2 camera system (Tokyo, Japan) using identical parameters and processing techniques.

Results

Six months after treatment of all surfaces of the lesions, marked improvement of the lesions was observed, with persistence of minimal to mild erythema and minimal pigmentary and textural changes. Representative results are show in Figures 1 to 4.

A successful cosmetic aspect of the treated areas was obtained. After a 2-year follow-up in the first patient and a 6-month follow-up in the second patient, no recurrence of the lesion was observed.

Discussion

Some authors assume that ACN and nevus flammeus are very closely related conditions. The following circumstances may be pertinent to this supposition:

- ACN and nevus flammeus show no essential histologic differences. Both are, for the most part, simple telangiectasias with venous reaching, usually down to the subcutaneous vascular plexus. As in nevus flammeus, late angioblastic proliferation also occurs in some cases of ACN.
- In some cases, the initial appearance of ACN is a circumscribed patch and is not much different from a nevus flammeus.
- ACN and nevus flammeus can be seen in the same patient under homologous conditions. Both lesions may form part of Klippel-Trénaunay and Sturge-Weber syndrome.[5]

Nevertheless, the evolution or natural history of both lesions is different. Darkening, thickening, and development of nodules are usual in the evolution of nevus flammeus but not the presence of hyperkeratosis of verrucous formation typical of ACN. The epidermal response to a similar vascular dermal ectasia is different. Other authors support the contention that ACN is not a true angioma.[16]

ACN may greatly resemble lymphangioma circumscriptum, and the occurrence of intermediate forms, in

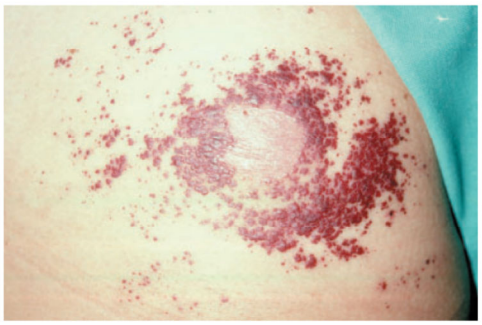

Figure 1. Angiokeratoma on the left buttock, with the central area treated.

Figure 2. Angiokeratoma on the right buttock.

which some of the superficial cystic nodules contain blood and others contain lymph fluids, makes the distinction between both conditions extremely difficult.[5] Recently, several cases of ACN of the tongue have been described.[17,18] In their histologic description, large dilated spaces, in some cases with erythrocytes and organizing thrombi and in others with clear fluid, have been observed. This may be an example of intermediate forms between lymphangioma and angiokeratoma circumscriptum.

However, the main terminologic and nosologic confusion of ACN occurred with verrucous or keratotic hemangioma. Histopathologic examination can distinguish these two entities. Angiokeratoma involves the superficial, papillary dermis, whereas verrucous hemangioma involves all levels of the dermis and subcutaneous tissue. The blood cysts that lie within the acanthotic epidermis in angiokeratoma are not observed in verrucous hemangioma.[19]

The treatment of larger lesions of angiokeratoma usually requires laser management because the other treatment modalities may produce great disfiguring results. Large lesions are habitual findings in ACN; our two treated cases have more than 20 cm^2 of surface area.

Several laser systems have been used to treat angiokeratomas, including argon laser,[13,16,20–23] carbon-dioxide laser,[24,25] Cooper vapor laser,[26,27] neodymium:yttrium-aluminum-garnet (Nd:YAG) laser,[28,29] pulsed dye laser,[30] and intense pulse light source systems.

The rapid vaporization of superficial cutaneous lesions is the main quality for which the carbon-dioxide laser has been used in dermatologic surgery. The advantages of this method include the approximate precision in depth and in surface area that can be achieved, the operative speed of the procedure, the hemostasis during the procedure, and the minimal postoperative pain and edema.[15]

With nonablative vascular laser systems (dye laser, Cooper vapor laser, pulsed argon laser, and Q-switched Nd:YAG laser) or intense pulse light sources, the treatment of each area of these lesions required several sessions because of the hyperkeratotic epidermal reaction difficult the access of laser beam to superficial dermal vessels.

With ablative laser systems, such as a continuous-wave argon laser or a carbon-dioxide laser, access to the superficial dermis is achieved after the first pass of treatment. Nevertheless, the risks of secondary effects, such as textural or pigmentary changes, are higher. These risks are minimized by good technical management, adequate instruction of the patients, and adequate postoperative care.

The remaining small blood vessels might be eliminated with a specific vascular laser, such as a pulsed dye laser, krypton laser, or intense pulse light systems.

The benefits of carbon-dioxide laser vaporization in the treatment of these lesions include permanent eradication of lesions and alleviation of the sporadic

Figure 3. Aspect of the lesion after 6 months to end treatment.

Figure 4. Aspect after 1 year of the last session of treatment.

bleeding (a usual symptom of ACN), its safety, and that it is performed as an outpatient procedure, under local anesthesia, with minimal discomfort or disability.

The treatment probably might be done in a lower number of sessions using lidocaine ± epinephrine, because higher volumes of anesthesia can be used compared with mepivacaine.

Our results, obtaining relevant cosmetic improvement after a few sessions of treatment, with low morbidity and minimal secondary effects, suggest that continuous-wave carbon-dioxide laser vaporization is a safe and effective treatment for ACN.

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Comentario:

El angioqueratoma circunscrito neviforme es una entidad de difícil encuadre nosológico descrita por Fabry en 1915. Hay casos descritos en la literatura que realmente son hemangiomas verrucosos y otros casos que corresponden a malformaciones venolinfáticas según la clasificación actual de la ISSVA. Algunos autores lo consideran como la enfermedad de Fabry de tipo II o un segmentarismo del *"angioqueratoma corporis diffusum"* de la enfermedad de Anderson-Fabry. Nuestros casos son mujeres jóvenes con lesiones adquiridas que se desarrollaron de forma segmentaria a partir de la secunda década de la vida. Curiosamente los dos casos y alguno que hemos visto con posterioridad se localizan en la cara posterior del muslo y de la nalga. Se habían descrito casos tratados con láser de argón[202] pero nuestro trabajo representa los primeros dos casos tratados con láser de CO_2. En la actualidad el láser de Nd:YAG de pulso largo podría obtener resultados similares con menor morbilidad que el láser de CO_2.

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Clinical report

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Necrobiotic xanthogranuloma associated with lymphoplasmacytic lymphoma. Palliative treatment with carbon dioxide laser

Necrobiotic xanthogranuloma (NXG) with paraproteinemia is a rare non-x histiocytosis with conspicuous lesions mainly located on the periorbital skin. A 68-year-old woman, with a previous history of lymphoplasmacytic lymphoma associated with IgG monoclonal gammopathy over a period of almost 4 years, presented typical lesions of NXG on the periorbital regions and left buttock. Treatment with dioxide carbon laser resulted in great improvement of cutaneous lesions, and no evidence of relapse after a 12-month follow-up. The association of NXG with lymphoplasmacytic lymphoma has not been previously described to our knowledge. The treatment of these lesions represents a true challenge for the clinician and palliative treatment of cutaneous lesions of NXG with CO_2 laser may constitute an alternative treatment in selected cases.

Key words: CO_2 laser, lymphoplasmacytic lymphoma, necrobiotic xanthogranuloma, paraproteinemia

Necrobiotic xanthogranuloma (NXG) is a rare non-X histiocytic disease described by Kossard and Winkelmann in 1980 [2]. Nevertheless, cases of NXG might have been previously reported as atypical multicentric reticulohistiocytosis, unusual necrobiosis lipoidica or atypical xanthoma disseminatum [2].

NXG is clinically characterized by two or more indurated, non-tender, yellow or violaceous papules, nodules, or plaques, sometimes with ulceration and scar formation. The disease mostly occurs on the periorbital area, followed by the trunk, face, arms, thighs, legs, shoulder and buttocks [1, 3].

NXG usually has a progressive course with involvement of internal organs, leukopenia, low serum complement or cryoglobulinemia, association with paraproteinemia in up to 80% of cases [4-7], and an increased risk for haematological and lymphoproliferative malignant diseases (13% of cases), specially multiple myeloma and lymphoma [3, 8].

The treatment of these lesions is difficult, and although several therapeutic approaches have been performed, recurrence is frequent.

We report a case of NXG on the periorbital area and left buttock with a 4-year evolution and associated with lymphoplasmacytic lymphoma.

Case report

A 68-year-old woman had a 4-year history of lymphoplasmacytic lymphoma with monoclonal gammopathy IgG lambda type. Between 1998 and 1999 she received chlorambucil and prednisone treatment, with relevant improvement. Therefore haematological ambulatory control was instituted, without further pharmacological treatment. In April 2002, xanthomatous lesions on both upper eyelids were removed at a Plastic Surgery Department. Histological examination of surgery specimens revealed deep infiltrative changes involving the whole dermis and subcutaneous tissue. Areas of necrobiosis with cholesterol clefts, a granulomatous infiltrate with giant multinucleated lymphocytes and foamy cells, and a necrosis area with several foamy histiocytes in contact with the epidermis were observed. A diagnosis of necrobiotic xanthogranuloma was established.

Five-months later, she was referred to the Dermatology Department for evaluation and treatment of new cutaneous lesions on the eyelid. Physical examination demonstrated sharply demarcated, brown and yellow infiltrated nodules and plaques, some of them with prominent erythematous-violaceous border, located on both her lower eyelids (*figure 1*) and left buttock.

Laboratory investigations demonstrated elevated sedimentation rate 64 mm/h, (normal < 20 mm/h), low white blood cell count 2.45×10^9/L (normal range 4.00-11.50 $\times 10^9$/L); neutropenia in blood manual count, monoclonal gammopathy IgG lambda type in protein electrophoresis (IgG 3290 mg/dL, normal range 751-1560 mg/dL), and elevated levels of gammaglobulin 46.10% (normal range 10.00-20.00%). β-2 microglobulin was normal (2.19 mg/L, normal range 1.50-2.30 mg/L). Red blood cell count, glucose, electrolytes, calcium, liver and renal function tests, cholesterol and triglycerides levels were within normal ranges.

The histopathological examination of a skin specimen obtained from the buttock lesion showed a normal epidermis and the entire dermis was infiltrated by well-formed xanthogranulomas, sheets of histiocytic cells, foam cells, giant cells and a few lymphocytes (*figures 2 and 3*). Some giant

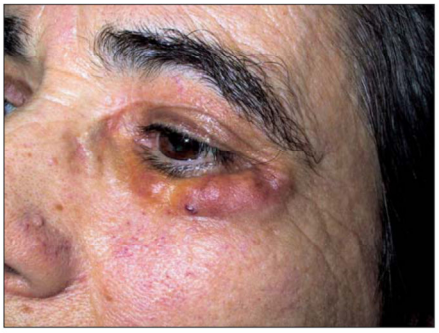

Figure 1. Yellow infiltrated nodules on the right lower eyelid.

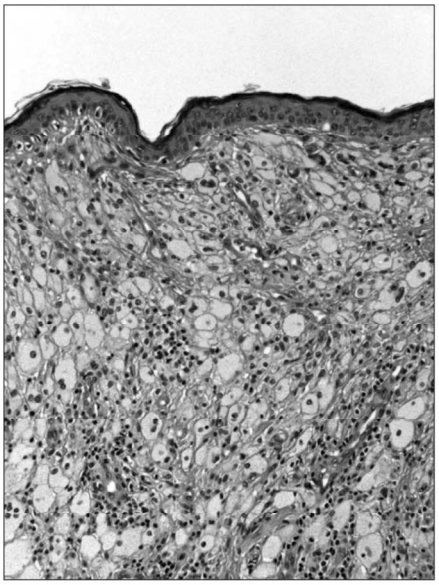

Figure 2. Dense dermal infiltrate with numerous foamy cells (hematoxyline-eosin, 40 ×).

cells were of the Touton type with interspersed necrobiotic zones.

The increase of NXG lesions altered the normal vision of patient. The stable situation of her lymphoma at this moment did not justify new chemotherapy treatment. In this manner, a palliative treatment of periorbital lesions with carbon dioxide laser was proposed.

After thorough explanation of the possible therapeutic efficacy and consequences of CO_2 laser treatment, written consent was obtained from the patient.

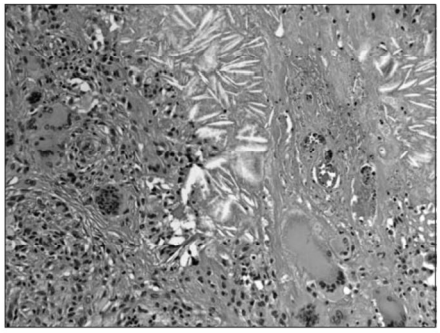

Figure 3. Detail of the infiltrate with granulomatous aspect showing sheets of histiocytic cells, foam cells, giant cells and a few lymphocytes. Cholesterol cleft aggregates were also observed around the necrobiotic areas (hematoxyline-eosin, 60 ×).

Intralesional anaesthesia was performed, using mepivacaine al 2% without epinephrine. A carbon dioxide laser (Kaplan pendulaser system, Optomedic Medical Technologies Ltd, Or-Yehuda Israel, a portable laser with maximal power density of 20 W/cm^2, that permits pulses of 90 ms) was used to treat the entire surface of all eyelid lesions. Several laser passes were performed on each lesion, using a focused mode with a power density of 5 W/cm^2. After each pass, the partially desiccated tissue was manually removed with a saline-soaked gauze. When the indurated mass of NXG was entirely removed, a topical antibiotic ointment (mupirocine) was applied to the wound and the area was covered with a dressing. Three sessions of treatment were carried out over four weeks.

After the three sessions of treatment, residual lesions of NXG were present, nevertheless the improvement of the cutaneous lesions was very relevant, achieving good functional results. After 12 months of follow-up, no relapse of the cutaneous lesions was observed.

Discussion

Approximately 70 cases of NXG have been described in the literature [9-11], with no sex predilection and an average age of appearance of 56 years (range 17 to 85 years) [3]. As with 90% of described cases [9, 12], our patient had monoclonal gammopathy IgG lambda type.

Skin lesions frequently involve the periorbital region, trunk and extremities. Several reports have documented the association with extracutaneous involvement, including upper respiratory tract, granulomatous infiltration of the lung, skeletal muscle, kidney, hepatic and splenic granulomas, necrobiotic lesions of the intestine, pelvic and retroperitoneal xanthogranuloma lesions [3, 10], and myocardial infiltration evidenced at autopsy [5, 13]. In our case, the clinical appearance of the lesions was very characteristic, with involvement of the periorbital area and left buttock, and no evidence of extracutaneous involvement.

NXG may be a paraneoplastic feature. In 13% of cases NXG is associated with carcinoma or lymphoproliferative

diseases [3, 6]. Patients with benign monoclonal gammopathy have a 10% risk of further development of multiple myeloma, macroglobulinemia, amyloidosis or malignant lymphoproliferative diseases [14]. Our patient had lymphoplasmacytic lymphoma diagnosed 4 years before. The association of NXG and lymphomas is well described in the literature [15-17]. However, to our knowledge, the specific relationship of lymphoplasmacytic lymphoma to NXG has not been reported.

The histopathological picture of NXG is characterized by a confluent granulomatous infiltrate involving the whole dermis and extending into subcutaneous tissues, comprising a mixture of lymphocytes, epithelioid cells, foamy cells, and Touton giant cells. Cholesterol clefts, lymphoid nodules, some of which develop germinal centres, and perivascular aggregates of plasma cells are frequent features. Numerous, atypical, bizarrely angulated, multinucleated giant cells may be seen adjacent to the areas of necrobiosis. Less common, but characteristic when occurring, are palisading cholesterol cleft granulomas and xanthogranulomatous panniculitis [4, 18, 19]. Our case presented typical histopathological features.

Laboratory findings include: paraproteinemia (IgG kappa or lambda), cryoglobulinemia, found in about 40% of cases, elevated sedimentation rate, neutropenia, leukopenia, and hypocomplementemia. Lipids may be elevated, normal or reduced [4, 9, 18, 20]. Many of these abnormalities were seen in our case.

Although there is no specific therapy for NXG, various treatments have been used with variable outcome, such as alkylating agents (chlorambucil or melphalan), associated or not with corticosteroids, methotrexate, cyclophosphamide, azathioprine, nitrogen mustard, plasmapheresis, local radiation therapy, and combination treatment with interferon alpha 2b [6, 18, 21]. The treatment of cutaneous lesions through surgical interventions is controversial, because the lesions have a tendency to recur after these interventions [8]. Jakobiec *et al.* [22] reported recurrence of xanthogranulomas similar to NXG within 6 months to 1 year after surgical procedure. In this study, recurrence of the lesions after excision was noted in 11 patients (42%), and development of lesions on previously disease-free incision sites occurred in 3 patients (12%). Cutaneous lesions in 2 patients worsened after trauma and intralesional corticosteroid injection. Problems with healing occurred in 2 patients after incisional surgery. Thus, more than a half of the patients experienced both rapid recurrence and lesions ultimately become larger than their original surgical scars. It may be prudent to delay the surgical treatment as long as possible [23].

In contrast with other reports [7, 22, 24], in our case we decided to perform a palliative treatment of the cutaneous lesions with carbon dioxide laser, because a new treatment with alkylating agents, associated or not with corticosteroids, was not justified because of the stable situation of her lymphoplasmacytic lymphoma. The CO_2 laser, especially when the principles of selective photothermolysis are adhered to, offers the laser surgeon multiple opportunities to enhance the care of patients with selected cutaneous conditions *(figure 4)* [24]. Adequate surgical technique and postoperative care minimize the possible secondary effects of CO_2 laser treatment, such as scarring or pigmentary changes. In our case, the improvement of the lower eyelid lesions after CO_2 laser treatment was very relevant, and a new increase of cutaneous lesions after a 12-month follow-up was not observed.

Figure 4. Improvement of eyelid lesions after CO2 laser treatment. This picture was obtained 6 months after the end of the treatment.

Therefore, we believe that CO_2 laser surgery may be an additional palliative therapeutic option for selected cases of NXG. ■

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Comentario:

El xantogranuloma necrobiótico es una forma de histiocitosis no X que suele localizarse en los párpados y que generalmente se asocia a tumores de estirpe hematológica. La paciente referida en nuestro trabajo presentaba un xantogranuloma necrobiótico asociado a un linfoma linfoplasmocitoide en remisión en ese momento. Las lesiones de los párpados eran bastante prominentes y dificultaban la visión a la paciente. Dado que con el linfoma en remisión el tratamiento con quimioterapia no parecía adeduado se decidió hacer tratamiento paliativo con láser de CO_2 con excelente resultado. Está indicación paliativa no había sido descrita con anterioridad pero posteriormente se publicaron casos de xantogranuloma juvenil múltiple tratados con láser de CO_2.[204]

9. Del Pozo J, Ferré A, San Román B, Vieira V, Fonseca E. ERYTHROPLASIA OF QUEYRAT WITH URETHRAL INVOLVEMENT: TREATMENT WITH CARBON DIOXIDE LASER VAPORIZATION. **Dermatology Surgery 2005; 31: 1454-1457[205].**

Erythroplasia of Queyrat with Urethral Involvement: Treatment with Carbon Dioxide Laser Vaporization

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BACKGROUND. Erythroplasia of Queyrat is an uncommon carcinoma in situ that usually arises on the mucosa of the glans penis or prepuce as red, shiny, sharply demarcated velvety plaques. The treatment is often difficult and associated with significant recurrence rates, especially in cases with urethral involvement.

OBJECTIVE. To evaluate carbon dioxide laser treatment in a case of erythroplasia of Queyrat with urethral involvement.

MATERIALS AND METHODS. We report a patient with erythroplasia of Queyrat involving the urethra who was treated with carbon dioxide laser vaporization.

RESULTS. Treatment with carbon dioxide laser vaporization resulted in an excellent cosmetic and functional status outcome for the glans penis and urethral lesions.

CONCLUSION. Carbon dioxide laser vaporization is probably the initial elective treatment for erythroplasia of Queyrat with urethral involvement in young immunocompetent patients. A follow-up is necessary, and new sessions of treatment should be quickly performed if recurrence occurs.

JESÚS DEL POZO LOSADA, MD, ASUNCIÓN FERRÉ, MD, BEGOÑA SAN ROMÁN, MD, VANESSA VIEIRA, MD, AND EDUARDO FONSECA, MD, HAVE INDICATED NO SIGNIFICANT INTEREST WITH COMMERCIAL SUPPORTERS.

ERYTHROPLASIA OF Queyrat is an uncommon carcinoma in situ that usually arises on the mucosa of the glans penis or prepuce of uncircumcised men between the third and sixth decades of life. It appears as red, shiny, sharply demarcated velvety plaques associated with scaling, crusting, and sometimes bleeding on the surface of the mucosa.

This entity was originally reported as a distinct clinical process by Queyrat in 1911. Later, Bowen described in 1912 two cases of precancerous dermatosis. Both terms have been used interchangeably by dermatologists and genitourinary physicians for a long time. Nevertheless, some authors have considered them different conditions. Histopathologically, both are similar.[1,2] Erythroplasia of Queyrat, Bowen's disease, and bowenoid papulosis are currently considered part of the spectrum of squamous cell carcinoma in situ and are generically included into penile intraepithelial neoplasia,[3] a conceptual approach that is similar to cervical intraepithelial neoplasia for women.

Chronic irritation, smegma, poor hygiene, genital herpes simplex, human papillomavirus (HPV),[4–8] heat, friction, trauma, and specific prepuce dermatoses, such as lichen sclerosus or lichen planus, may be risk factors for developing erythroplasia of Queyrat. All cases occur in uncircumcised patients, although the exact role for the absence of circumcision in the pathogenesis of erythroplasia of Queyrat has not been elucidated.

Differential diagnosis with balanitis circumscripta plasmacellularis, erosive lichen planus, fixed drug eruption, or mucous membrane cicatricial pemphigoid must be established, and a biopsy is mandatory to confirm the diagnosis and design an adequate therapeutic strategy.

Treatment is often difficult and associated with significant recurrence rates.[9] Several treatment modalities have been proposed, including local excision,[10] Mohs surgery,[11,12] partial or total penectomy, topical 5-fluorouracil cream,[13] electrodesiccation and curettage,[1] deep fulguration, cryosurgery,[14] radiotherapy,[15] laser ablation,[16–18] topical aminolevulinic acid photodynamic therapy,[19] imiquimod cream,[20] topical cidofovir,[21] and interferon-α-2a.[22]

We report a patient with erythroplasia of Queyrat involving the urethra who was treated with carbon dioxide laser vaporization with an excellent outcome.

Case Report

A 34-year-old-man, without a medical history of interest, presented with an erythematous plaque with progressive enlargement located on the glans penis. This lesion began in the gland mucus but in a few months affected the ostium

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urethrae externum with an extension of 2 × 3 cm (Figure 1). There was no history of HPV infection, lichen planus, or lichen sclerosus.

Histopathologic study of a punch biopsy revealed an epidermis with mild parakeratosis and marked acanthosis and papillomatosis and a dense chronic inflammatory infiltrate in the papillary dermis composed of lymphocytes and plasma cells (Figure 2). The detailed study of epidermal cells showed a loss of cellular polarity with pleomorphic and hyperchromatic nuclei within the superficial layers and some mitotic figures. A diagnosis of erythroplasia of Queyrat was established. Hibridation in situ for HPV-6, -11, -16, -18, -31, and -33 was negative.

A basic analytic study was normal, as well as serology for human immunodeficiency virus (HIV), syphilis, and hepatitis C virus.

Figure 1. Erythematous velvety plaque on the glans penis.

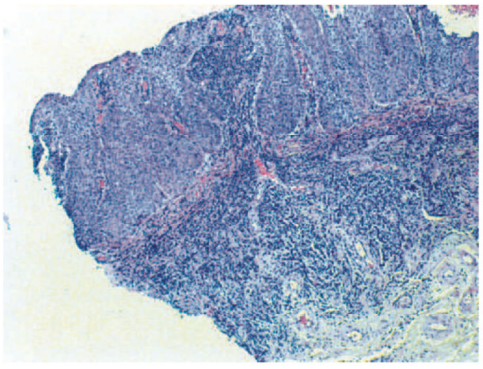

Figure 2. Histopathologic study showed an epidermis with mild parakeratosis and marked acanthosis and papillomatosis and a dense chronic inflammatory infiltrate in the papillary dermis composed of lymphocytes and plasma cells (hematoxylin-eosin stain; ×20 original magnification).

The surface of the lesion, except the meatus, was treated with carbon dioxide laser vaporization in the first session. Informed consent was obtained, and the treatment was performed, under local anesthesia with mepivacaine and without epinephrine, using a carbon dioxide laser (Kaplan Pendulaser System; Optomedic Medical Technologies Ltd, Or-Yehuda, Israel; a portable laser system in which the beam laser may be manually defocused).

Two laser passes were performed within a single session. In the first pass, we used a continuous wave and focused mode (beam diameter 1 mm), with a power density of 5 W/cm^2, to eliminate the dysplastic epidermis. We use the focused mode in the first pass because with this mode, the deep penetration of the carbon dioxide laser is higher, the elimination of the dysplastic epidermis is more effective, and the possibility of recurrence is reduced. After this pass, the partially desiccated tissue was manually removed with a saline-soaked gauze. The second pass was performed with a defocused mode (beam diameter approximately 10 mm) and the same power density, with the aim of achieving a slight contraction of tissue and coagulation of dermal vessels.

After laser treatment, topical antibiotic ointment (mupirocin) was applied to the wound, and the area was covered with a dressing. A daily cleaning of the treated area with mild soap and water, followed by application of antibiotic ointment for a period of 2 weeks, was indicated. A new physician evaluation was made after 6 weeks of treatment. This treatment resulted in elimination of the erythematous plaque and excellent cosmetic results (Figure 3).

In a second session of treatment, the remaining lesion was treated with the same system and parameters. After treatment of the meatus area, a fragment of a urinary probe was introduced through the meatus to avoid the formation of adherences in the lumen of the urethra. The response in this area was also excellent (Figure 4). The

Figure 3. Aspect of the glans penis after carbon dioxide laser treatment.

Figure 4. Meatus area after laser treatment.

treatment was performed in two sessions because we think that isolated treatment of the meatus area minimizes the main possible secondary effect, the stricture of meatus secondary to cicatricial adherences.

Six months after the last laser session, no recurrence was observed.

Discussion

The choice of therapy in erythroplasia of Queyrat requires consideration for preservation of morphology, function, and cosmetics while offering a high cure rate. Treatment is often difficult and associated with significant recurrence rates because the evaluation of the more adequate option may be difficult.

Although the patients usually prefer conservative treatments, some authors recommend vigorous treatment for all cases of penile intraepithelial neoplasia, including circumcision and a lifelong follow-up.

The immune status of the patient determines the response to different treatments, and this consideration is essential to choosing an adequate therapy. In immunocompetent patients, more conservative treatments may be used, whereas vigorous treatment must be performed in immunosuppressed patients.

Topical 5-fluorouracil has been reported to be effective, but failure to respond, partial responses, and recurrences are not uncommon.[13] Cryotherapy induces an intense postoperative edema but may be effective, with a small percentage of failure and a low recurrence rate. It may also produce residual alterations as pigmentary discoloration or textural changes. Graham and Helwig described recurrences over 83% after desiccation and curettage,[1] and local excision resulted in recurrence in 18 to 40%.[10] These high recurrence rates suggest that Mohs micrographic surgery may be effective because it allows minimal tissue loss.[11] Partial or total penectomy is usually an unnecessary mutilating procedure.[10] Grabstald and Kelly reported a 90% complete response rate maintained for a follow-up of 6 to 10 years after radiation therapy. Nevertheless, 40% of patients developed urethral stricture.[15] Photodynamic therapy is a difficult technique with a low availability and elevated cost. Imiquimod treatment is an easy treatment, but an incomplete response and recurrences are frequent.[3]

Laser ablation of the erythroplastic area is a good alternative to treatment; continuous-mode neodymium: yttrium-aluminum-garnet and carbon dioxide laser have been used.[16–18] Currently, the carbon dioxide laser is the system most commonly used. Carbon dioxide laser ablation obtains a complete response, with satisfactory functional and cosmetic results.

The main problems of this treatment are the elevated rate of recurrences and that this technique does not provide an analysis of the margins of the lesion. The main possible secondary effects after carbon dioxide laser vaporization are stricture and color and textural changes.

The involvement of HPV in penile epithelial neoplasia has been described.[6,8] Nevertheless, no studies were performed to assign higher potential malignant transformation of these cases than the cases without HPV implication. As a consequence, a careful follow-up is necessary in all patients, especially in cases treated with conservative management.

In young immunocompetent patients with urethral involvement, as in our case, carbon dioxide laser vaporization is probably the elective initial treatment. A follow-up is necessary, and a new session of treatment should be quickly performed if there is a recurrence. The evolution of erythroplasia of Queyrat permits, with the consent of the patient, accepting minimal risks to avoid mutilating or disfiguring interventions.

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Comentarios:

La eritroplasia de Queyrat es un carcinoma in situ que afecta normalmente la mucosa del glande y le da un aspecto rojizo, aterciopelado característico. Tiene una elevada tendencia a desarrollar un carcinoma epidermoide invasivo por lo que generalmente el tratamiento electivo es la cirugía en mayor o menor medida. Sin embargo cuando hay afectación uretral el láser de CO_2, con un estricto control postratamiento, puede ser una gran opción terapéutica como se muestra en nuestro trabajo. Para evitar sinequias al hacer el tratamiento en la parte anterior de la uretra, se coloca un pequeño fragmento de sonda intrauretral en los primeros días del postoperatorio. El tratamiento con láser de CO_2 había sido descrito[15,206,207,208] con anterioridad y constituye una alternativa a tener en cuenta sobre todo en pacientes jóvenes para conservar la funcionalidad.

10. Paradela S, Del Pozo J, Martínez W, Fernández-Jorge B, Rodríguez-Lozano J, Yebra-Pimentel MT, Fonseca E. PYOGENIC GRANULOMA: SATELLITOSIS AFTER CARBON DIOXIDE LASER VAPORIZATION RESOLVED WITH AN INTENSE PULSED LIGHT SYSTEM. **Dermatologic Surgery 2007; 33: 104-108[209].**

Pyogenic Granuloma: Satellitosis after Carbon Dioxide Laser Vaporization Resolved with an Intense Pulsed Light System

Sabela Paradela, MD,* Jesús del Pozo, MD,* Walter Martínez, MD,* Beatris Fernández-Jorge, MD,* Jesús Rodriguez-Lozano, MD,* Teresa Yebra-Pimentel, MD,† and Eduardo Fonseca, MD*

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Pyogenic granuloma is a common benign vascular lesion included into the capillary lobular hemangiomas that might involve skin and mucous membranes and usually occurs during infancy and childhood.[1] An isolated, papular or nodular, pedi-culated, red-to-violaceous lesion with peripheral desquamative ring is the usual clinical presentation. The flat, friable, and bleeding surface of these lesions in some cases shows erosions or crusts. The size is usually smaller than 2 cm, and head, neck, hands, and oral mucosa are the more frequent localizations.

The usual histopathologic picture is an active endothelial cell proliferation resulting in lobules of capillaries separated by septa of connective tissue. Histologic evaluation is recommended because malignant tumors, as melanoma, might mimic these lesions.

Pyogenic granuloma usually appears spontaneously. Nevertheless, several predisposing factors have been related with the appearance of these lesions, including traumatic events,[2,3] burns,[4,5] localized viral infections,[2] insect bites,[2] previous dermatitis,[6] preexistent vascular malformations,[7,8] previous laser treatment,[9,10] pregnancy,[11] oral or topic retinoids,[12–20] protease inhibitor treatments,[21,22] or some chemotherapy agents, such as capecitabine.[23]

Several treatment alternatives for pyogenic granuloma have been described, including surgical excision,[2] curettage, cryotherapy, chemical[24] and electric[3] cauterization, and lasers.[25–33]

The recurrence of these lesions after treatment is a frequent event, observed in between 40 and 50% of cases in some series. The recurrence as multiple lesions is named pyogenic granuloma with satellitosis, an event known as Warner and Wilson–Jones syndrome, the authors who initially described this rare phenomenon.

We report a case of isolated pyogenic granuloma treated with carbon dioxide laser vaporization. The disease recurred as multiple lesions that newly worsened after another session of carbon dioxide laser vaporization. These lesions resolved after treatment with an intense pulsed light (IPL) system.

Case Report

A 15-year-old girl without medical history of interest presented with an isolated, papular, red-shiny lesion on her left shoulder, with 1 month of evolution, which appeared spontaneously without previous traumatism. This lesion caused frequent hemorrhagic episodes and increased progressively in size as far as 1.5 cm in diameter.

A shave of lesion was made under local anesthesia with mepivacaine (1%). The basis of the lesion was vaporized with a carbon dioxide laser system (SE-

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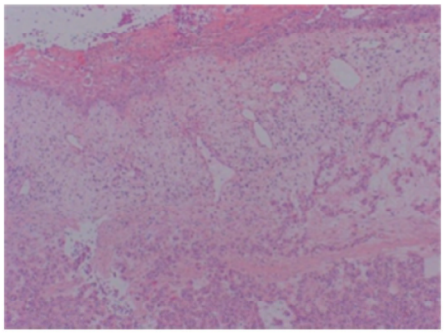

Figure 1. Expanded papillary dermis with abundant vascular lumens, covered by normal, nonprominent, endothelial cells, without atypical aspect.

20–30w Franck-line, Intermedic, Barcelona, Spain) in superpulsed mode, focalized at 5 W per cm^2. A specimen was included to perform histopathologic study (Figure 1). This study revealed an expanded papillary dermis with abundant vascular lumens, covered by normal, nonprominent, endothelial cells, without atypical aspect.

Five months after this treatment, a recurrence of the initial lesion as well as other similar peripheral lesions was observed (Figure 2). A new treatment with carbon dioxide laser vaporization using the same parameters was performed, but a month later, more prominent satellite lesions resulted (Figure 3). A treatment with an IPL system (Photoderm-Vasculight, Lumenis, New York, NY) was then performed using a cutting filter of 570 nm, energy fluency of 45 W per cm^2, a double pulse of 3 ms, and a delay between pulses of 20 ms. Two sessions of treatment were performed separated by 6 weeks, resulting in total clearance of all lesions, with excellent cosmetic results (Figure 4). No new recurrence of lesions was observed during a follow-up of 18 months.

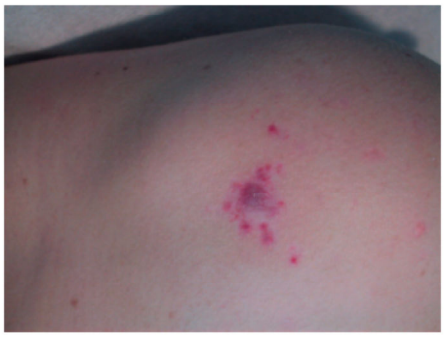

Figure 2. An isolated, papular, red-shiny lesion on her left shoulder, surrounded by smaller size lesions.

Figure 3. More prominent satellite lesions after the second carbon dioxide laser vaporization session.

Discussion

The recurrence of pyogenic granuloma after treatment is not a rare event, varying between 16[34,35] and 50%[2] according to different series. The recurrences may occur as isolated lesions or, as in our case, as multiple satellite lesions around the cicatricial area.

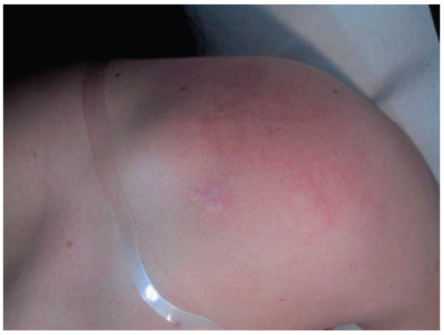

Figure 4. Clearance of all lesions after pulsed light system treatment.

Some studies have compared the recurrence index of pyogenic granuloma after different modalities of treatment, but there are no controlled studies with low statistic significance and no revealed adequate conclusions.

Patrice and colleagues[2] treated 178 cases of pyogenic granuloma. A total of 143 were treated by surgical excision and 21 by shave and electric cauterization of the basal surface. Recurrences were observed in 10 patients of the second group.

Kirschner and Low[25] treated 13 patients with pyogenic granuloma by shave and coagulation of basal surface with carbon dioxide laser. Only 1 patient recurred after treatment.

Pagliai and Cohen[3] treated 76 children with pyogenic granuloma: 58 were treated with shave and electric cauterization, 3 with carbon dioxide laser vaporization, 9 with a pulsed dye laser, 1 with surgical excision, and 1 with cryotherapy. Recurrence was observed in 3 patients treated with carbon dioxide laser (100%) and 3 patients treated with pulsed dye laser (33%). These results are not conclusive because the more recurrent of big lesions are treated with these systems of treatment.

Several studies evaluated the response of these lesions with different types of laser. Goldberg and Sciales[33] in 1991 treated 3 children with excellent cosmetic results and no recurrences. Gonzalez and colleagues[32] treated 18 children with pulsed dye laser (585 nm) and obtained a favorable response in 16 cases (89%), without textural or pigmentary changes. Tay and colleagues[30] conducted a prospective study of 32 cases of pyogenic granuloma in children treated with a pulsed dye laser (577 nm). Ninety-one percent of cases showed favorable response with clearance of lesions, no recurrence, and no cicatricial changes. Nine percent of patients did not respond; all these cases were pediculated and bigger than 5 mm. In 30% of cases two or more sessions of treatment were necessary to resolve the lesions. Raulin and colleagues[28] treated 100 patients with carbon dioxide laser combining continuous and ultrapulsed systems. In 98% of cases with an isolated session, a good response was obtained without recurrences. Nevertheless, in 10% of cases cicatricial changes appeared after treatment.

According to these studies, pulsed dye laser is a single and not painful procedure without residual scar lesions and might be the elective technique in small lesions in children. The carbon dioxide laser might be used when the treatment must be performed in one session, or in lesions bigger than 5 mm. The risk of scar residual lesions may be minimized with an adequate technique and postoperative cares.

Warner and Wilson–Jones[36] syndrome describes the appearance of multiple satellite lesions around the initial lesion of pyogenic granuloma between 1 to 4 weeks after the initial treatment, with or without recurrence of the initial lesion. This phenomenon usually affects young patients with lesions located on the back, in the scapular area. It is an infrequent process with fewer than 50 cases described in the literature.[35,37–46]

The exact physiopathologic mechanisms of satellitosis are unknown: it usually occurs after a traumatic antecedent, and probably the liberation of vascular endothelial growth factor (VEGF) is a relevant

pathogenic event.[45] Carbon dioxide laser induces no selective tissue damage, and after the ablation of epidermis and superficial dermis, by similar mechanisms to the implied in wound repair, liberation of proangiogenic factors might occur. Treatment with an IPL source induces a more selective vascular coagulation without ablation of the epidermis and without liberation of proangiogenic factors. It is a possible explanation of our case, the appearance and worsening of satellitosis with carbon dioxide laser vaporization and the response to IPL system.

Several treatments of satellitosis have been described, including no treatment[38,46] (it is a benign process and usually spontaneous involution occurs between 6 and 12 months), surgical excision, curettage and electric cauterization of the basis,[36,40,41] carbon dioxide laser,[39] compression,[44] cryotherapy, and systemic steroids.[35] IPL may be an adequate system of treatment of these lesions with good cosmetic results and without residual scars.

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Comentario:

La aparición eruptiva de lesiones satélites de granuloma piogénico en gran cantidad es de causa desconocida y es un hecho raramente descrito. En nuestro caso se presentó tras haber tratado la lesión inicial con láser de CO_2, lo cual no había sido descrito con anterioridad. Una posible explicación a la satelitosis es que es laser de CO_2 al ser un tratamiento ablativo e inducir un proceso de cicatrización, puede iniciar una respuesta proangiogénica que sería la responsable de la satelitosis. De este modo la luz pulsada al no ser un tratamiento ablativo consigue resolver el problema. Tenemos experiencia en otro caso personal no publicado que apareció tras un tratamiento de electrocoagulación. Deben participar sin embargo otros factores ya que este sistema de láser se utiliza habitualmente para el tratamiento de los granulomas piogénicos y la aparición de satelitosis es casi excepcional. También se han descrito otros tratamientos como corticoides sistémicos[210] o tratamiento conservador[211].

11. Paradela S, Del Pozo J, Fernández-Jorge B, Rodríguez-Lozano J, Martínez-González C, Fonseca E. EPIDERMAL NEVI TREATED BY CARBON DIOXIDE LASER VAPORIZATION: A SERIES OF 25 PATIENTS. **Journal of Dermatological Treatment 2007; 18 (3): 169-174**[212].

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ORIGINAL ARTICLE

Epidermal nevi treated by carbon dioxide laser vaporization: A series of 25 patients

SABELA PARADELA, JESÚS DEL POZO, BEATRIZ FERNÁNDEZ-JORGE, JESÚS LOZANO, COVADONGA MARTÍNEZ-GONZÁLEZ & EDUARDO FONSECA

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Abstract

Background: Epidermal nevi are benign proliferations of epidermis. Numerous treatment modalities have been tried, but no ideal treatment is yet available. *Objective*: To report our experience with CO_2 laser vaporization in the treatment of verrucous epidermal nevi, and to identify which factors could have influence in long-term results. *Methods*: A total of 25 patients were treated with the CO_2 laser in the superpulsed mode, focalized at 2 W/cm^2. The patients were between 3 and 41 years old (mean: 17 years). A total of 44% of lesions were <20 cm^2, 40% measured between 20 and 100 cm^2 and 16% were >100 cm^2. The follow-up was 4–79 months (mean: 28 months). In 76% of patients, multiple treatment sessions were required. *Results*: Good results were achieved in 92% of patients with soft, flattened nevi and in only 33% patients with keratotic nevi. In addition, 87% of the latter had moderate results and 12.5% had poor results. *Conclusion*: We conclude that the CO_2 laser in superpulsed mode is an effective and safe treatment for verrucous epidermal nevi and provides fewer recurrences than other laser therapies. We also believe that the most determining factor for the cosmetic result is thickness of the nevus.

Key words: *Carbon dioxide laser, epidermal nevus*

Introduction

Epidermal nevi are a spectrum of hamartomatous lesions that arise from the embryonic ectoderm, limited to proliferation of epidermis (1). There are three subtypes which are histologically identical and differ only in the degree of clinical involvement. The most common subtype is the verrucous epidermal nevus (VEN), which are solitary or multiple localized lesions. Systematized nevus is a more severe and widespread lesion, and it is called nevus unius lateris when it affects one-half of the body (histopathological examination reveals epidermolytic hyperkeratosis) and ichthyosis hystrix when it has a bilateral or generalized distribution and tends to form wavy, transverse, scaly and erythematous bands on the trunk (2).

VEN may be present at birth or may develop during early childhood (3,4). They are commonly yellowish-brown warty papules that coalesce to form papillomatous plaques with irregular margins, usually localized on the trunk or extremities following Blaschko's lines (3,5). They are flat, velvety lesions in the newborn and become more raised, verrucous and hyperpigmented during adolescence (2). Histology shows sharply demarcated hyperkeratosis, papillomatosis, mild acanthosis and elongation of the rete ridges (1,3). Some cases show increased melanin pigmentation in the basal layer (3). Distinct histological subtypes of epidermal nevus associated with at least six distinct syndromes are reported, including Schimmelpenning syndrome, nevus comedonicus syndrome, pigmented hairy epidermal nevus syndrome, Proteus syndrome, CHILD syndrome (2,6) and phakomatosis pigmentokeratotica (7–9).

Epidermal nevi are usually asymptomatic, benign lesions but the cosmetic appearance leads patients to seek advice (10). No ideal treatment is yet available because superficial removal techniques such as topical treatments often result in recurrence, and more aggressive approaches tend to produce postoperative scarring (11).

In the last three decades, multiple modalities of laser treatment have been tried but there are no large series reported comparing results. Based on selective

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photothermolysis, pigment-specific lasers can be used to achieve significant cosmetic improvement of dark epidermal nevi with a reduced risk of scarring, but good results were not achieved in non-pigmented or keratotic lesions (3). Non-pigment-selective modalities such as the CO_2 and erbium-YAG laser have been useful for the treatment of superficial epidermal pigmented lesions. Their wavelengths are absorbed by the intra- and extracellular water of the epidermis and dermis, which results in a non-specific destruction (12). There is a relatively narrow margin of safety when treating epidermal nevi: if the treatment is too superficial with only the epidermis removed, the nevus will recur; if it goes too deeply into the reticular dermis, hypertrophic scar can develop (13). Vaporization should extend only into papillary dermis. In addition, the expected outcome after healing is hypopigmentation (13). However, it is more precise and easier therapy than surgery, with less morbidity (14).

Materials and methods

Out of 25 patients who had been treated with the carbon dioxide (CO_2) laser, 24 had VEN and one had systematized nevus (Table I). We excluded cases of inflammatory lineal verrucous epidermal nevus (ILVEN) and nevus unius lateris with epidermolytic hyperkeratosis. The patients were between 3 and 41 years old with a mean age of 17 years. Nine patients were male and 16 were female. A total of 11 (44%) lesions were small (<20 cm^2), 10 (40%) measured between 20 and 100 cm^2 and four (16%) were extensive lesions (>100%). The most frequent location was on the trunk, followed by the neck, head and extremities. Only one lesion (4%) was widespread.

The skin was previously prepared with an antiseptic such as Betadine® or Clorhexidina®, and the treatment was performed under local anaesthesia (mepivacaine chlorhydrate).

The lesions were vaporized down to the superficial dermis with a CO_2 laser system (Frank Line SE-20–30W CO_2, Inter-medic (Barcelona, Spain)) in superpulsed mode, focalized at 2 W/cm^2. Only 58% of small lesions (<20 cm^2) were vaporized in a single session. In most patients (76%), multiple treatment sessions were required to treat all the lesions. The mean number of sessions was four (range: 1–28). For lesions >20 cm^2, 64% needed between two and five sessions, and 24% more than six. On subsequent sessions, only the areas that were pigmented and still raised were treated further.

During the operative procedure, bleeding was controlled by intermittent application of saline-soaked gauze compresses. Postoperative instructions included application of an occlusive, non-adherent dressing (Tulgrasum®) and antibiotic ointment (mupirocin: Bactroban®) during the healing process.

Results

Clinical assessment of outcome was made by the physician who treated all the patients. He decided the parameters of treatment (mode, fluence of energy) and number of sessions according to the response. The following definitions were modified from Hohenleutner et al. (15) and used to evaluate the results:

- *very good to good*: complete or almost complete removal of lesions without or with very superficial, only slightly hypopigmented scar formation or minimum residual erythema
- *moderate*: hyper- or hypopigmented shallow atrophic or slightly hypertrophic scars, partial removal of the lesions and/or small recurrences
- *poor*: no remission or full recurrence of lesion and/or hypertrophic or keloidal cosmetically unacceptable scarring.

One out of 25 patients had incomplete treatment, 64% showed good results, 32% moderate results and 4% poor results (Figure 7). Good results were achieved in 92% of patients with soft, flattened nevi and in only 33% of patients with keratotic nevi. In addition, 87% of the latter had moderate results and 12.5% had recurrences and hypertrophic scarring.

There were five recurrences: 60% in patients with keratotic nevi. The mean follow-up was 2 years and 4 months (range: 4–79 months). In spite of the fact that most patients were children and multiple sessions were needed, the procedure was well tolerated. On the whole, they agreed with our clinical assessment and 92% of patients thought that good results were achieved.

Representative results are shown in Figures 1–6.

Discussion

Although epidermal nevi are benign epidermal hyperplasias, most of the attempted treatments have been not successful because of recurrences and anaesthetic scars.

The keratotic surface may be improved by topical treatments (14) – such as combined therapy with retinoic acid and 5-fluorouracil (16,17), chemical peels (3) and podophyllin (3,18) – but they always correlate with a great rate of relapses. Destructive therapies such as cryosurgery, electrocautery and dermabrasion are advocated but recurrences are commonly seen if the damage is superficial (14), and hypertrophic or hypopigmented scarring can occur if a significant proportion of the dermis is removed (11). Surgical excision always causes scar formation and is reserved for the smallest lesions (1–3,11,19). Systemic retinoids may be beneficial for the treatment of widespread systematized epidermal nevus

Table I. Summary of cases treated.

Patient no.	Age on diagnosis	Sex	Location	Size	Epidermal hyperplasia	No. of sessions	Results	Follow-up	Recurrence
1	23	M	Face (right side of forehead)	63 cm^2	Medium	4	Good	1 year and 8 months	No
2	21	F	Systematized epidermal nevus	Diffuse	High	4	Moderate	4 months	Incomplete treatment
3	12	F	Right side of trunk	64 cm^2	Medium	2	Very good	5 years and 7 months	Yes
4	15	F	Trunk	12 cm^2	Medium	1	Good	6 months	No
5	10	M	Upper lip	0.64 cm^2	Medium	1	Very good	4 years and 9 months	No
6	13	M	Right side of neck	6 cm^2	High	5	Moderate	4 years and 3 months	No
7	11	M	Left axilla and left side of trunk	450 cm^2	Medium	28	Good	6 years and 7 months	No
8	41	F	Left upper chest	10 cm^2	Medium	2	Good	10 months	No
9	18	F	Abdomen	55 cm^2	High	1	Good	2 years and 6 months	Yes
10	28	F	Left side of trunk and abdomen	72 cm^2	High	2	Moderate	1 year and 11 months	No
11	37	F	Back side of right shoulder	8 cm^2	Medium	1	Very good	1 year and 1 month	No
12	35	F	Front side of left thigh	32.5 cm^2	High	2	Good	1 year and 2 months	Yes
13	19	M	Left palm	30 cm^2	High	6	Good	1 year and 2 months	No
14	7	F	Right side of neck	15 cm^2	Medium	1	Very good	1 year and 4 months	No
15	26	F	Left ear	1.2 cm^2	High	1	Good	1 year	No
16	16	F	Right upper chest	36 cm^2	Medium	4	Medium	2 years and 2 months	No
17	14	M	Right side of neck	28 cm^2	Medium	2	Very good	5 months	No
18	13	M	Abdomen	40 cm^2	High	2	Poor	4 years and 7 months	Yes
19	11	M	Front side of neck	4 cm^2	High	5	Moderate	1 year and 7 months	No
20	7	F	Left side of trunk	12 cm^2	Medium	2	Very good	10 years	Yes
21	12	M	Left side of neck, left axilla and left side of trunk	168 cm^2	High	6	Moderate	4 years	No
22	18	F	Inner right thigh	48 cm^2	Medium	6	Very good	3 years	No
23	9	F	Retro auricular and left side of neck	16 cm^2	High	6	Moderate	3 years and 9 months	No
24	11	F	Left side of neck	5 cm^2	High	1	Good	1 year	No
25	3	F	Right buttock and back side of right thigh	168 cm^2	High	2	Moderate	1 year and 1 month	No

Figure 1. Patient 5: upper lip with small, flat, verrucous epidermal nevus before treatment.

Figure 2. Patient 5: very good result. Complete removal without scarring after one CO_2 laser treatment session.

Figure 3. Patient 1: widespread soft verrucous nevus on the left side of the forehead before treatment.

Figure 4. Patient 1: good result after four CO_2 laser treatment sessions.

Figure 5. Patient 10: widespread, hard verrucous epidermal nevus with a high level of epidermal hyperplasia on the left side of the trunk and abdomen before treatment.

Figure 6. Patient 10: moderate result with hypopigmented and slightly hypertrophic scar formation after two CO_2 laser treatment sessions.

(20,21), but the requirement of life-long therapy is inappropriate for smaller lesions (15,11).

Laser therapy offers a potential method of ablating epidermal nevi whilst producing minimal scarring.

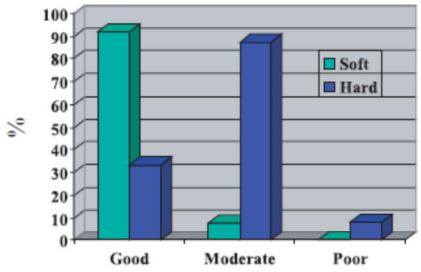

Figure 7. Comparison of treatment results in soft and hard lesions.

In patients with systematized nevus, laser ablation offers a valuable therapeutic tool and relief that would otherwise be unavailable (15,14). Success with this therapy is related to the type of lesion and its clinical characteristics (2). Different types of laser have been reported to be effective.

The argon laser is a continuous wave laser with a wavelength (488 nm and 514 nm) absorbed by melanin (22). However, the thermal relaxation time of the melanosome is exceeded and thermal energy dissipates to surrounding tissue causing an increased risk of hypertrophic scarring and pigmentary changes (3,10,22). This treatment was found to achieve complete or almost complete lesion removal with only slight scarring in all patients with 'soft', flat, velvety, verrucous nevi (3,15,10). Patients with 'hard', keratotic verrucous nevi showed incomplete response or recurrence after treatment (15,10).

The long-pulsed ruby laser is a pigmented-specific laser with a selective thermolytic effect, and has been used for the treatment of superficial pigmented disorders (23,24). There are a small series of epidermal nevi reported with successful effects in 50–80% of the cases, especially in lesions with darker pigmentation, less thickness and a more flattened surface (12,25,26). After one to four sessions, Baba et al. (12) obtained good cosmetic results without recurrences during 2 or 3 years of follow-up. Hypopigmentation (transient or permanent) in patients with darker skin and a decrease in hair growth were noted in some cases. However, its efficacy has not been shown in non-pigmented epidermal nevi.

The continuous wave CO_2 laser has been shown to be more effective for removing keratotic verrucous epidermal nevi than the argon laser in a study of 43 patients with verrucous epidermal nevi (15). Hohenleutner et al. (27) achieved complete removal without scarring or recurrence of a widespread epidermal nevus treated with CO_2 laser. Ratz et al. (28) reported that this treatment was successful in 15 patients with epidermal nevus.

The best results were observed when a relative low output power of 5 W was used (28), whereas power higher than 10 W led to unacceptable hypertrophic scarring in two of three patients (15).

Ultrapulsed, superpulsed lasers and scanners have allowed for more controlled tissue ablation with greater control of the depth of thermal damage and less risk of scarring (3,29). Boyce and Alster (29) treated three extensive epidermal nevi with the pulsed CO_2 laser in one or two sessions, without scarring or recurrences over 10–12 months of follow-up. Michel et al. (19) treated five lineal epidermal nevi with a superpulsed laser, and they had successful results with one to four sessions. Satisfactory cosmetic results were obtained with only slight hyperpigmentation, and there was no recurrence in 2 years of follow-up.

The pulsed erbium:YAG laser operates at 2940 nm, and this wavelength light is strongly absorbed by tissue water. The penetration of the laser beam is limited and the pulse energy is concentrated into the ablative process with minimal adjacent thermal diffusion. For this reason, tissue damage is minimized, decreasing postoperative morbidity and allowing shorter postoperative recovery (5). Literature relating to the erbium:YAG laser is mainly concentrated on resurfacing techniques. There are three series (1,5,30) with excellent cosmetic results without apparent scarring in patients with epidermal nevi located in problematic sites, such as the neck and upper chest. These could be due to biases in the selection of cases with superficial or small lesions. The pulsed erbium:YAG laser is therefore an effective treatment for epidermal nevi, which can present a problem for adequate cosmetic treatment. Also, wound healing was complete in 10 days, which is faster than the continuous-wave (14–28 days) and ultrapulsed CO_2 laser (10–14 days) (5). However, thick, verrucous lesions may not respond or produce hypertrophic scars, owing to the unpredictable penetration of the laser beam through the warty tissue. Also, 25% of patients can show a relapse within 1 year after the treatment (5).

In our patients, the hyperkeratotic level of the epidermis is the most important variable regarding the results. However, age of the patient at the time of treatment and location of lesions are not related to the final cosmetic outcome. When we considered separately the results in the head and neck, extremities and trunk, we found that 75% of patients had good or very good results regardless of the location of the epidermal nevus. We use low-energy fluences to minimize the risk of scarring or other secondary effects of laser vaporization, even if the rate of recurrences is higher. The treatment of epidermal nevi is usually a cosmetic problem and the final outcome with good aesthetic results is very important, so we think it could be better to perform more sessions to obtain these results.

We conclude that the CO_2 laser is an effective and safe treatment of verrucous epidermal nevi. In comparison with other laser therapies, it provides more favourable results with fewer recurrences, but more scarring risk. Although we usually need a greater number of sessions to remove the nevus, it could be worth using the superpulsed mode and low levels of energy at first in cosmetic areas such as the face because, in our experience, it provides better aesthetic results with a lower risk of scarring without having a much higher rate of recurrence.

We also believe that the most determining factor for the cosmetic result is thickness and time of evolution of the nevus. Therefore, recent and flattened lesions could be effectively removed with this technique.

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Comentario:

Los nevus epidérmicos constituyen un espectro de lesiones hamartomatosas que derivan del ectodermo embrionario. Cuando el componente esencial sobre el que asienta esa proliferación hamartomatosa son los queratinocitos tenemos los nevus queratinocíticos o nevus epidérmicos no organoides. Uno de los tratamientos electivos de estas lesiones ha sido considerado desde sus inicios el láser de dióxido de carbono[213,214]. También se ha descrito el tratamiento de estas lesiones con otros sistemas de láser como el láser de rubí con sistema Q[215] (un sistema de emisión de pulsos en la franja de los nanosegundos basado en resonancia óptica), o el láser de erbio:YAG[216]. Nuestra serie de pacientes con nevus epidérmico, la más larga publicada, excluye los casos de nevus epidérmico verrucoso inflamatorio lineal y los casos de nevus epidérmico con hiperqueratosis epidermolítica. En ella se hace incapie en los factores pronósticos a largo plazo para estos pacientes tras una media de seguimiento de 28 meses. El factor pronóstico más importante es el grosor del nevus, cuando más aplanado sea mejor resultado cosmético se obtiene.

12. Martínez-González MC, del Pozo J, Paradela S, Fernández-Jorge B, Fernández-Torres R, Fonseca E. BOWEN'S DISEASE TREATED BY CARBON DIOXIDE LASER. A SERIES OF 44 PATIENTS. **Journal of Dermatological Treatment 2008; 19: 293-299[217].**

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ORIGINAL ARTICLE

Bowen's disease treated by carbon dioxide laser. A series of 44 patients

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Abstract

Background: Bowen's disease is a common form of intraepidermal (in situ) squamous cell carcinoma of the skin and mucous membrane. Treatment with destruction of the epidermis by any method is necessary to prevent invasive squamous cell carcinoma. *Objective*: To report our experience with CO_2 laser vaporization in the treatment of Bowen's disease and try to identify which factors could have any influence on results. *Methods*: A total of 44 patients were treated with the CO_2 laser in superpulsed mode, focalized at 2 W/cm^2. *Results*: In 86.3% of patients, a unique treatment session was required. 'Clearance after one treatment' was achieved in 86.3% of the total series of patients and only 7.9% of these patients developed recurrence of the lesion. In 11.3% of the cases, there was 'clearance after more than one treatment' without clinical recurrences in any of these patients during the follow-up. 'No response' was achieved in 2.2% of the total series of patients. *Conclusion*: We conclude that the CO_2 laser in superpulsed mode is an effective, efficient, safe, functional and good cosmetics treatment for Bowen's disease and it provides the same recurrence rate as other more aggressive or more expensive modalities of treatment.

Key words: *Bowen's disease, carbon dioxide laser, dermatologic surgery, epidermal vaporization, squamous cell carcinoma*

Introduction

Bowen's disease (BD) is a common form of intraepidermal (in situ) squamous cell carcinoma (SCC) of the skin and mucous membranes, originally described in 1912 (1). It is usually persistent and progressive, with a small potential for invasive malignancy, although spontaneous partial regression may occur. If untreated, in 3–5% of the cases it may progress to invasive carcinoma, metastases and even death. This risk is higher for genital and perianal disease (10%). Therefore, treatment is necessary, but not urgent (2,3). A number of therapies have been used based on the destruction of epidermis, such as 5-fluorouracil (5-FU), cryotherapy, curettage with cautery/electrocautery, surgical excision, laser therapy, photodynamic therapy and imiquimod cream, among others (2,4). The choice of therapy is based on factors such as size and location of the lesion, but the treating doctor's experience and training, and accessibility to specialized modalities of treatment are also considered (2,4).

Among these therapies, vaporization with CO_2 laser is included. Its wavelengths are absorbed by the intra and extracellular water of the epidermis, which results in a non-specific destruction.

We report our experience with CO_2 laser vaporization in the treatment of BD, and we try to identify which factors could have any influence on results.

Materials and methods

Patient selection

We made a retrospective study with a total of 44 patients with BD diagnosed in the Dermatology Department of the Juan Canalejo Hospital in La Coruña, Spain, between February 2003 and November 2006. The patients were aged between 37 and 89 years old (mean: 76.2 years $\pm$ 22.2); 11 patients were men (25%) and 33 women (75%). A total of 27.3% of all patients had an immunosuppressive status due to organ transplants, malignance or severe chronic diseases.

Some 90.9% of patients had a solitary lesion. Three patients had two lesions, and one patient had three. Only one of these patients with multiple

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lesions (patient 38) had an immunosuppressive status (immunosuppressive treatment due to heart and kidney transplants). The size of lesions was between 1 cm and 4 cm in diameter. The most frequent localization was on the leg (63.6%), followed by hand and arm, forehead, ear and thigh. Other sites included chest, abdomen and foot.

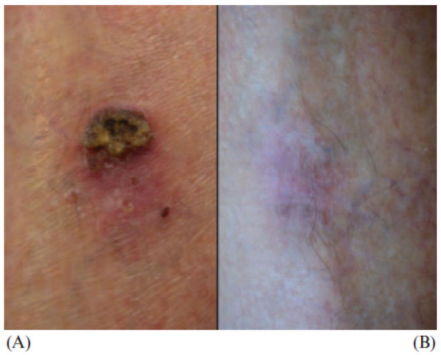
Treatment options, risk and the likelihood of success were discussed with each patient. They signed an informed consent form and were scheduled to have treatment with the CO_2 laser.

Laser treatment

Each lesion was photographed before treatment. The skin was previously prepared with an antiseptic such as Betadine® or Clorhexidina®. Local anesthesia was applied with 2% mepivacaine chlorhydrate without epinephrine. The SE-20-30w Franckline (Intermedic) CO_2 laser system was used to perform the treatments.

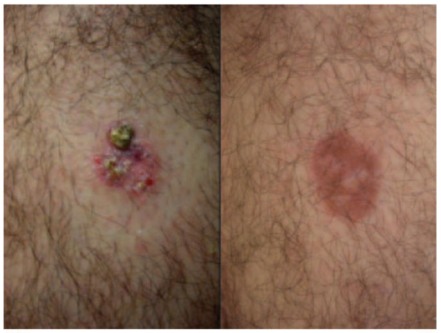
The first pass of each laser session was performed in focalized mode at 2 W/cm^2. A cotton-tipped applicator soaked in saline solution was used to remove vaporized debris. A bleeding surface appeared to delineate the extension of the lesion but 4 mm of surrounding normal skin were ablated and vaporized. Several passes, according with the depth of lesion, were performed to remove entirely the affected skin.

After surgery, 2% mupirocin ointment and a mild pressure dressing were applied. The wound was cleaned each day with normal saline, mupirocin ointment and application of an occlusive, non-adherent dressing (Tulgrasum®). Scheduled visits at 2 and 4 weeks, and then every 6 months were performed for clinical assessment.



(A) (B)

Figure 1. Patient 37: (A) BD on the left side of the thigh before treatment; (B) skin 4 months after treatment. 'Clearance after one treatment' result after a CO_2 laser treatment session. Complete removal without local adverse events.



(A) (B)

Figure 2. Patient 14: (A) BD on the thigh before treatment; (B) skin 4 months after treatment. 'Clearance after one treatment' result with minimal skin hyperpigmentation.

Results

Clinical results post-laser treatment were classified into:

- 'Clearance after one treatment': the lesion responded with total clinical healing after only one laser session.
- 'Clearance after more than one treatment': the lesion partially responded with the first session and total clinical healing was achieved after more than one laser session.
- 'No response': the lesion did not clinically respond to the first laser treatment.

The total response rate was 97.7% (43 patients achieved total remission of the lesions in one or more treatment sessions).

'Clearance after one treatment' results were achieved in 38 patients (86.3% of the total series of patients). In addition, in five patients (11.3%) there were 'Clearance after more than one treatment' results. The 'no response' result was achieved in one patient (patient 5) (2.2% of patients). This patient, without any immunosuppressive status, was then treated with topical 5-FU, with complete wound healing in 9 months.

In 86.3% of patients, a single treatment session was required. Multiple treatment sessions were required only in five patients (11.3%): three of them required two sessions, one of them required three, and the other one required four sessions. This last patient had an immunosuppressive status due to a kidney transplant and its treatment.

The mean follow-up was 18.8 ± 21.2 months (range: 8–52 months).

The recurrence rate was 6.8% (three patients of the total series, all of them in the 'clearance after one treatment' response group and only one of them on immunosuppressive treatment). Two recurrent lesions were diagnosed 6 months and 4 months after

treatment, respectively, on patients 12 and 33. Patient 11 left the follow-up after the first month visit. She presented 1 year and 5 months after surgery with a recurrent lesion, with an unknown evolution time. Two of the recurrent lesions were treated with surgical excision, and the third one with 5-FU, with total healing.

Secondary effects to the laser treatment were found in 14 patients (31.8%), but only one had an important adverse local event consisting in a keloid scar (probably according with the location of the lesion in the chest). The other ones had minimal local adverse events consisting of minimal erythema, and hypo and hyperpigmentation.

Representative results are provided in Table I.

Discussion

BD is a common form of intraepidermal (in situ) SCC of the skin and mucous membranes. It is suggestive of a relationship with chronic solar damage, especially considering the age group (over 60 years old) and body site distribution of BD (head and neck, female lower leg) (2,3,5). Furthermore, BD has been frequently reported in disseminated superficial porokeratosis (6). BD has also been reported to be caused by arsenicals, trauma, human papillomavirus (HPV) infection, an immunodeficiency state and internal malignancy (2,3,7–9). It is possible that an immunosuppressive state is associated with the occurrence and the rapid growth of BD, as it has been suggested that a deficiency and dysfunction of natural killer cells in patients with leukemia might be responsible for the increased incidence of secondary malignancy (10). BD of the fingers and genitalia has generally been accepted to be associated with HPV infection, and HPV type 16 DNA has been identified in the majority of cases with BD. But HPVs belonging to the mucosal high-risk group may participate in the development of extragenital BD (8,10).

Therapy for BD is necessary for the prevention of invasive SCC and metastases. Owing to its intraepidermal localization, destruction of epidermis by any method (topical treatments and surgical treatments) is often effective. The therapeutic options for the treatment of BD include:

- 5-FU, used topically (strength of recommendation B). It is applied once or twice daily in the form of 5% cream for a variable period of time between 1 week and 2 months, with success rates of 90–100% (2,4).
- Cryotherapy (strength of recommendation B), appears to have a good success rate (recurrences less than 10% at 12 months) but healing may be slow for broad lesions and discomfort may limit the treatment of multiple lesions (2,4).
- Curettage with cautery/electrocautery (strength of recommendation A) (2,4,11).
- Excision (strength of recommendation A), even Mohs micrographic surgery for lesions at special sites such as the penis (2,4,11).
- Laser (strength of recommendation B), includes: carbon dioxide (CO_2), argon and Nd:YAG. They have been used particularly to treat lesions at difficult sites such as the finger or genitalia, and the CO_2 laser has also been used to treat Bowenoid papulosis (2,12). Published results are generally stated to be good, but they are described in only small series or are considered with other epidermal neoplasias, making difficult any specific analysis (2). Fader and Lowe described three patients with BD who were treated with the CO_2 laser plus the long-pulsed diode laser, and there was no evidence of recurrences at 4 months (13). Tantikun described six patients with BD of the digits treated with the CO_2 laser, and there has been no evidence of recurrences in the 6 months to 7.7 years since surgery (12). Dave et al. published a study of 16 patients with 25 lower leg BD lesions treated with this modality and demonstrated 100% healing at 2 months without recurrences at 6 months, but there was a 12% progression to invasive carcinoma within12 months of discharge from follow-up (14).
- Photodynamic therapy (strength of recommendation A): the currently reported overall initial clinical clearance rate for ALA-PDT (aminolevulinic acid-photodynamic therapy) is 90–100%, and the recurrence rate is 0–11% in studies with completed 12-month follow-ups. Good cosmetics results and healing is likely, but availability is limited (2,4,15).
- Imiquimod 5% cream (strength of recommendation B): daily for 16 weeks, or on alternate nights to minimize local reactions (2,4,16,17).
- Radiotherapy (strength of evidence B): a variety of radiotherapy and regimens have been used (external beam irradiation, strontium 90, proton radiotherapy and beta-emitting radionuclides) (2,4,16).
- Other treatments:
  - Isotretinoin plus interferon alpha in concomitant use (2).
  - Acitretin: Yerebakan et al. described two cases treated with acitretin, starting with 1 mg/kg per day dose and then decreasing to 0.25–0.3 mg/kg per day during months (5 and 12, respectively), resulting in remarkable improvement and regression of BD lesions (7).
  - 5-FU plus cryotherapy in sequential use (2).
  - Etretinate plus interferon gamma in concomitant use (2).
  - High-energy pulsed CO_2 laser plus long-pulsed (810 nm) diode laser (13).
  - Imiquimod 5% cream plus an oral cyclooxygenase (COX) inhibitor (Sunlindac) (17).
  - Erbium:YAG laser following by 5-FU (18).

Table I. Summary of treated cases.

Patient	Age on diagnosis	Sex (M/F)	Localization	No. of lesions	Immunosuppressive treatment / status / disease	No. of sessions	Results	Follow-up	Recurrence	Secondary effects
1	70	M	Leg (posterior side of the right leg)	1	Yes (Cls, MM, Pred / Ltx / HCV, HCC)	1	Clearance after 1 treatment	18 months	No	No
2	76	M	Hand (dorsal side)	1	Yes (RAC)	1	Clearance after 1 treatment	18 months	No	Minimal hypopigmentation
3	81	M	Leg (anterior side)	1	No	1	Clearance after 1 treatment	15 months	No	No
4	85	M	Hand (dorsal side)	1	Yes (PAC)	1	Clearance after 1 treatment	10 months	No	Minimal persistent erythema
5	82	F	Leg	1	No	1	No response	28 months	–	No
6	86	F	Leg (dorsal side)	1	No	1	Clearance after 1 treatment	12 months	No	No
7	71	F	Leg (dorsal side)	1	No	2	Clearance after more than 1 treatment	35 months	No	Minimal persistent violaceous erythema
8	79	F	Leg	1	No	1	Clearance after 1 treatment	19 months	No	No
9	84	M	Ear	1	No	3	Clearance after more than 1 treatment	31 months	No	No
10	67	M	Ear	1	Yes (Cls, Pred, AZA / Ktx)	4	Clearance after more than 1 treatment	15 months	No	No
11	55	F	Leg (anterior side)	1	Yes (MM, Pred / Ktx)	1	Clearance after 1 treatment	50 months	Yes (1 year and 5 months post-treatment)	No
12	88	F	Leg (anterior side)	1	No	1	Clearance after 1 treatment	38 months	Yes (6 months post-treatment)	No
13	75	M	Thigh	1	Yes (metastatic PAC)	2	Clearance after more than 1 treatment	27 months	No	Minimal persistent erythema
14	37	M	Thigh	1	No	1	Clearance after 1 treatment	17 months	No	Minimal Hyperpigmentation
15	74	F	Fourth digit of left hand	1	No	1	Clearance after 1 treatment	231 months	No	No
16	80	F	Leg (dorsal side)	1	No	1	Clearance after 1 treatment	27 months	No	Minimal hypo- and hyperpigmentation
17	74	F	Leg	1	No	1	Clearance after 1 treatment	18 months	No	Minimal persistent violaceous erythema
18	83	M	Arm	1	Yes (PAC)	1	Clearance after 1 treatment	18 months	No	Minimal persistent erythema
19	89	F	Both legs	3	No	1	Clearance after 1 treatment	27 months	No	No
20	60	F	Leg	1	No	1	Clearance after 1 treatment	27 months	No	No
21	81	F	Leg	1	No	1	Clearance after 1 treatment	21 months	No	Minimal erythema
22	89	F	Leg	1	No	1	Clearance after 1 treatment	22 months	No	No
23	75	F	Leg (external side)	1	Yes (HCV and LC)	1	Clearance after 1 treatment	14 months	No	Minimal hyperpigmentation
24	83	F	Leg (anterior side)	1	No	1	Clearance after 1 treatment	22 months	No	Minimal hypopigmentation
25	52	F	Leg	1	No	1	Clearance after 1 treatment	23 months	No	No
26	80	F	Leg (anterior side)	1	No	1	Clearance after 1 treatment	52 months	No	No
27	86	F	Right forearm	1	No	1	Clearance after 1 treatment	8 months	No	No

Table I. *(Continued.)*

Patient	Age on diagnosis	Sex (M/F)	Localization	No. of lesions	Immunosuppressive treatment / status / disease	No. of sessions	Results	Follow-up	Recurrence	Secondary effects
28	75	F	Forehead (frontotemporal region)	1	Yes (Cls, MM, Pred / Ktx)	1	Clearance after 1 treatment	10 months	No	No
29	84	F	Leg	1	No	1	Clearance after 1 treatment	11 months	No	Minimal erythema
30	79	F	Leg	1	Yes (BC)	1	Clearance after 1 treatment	11 months	No	No
31	84	F	Leg (posterior side)	1	No	1	Clearance after 1 treatment	11 months	No	No
32	79	F	Dorsal side of left foot	1	No	1	Clearance after 1 treatment	10 months	No	No
33	72	F	Leg	2	No	1	Clearance after 1 treatment	12 months	Yes (in one lesion, 4 months post-treatment)	Minimal persistent violaceous erythema
34	80	F	Arm (external side)	1	No	1	Clearance after 1 treatment	10 months	No	No
35	86	F	Forehead (frontotemporal region)	1	No	2	Clearance after more than 1 treatment	12 months	No	No
36	62	M	Abdomen	1	No	1	Clearance after 1 treatment	12 months	No	No
37	80	F	Leg	1	No	1	Clearance after 1 treatment	12 months	No	No
38	59	M	Chest and right arm	2	Yes (Cls, MM, Pred / Ktx and Htx)	1	Clearance after 1 treatment	12 months	No	Keloid scar in chest
39	79	F	Hand (dorsal side)	1	No	1	Clearance after 1 treatment	11 months	No	No
40	79	F	Leg	1	No	1	Clearance after 1 treatment	15 months	No	No
41	89	F	Leg (anterior and internal sides)	2	No	1	Clearance after 1 treatment	9 months	No	No
42	59	F	Leg	1	Yes (Pred and Tacr / Ktx / HCV)	1	Clearance after 1 treatment	8 months	No	No
43	81	F	Leg	1	Yes (CAC)	1	Clearance after 1 treatment	8 months	No	No
44	83	F	Leg	1	No	1	Clearance after 1 treatment	8 months	No	No

AZA = azathioprine; BC = breast cancer; CAC = colon adenocarcinoma; Cls = ciclosporin A; HCV = hepatitis C virus positive; HCC = hepatocellular carcinoma; LC = liver cirrhosis; MM = micofenolate mofetil; PAC = prostate adenocarcinoma; Pred = prednisone; RAC = rectal adenocarcinoma; Tacr = tacrolimus; tx = organ transplant (L = liver; K = kidney; H = heart).

Cryotherapy, curettage and cautery, excision, laser ablation, photodynamic therapy and 5-FU are all known to have similar recurrence rates in the order of 5–10% (or clearance rates in the order of 90—95%), and no treatment modality appears to be superior for all clinical situations (2,3,11,16).

Based on the review by Ramrakha-Jones and Herd, a single lesion of BD is most cheaply treated by curettage or excision biopsy under local anesthetic and the most expensive treatment is photodynamic therapy. The CO_2 laser has a medium cost. As for cryotherapy, laser has the advantage that more than one lesion can be treated at the same time for no extra cost (16).

Treatment with imiquimod cream provides good cosmetic results too, but the CO_2 laser provides a short-term treatment with guaranteed accomplishment. Regarding photodynamic therapy, the main advantage we see with the CO_2 laser is its greater availability.

While surgical excision has a low relapse rate, it may result in bleeding, scar contracture and dysfunction. For that reason there have been other superficial, less aggressive, destructive treatments in use, such as the CO_2 laser, especially in particular sites such as the digits or genitalia (4,12,13,19–25). Their wavelengths are absorbed by the intra and extracellular water of the epidermis and dermis, which results in a non-specific destruction. Vaporization should extend only into the papilar dermis. In addition, the expected outcome after healing is hypopigmentation. Since deeper follicular epithelium is spared with the CO_2 laser, this treatment is limited if there is deep follicular involvement (12–14). So, if we treat BD with the CO_2 laser, we must follow-up the patient to detect possible recurrence for a long time. Fader et al. used concomitant long-pulsed diode laser to ablate abnormal follicular epithelium (13). It is important to know as well that although BD was not specifically evaluated, the SCC always extends beyond the apparent clinical margins and 4-mm margins are recommended for treatment (12).

To our knowledge there are only isolated case reports with this technique and the largest series has 16 patients (12–14,19,20,24). We report a case series with 44 patients with BD treated with CO_2 laser vaporization.

Conclusions

We concluded that, in our experience, the CO_2 laser is a good alternative treatment to BD, which provides ease of surgery, lack of bleeding and no cosmetic disfigurement, with preservation of function and effectiveness. In our case series, the sex, age, localization of the lesion, size and immunosuppressive status were not in clear relationship with results.

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Comentario:

La enfermedad de Bowen es una forma relativamente común de carcinoma epidermoide “in situ” que suele presentarse en la piel o en las mucosas. Es muy importante su tratamiento para prevenir la evolución a carcinoma epidermoide aunque ésta en la piel puede durar años. El láser de CO_2 es una alternativa para el tratamiento de esta enfermedad conocida desde hace muchos años. La serie de nuestro Servicio es la mayor serie de pacientes publicada de enfermedad de Bowen tratada con láser de CO_2, y su evaluación arroja unos resultados de eficacia excelentes, similares o mejores a técnicas quirúrgicas mucho más agresivas. La mayoría de los trabajos aparecidos tras nuestra serie, sin embargo, se centran sobre todo en las diferentes variantes de tratamiento con terapia fotodinámica[218].

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ORIGINAL ARTICLE

Venous malformations with lip involvement: Palliative treatment with carbon dioxide laser vaporization in five cases

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Abstract

Background: The treatment of venous malformations remains controversial. Traditional surgical excision is only possible in a few cases. Numerous sclerosing agents have been used, but none of them are ideal or absolutely safe for the treatment of venous disorders. In isolated cases, an expectative control would be a good option. *Objective*: To report our experience with CO_2 laser vaporization as palliative treatment in five cases of head and neck venous malformations with lip involvement. *Methods*: Five patients were treated with a CO_2 laser in superpulsed, focused mode at 2 W/cm^2, with several passes in each session. Patients were aged from 16 to 49 years old (mean: 36.6 years). Three sessions of treatment were performed in two patients while only one session was used in the rest. The follow-up was 6–36 months (mean: 22.8 months). *Results*: Significant cosmetic improvement with flattening of the lip surface was achieved in all patients. *Conclusion*: Carbon dioxide laser vaporization can be considered as one method of choice for an effective palliative treatment of lip involvement in venous malformations.

Key words: *carbon dioxide laser, venous malformations*

Introduction

Venous malformations are common low flow vascular malformations normally present at birth, although they may not be evident until childhood or adulthood. They can occur in any localization, although they have a propensity to appear in the head and neck region, including the tongue and lips. They can be localized or involve extensive areas that vary in size and depth (1).

Most lesions show progressive enlargement and growth into soft tissues, including muscles, nerves and blood vessels, is not rare. Usually these lesions are difficult to delineate.

Venous malformations are usually compressible lesions that show bluish discolouration when visible and they may show enlargement with the Valsalva's manoeuvre, during increased physical activity, dependent positioning, and with hormonal influence, trauma and infection. No pulsations, bruits or thrills are present and the surface of the lesions has a normal temperature.

The symptoms of venous malformations are related to size and distribution, with thrombosis, pain and swelling being most common.

The treatment of venous malformations, particularly those with lip involvement, remains problematic. Surgical excision is the standard method of treatment, but this is usually traduced in significant loss of motor function and nerve damage, massive bleeding, and deformity if the lesion is extensive. In addition, the complete excision of lesions was usually not achieved and always led to recurrence. This explains why this treatment is only effective in localized lesions.

Sclerotherapy is an alternative method of treatment (2,3). Numerous sclerosing agents have been developed, including 95% ethyl alcohol (4), absolute alcohol (5), sodium tetradecyl sulphate (6), bleomycin (7), ethibloc (8), and foam (9–11), but none of

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them are ideal or absolutely safe for the treatment of venous disorders and direct percutaneous treatment (12,13). Complications of this therapy include ischemic bulla, tissue necrosis, deep vein thrombosis, pulmonary embolism, nerve palsy, and transient bradycardia. In addition, venous malformations with extensive involvement require stronger sclerosing agents and multiple sessions of sclerotherapy are needed since inappropriate therapy and significant recanalization always leads to recurrence.

The most effective management of large head and neck venous malformations is a combined approach of percutaneous sclerotherapy with surgical excision. Nevertheless, in small superficial lesions other therapeutic options can also be used.

In summary, the treatment of head and neck venous malformations must be individualized according to lesion extent, functional impairment, cosmetic deformity, symptoms, patient expectations and physician experience (14).

Herein we report five cases of venous malformations of the head and neck area with important involvement of the lips. Palliative treatment with CO_2 laser vaporization was performed and good cosmetic results were achieved.

Case reports

Each lesion was photographed before treatment. The lip was previously prepared with an antiseptic such as Betadine® or Clorhexidina®. Local anaesthesia with 2% mepivacaine chlorhydrate without epinephrine was administered. The SE-20-30w Franckline (Intermedic) CO_2 laser system was used to perform the treatments.

The first pass of each laser session was performed in focused mode at 2 W/cm^2 in order to achieve a contraction of the tissue, and an immediate flattening of the surface of the lesion was observed. A cotton-tipped applicator soaked in saline solution was used to remove vaporized debris. Subsequently, several passes were performed according to the response, until the surface of the lip was flattened.

After surgery, 2% mupirocin ointment and a mild pressure dressing were applied. The wound was cleaned each day with normal saline solution, mupirocin ointment and application of an occlusive, non-adherent dressing (Tulgrasum®). Visits were scheduled at 2 and 4 weeks, and every 6 months.

Case 1

Case 1 was a 38-year-old man who presented with a bluish lesion on the external left third of the lower lip with involvement of adjacent oral mucosa. The lesion, which was present at birth, showed progressive enlargement over time, and an important deformity of the lower lip was observed at the moment of initial evaluation. After three session of CO_2 vaporization, the aesthetic aspect of the lip showed an important improvement. The mucosal lesion near to the lip was also treated, but not the rest of the lesion localized in the oral cavity. After 2 years of follow-up, the lip aspect remained normal (Figure 1).

Case 2

Case 2 was a 43-year-old woman with a similar lesion that presented in the external left third of the lower lip. The mucosal aspect of the lower lip and the oral mucosa of the near vestibular area were also involved. To achieve the flattening of the lip, three sessions of CO_2 laser vaporization were necessary. One of those allowed us to extract a calcium deposit from the lesion (phlebolith) (Figure 2). After 3 years of follow-up, no new sessions of laser treatment were necessary.

Case 3

Case 3 was a 49-year-old man who presented with a congenital bluish lesion with progressive enlargement on the external left third of the lower lip. Oral lip and vestibular mucosa were also affected, but the patient demanded treatment for the cosmetic appearance of the lower lip. Two sessions of CO_2 vaporization normalized the lip aspect, and no new sessions of treatment were necessary after 3 years of follow-up.

Case 4

Case 4 was a 16-year-old woman who presented with a congenital venous malformation that affected

Figure 1. Case 1: the lip before (A) and after (B) treatment with the CO_2 laser.

Figure 2. A typical phlebolith obtained in case 2 during CO_2 laser treatment.

the right half of the lower lip, the mucosal lower lip to the inferior line of the teeth with extension to the floor of the mouth. A slight deformity of the affected lip was also observed. A coagulation profile before intervention was obtained with normal values. Only one session of treatment was performed with an important improvement of the lesion (Figure 3). The follow-up of this patient was 1 year.

Case 5

Case 5 was a 37-year-old man who presented with a venous malformation involving the right half of the lower lip, tongue, and anterior area of the neck. Functionality of the tongue was normal. A magnetic resonance imaging (MRI) scan and a coagulation profile were performed. The coagulation profile was normal. The MRI scan revealed the extent of the venous malformation to the bilateral chew spaces, the right vascular space of the neck and extension to the cutaneous plane of the anterior neck and submaxillary area. The patient's main concern was an aesthetic one and he refused surgical or embolization procedures. Therefore, a single session of CO_2 laser vaporization was performed to normalize the lip aspect. Six months after the treatment no recurrence was noted in the lip (Figure 4).

Figure 3. Case 4 before (A) and after (B) CO_2 laser treatment.

Discussion

Venous malformations have a propensity to appear in the head and neck region, and lesions on the lips and tongue are not rare. Symptoms are related to the size and location of the venous malformation. Lesions of the tongue may bleed, ulcerate, cause pain, interfere with speech and swallowing, and obstruct the airway. Nevertheless, lesions with lip involvement produce an aesthetic problem, which is usually more important than the functional one.

The general goals of therapy in head and neck venous malformations are to prevent distortion of facial features, limit bony deformation, preserve function and minimize painful swelling (15).

The first evaluation of a venous malformation should focus on delineating the extent and the depth of the lesion. These parameters are two determinant factors in the biological behaviour of venous malformations. The most accurate radiological techniques for delineating venous malformations are MRI and direct injection venography. MRI can also detect developmental venous anomalies of the brain, which are commonly present in patients with those venous malformations (16).

Before intervention, a coagulation profile should be obtained to rule out an underlying coagulopathy.

The treatment of extensive head and neck venous malformations is usually aggressive and the patient

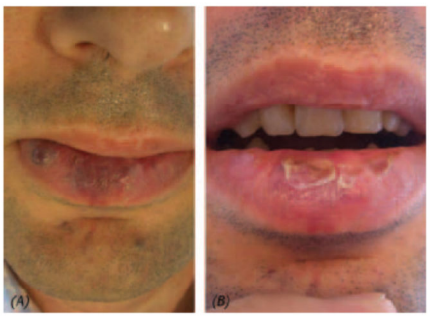

Figure 4. Case 5 with a more extensive venous malformation. Lip involvement is shown before (A) and after (B) CO_2 laser treatment.

has to undergo several sessions of general anaesthesia without the guarantee of removing the entire lesion. Nevertheless, the presence of small lesions with affectation of the lip and an adjacent area of oral mucosa is not rare. In addition, in some extensive cases, no symptoms or functional impairment are present. In these cases, patients may desire treatment to improve the aesthetic appearance of the lip.

Our five cases are representative examples of the problems related to aesthetic distortion. The functionality in all cases was normal, and no symptoms were present. Therefore, in accordance with patient wishes, we decided to perform CO_2 laser vaporization to treat lip deformity. CO_2 laser vaporization may be an effective alternative in these cases. The treatment is performed with local anaesthesia, is easily repeatable, and with adequate technique and postoperative care cosmetic results are satisfactory.

In the follow-up of these patients, no recurrence of the lesions occurred, even after several years. Although the natural evolution of venous malformations is to produce a slow enlargement, the dermal scar induced by CO_2 laser vaporization on the lip prevented this overgrowth.

Alternative treatments in our cases might be surgical treatment, percutaneous sclerotherapy (17,18), radiofrequency (19) or other laser systems. We firmly believe that surgical treatment is more problematic than CO_2 laser therapy in these patients because of the involvement of labial commissure in three cases. Percutaneous sclerotherapy requires general anaesthesia and probably several sessions of treatment would have been necessary. In addition, there may also be a major risk of lip necrosis with this procedure.

Laser treatment of venous malformations has been described with argon (20), yellow dye laser (20), Nd:YAG/KTP laser (20) (in two manners: passing the fibre optic wand percutaneously through a hypodermic catheter, or in contact mode with a sapphire scalpel tip), long-pulsed Nd:YAG laser (20–26), continuous wave Nd:YAG laser (25), and diode (27) or IPL systems (28). Nevertheless, reports of laser treatment of venous malformations in the literature are scarce and for the most part anecdotal. The results of the published articles cannot be directly compared with our cases because the objective in the referred series is the resolution of venous malformations. In our patients, the objective of treatment was the aesthetic improvement of lip deformity.

In several series, good results with laser treatment were obtained in lip lesions comparable with our cases; however, recurrence rates were not clearly referenced.

The capacity of the CO_2 laser to induce tissue contraction is much more important than the other laser systems. This capacity is very important in the treatment of these patients because of the flattening of the lip surface.

In summary, as can be seen from the five presented cases, CO_2 laser vaporization may be employed as an effective method of palliative treatment of lip involvement in venous malformations.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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Comentario:

Las malformaciones venosas cutáneo-mucosas superficiales, que son las susceptibles de tratamiento con láser, en más del 50% de los casos se localizan en cabeza y cuello y dentro de éstas, la boca es una localización frecuente. En las malformaciones venosas que afectan a la boca, independientemente de su profundidad y extensión es muy frecuente que se afecten los labios. El crecimiento de la malformación va induciendo una deformidad labial que llega a tener una gran importancia sobre todo desde el punto de vista estético. En nuestra serie de 5 pacientes recogemos por primera vez un tratamiento paliativo de estas lesiones que además no es incompatible con otros tratamientos, para mejorar el aspecto del labio. Los resultados cosméticos asi como la satisfacción de los pacientes fueron excelentes. En la actualidad estas lesiones venosas superficiales tienden a tratarse más con láseres de Nd:YAG de forma aislada o combinada con láser de colorante pulsado[220].

14. Castiñeiras I, Del Pozo J, Robles O, Martínez-González C, Fernández-Torres R, Fonseca E. EUTHYROID NODULAR PRETIBIAL MUCINOSIS: PALLIATIVE TREATMENT WITH CARBON DIOXIDE LASER. **Dermatology Surgery 2009; 35 (4): 719-721[221].**

Euthyroid Nodular Pretibial Mucinosis: Palliative Treatment with Carbon Dioxide Laser

To the Editor:

Pretibial mucinosis (PTM) occurs most often in association with Graves' disease. In these patients, clinical features include hyperthyroidism, goiter, ophthalmopathy, and pretibial myxedema, a characteristic cutaneous sign of Graves' disease characterized by localized dermal mucin deposition on the shins. PTM associated with Graves' disease must be differentiated from euthyroid PTM associated with venous stasis. We report a case of nodular PTM without thyroid disease that received palliative treatment with carbon dioxide (CO_2) laser.

A 72-year-old woman visited the dermatologic clinic for evaluation of erythematous indurated tender patches on her legs. She had diabetes mellitus, hypertension, ischemic cardiopathy, and chronic venous insufficiency. Physical examination revealed ill-defined, erythematous, swollen patches with nodular lesions on her shins (Figure 1). No clinical signs of Graves' disease were found. Laboratory investigations, including thyroid function test, were normal. Histopathology revealed separation of collagen bundles in the upper dermis due to mucin deposition demonstrated on Alcian blue staining (Figure 2). The diagnosis of PTM associated with venous insufficiency was established.

We decided to treat the nodular lesions using CO_2 laser vaporization. The treatment was performed under local anesthesia and was performed on an outpatient basis. The SE-20-30w Franckline (Intermedic Barcelona, Spain) CO_2 laser system, in focalized mode at 5 W/cm^2 was used to perform the treatment. In each nodular lesion, several passes of laser were performed until subcutaneous adipose tissue was visualized. After surgery, 2% mupirocin ointment and a mild pressure dressing were applied. Visits at 2 and 4 weeks and then every 6 months were scheduled for clinical assessment. The patient demonstrated complete reepithelization at 4 weeks. No recurrence was noted 18 months postoperatively.

A significant improvement of the clinical aspect of the lesions was achieved after treatment, with associated reduction of discomfort (Figure 3).

Pretibial myxedema occurs in 1% to 4% of cases of Graves-Basedow's disease. In most patients, dermopathy is a late feature, occurring after the onset of clinical hyperthyroidism and ophthalmopathy and preceding the development of acropachy.[1] Clinical forms include nonpitting edema and infiltrative plaques, which are more common than the nodular and elephantiasic types. Dermopathy is most often pretibial, although it may appear in unusual locations, including arms, head, and neck. Our patient presented a classic pretibial location of myxedema with uncommon nodular morphology.

Most cases of pretibial myxedema are associated with thyroid disease. There have been few case reports of PTM without thyroid dysfunction.[2–4] This is a rare condition usually associated with stasis dermatitis and venous insufficiency.[5,6]

Several therapeutic options have been used in PTM, with variable outcomes. Therapeutic alternatives include topical, intralesional, and systemic steroids; compression therapy; complete decongestive physiotherapy; radiotherapy; surgery; plasmapheresis; immunosuppressive agents; pentoxifylline; somatostatin analogue; and high-dose intravenous immunoglobulin.[7]

Although there are no specific references to laser therapy in PTM, Kaymen and colleagues described a case of lichen myxedematosus treated using CO_2 laser vaporization.[8]

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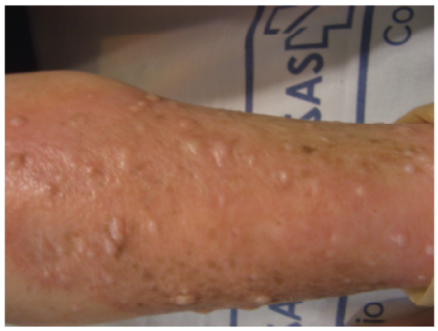

Figure 1. Ill-defined erythematous indurate patches with several nodular lesions over the pretibial area.

Figure 3. Clinical aspect of lower legs after palliative treatment with carbon dioxide laser.

The objectives of laser treatment in our patient were the elimination of nodular lesions and the improvement of patient discomfort. Nodular lesions showed relevant improvement, no new lesions appeared in the treated areas, and the discomfort was relieved.

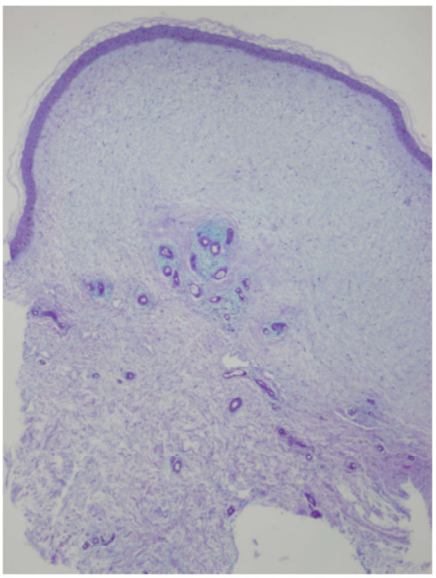

Figure 2. Separation of collagen bundles in the upper dermis due to mucin deposition that was detected on Alcian blue stain.

In summary, we report a case of pretibial myxedema with an uncommon clinical presentation due to the morphology of lesions and the absence of thyroid disease. In addition, a good response to palliative treatment with carbon dioxide laser was obtained.

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Regarding Complete Spontaneous Regression of Merkel Cell Carcinoma

To the Editor:

Richetta and colleagues recently reported a case of complete spontaneous regression (CSR) of Merkel cell carcinoma (MCC), adding number 15 to the 14 previously reported cases and reviewing those cases.[1] My coauthors and I had previously compiled the first 10 cases of CSR of MCC.[2] Even though CSR in MCC is described as extremely rare, it constitutes approximately 1.4% of the total reported cases of MCC (15/1,100). The phenomenon may be more important when one considers that, in each case, CSR occurred before planned treatment could be initiated, or the patient refused treatment or was considered to be too ill from other disease processes to be a candidate for treatment. Because treatment for MCC is the norm and is initiated quickly after diagnosis, we cannot be sure of the true incidence of CSR in this disorder. Finally, in all reported cases, CSR was rapid and complete in several weeks. There are no reports of recurrence after CSR in any reported case. It is likely that a yet-undiscovered immunological process is responsible for these remarkable cases of CSR. New studies reveal the association between MCC with the Merkel cell polyomavirus.[3]

I would like to propose that those of us diagnosing and treating MCC preserve tissue and blood samples of patients. Hopefully, at some time in the future, such an effort would help uncover the mechanism of the process by which MCC undergoes CSR in a significant number of cases.

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Infrared Irradiation as an Adjuvant Therapy in Recalcitrant Alopecia Areata

To the Editor:

Management of alopecia areata can be challenging, especially in patients with ophiasis or extensive involvement, namely, alopecia totalis or universalis. Unlike patchy alopecia areata, spontaneous remission is uncommon.[1] The available armamentarium includes various forms of corticosteroids, systemic immunosuppressants, psoralen plus ultraviolet light A radiation (PUVA), and topical irritants such as anthralin and diphencyprone. They are aimed at blocking the T-cell-mediated hair loss process using

Comentario:

La mucinosis nodular pretibial es una entidad raramente descrita que se caracteriza por la presencia de acúmulos de mucina en ocasiones de varios centímetros de altura localizados fundamentalmente en las piernas. Nuestro caso se trata de una paciente sin alteraciones tiroideas que presentaba la mucinosis como manifestación de una insuficiencia venosa crónica inveterada. Dado que las lesiones le producían muchas molestias se valoró la posibilidad de tratamiento paliativo de estas lesiones con láser de CO_2, con excelente resultado cosmético. Esta indicación de tratamiento con este sistema de láser no había sido descrito con anterioridad en la literatura.

15. Fernández Torres R, Del Pozo J, Castiñeiras I, Sacristán F, Mazaira M, Fonseca E. Treatment of multiple eruptive vellus hair cyst with carbon dioxide laser vaporization and manual lateral pressure. **Clinical Experimental Dermatology 2009; 34: e716-e718**[222].

Treatment of multiple eruptive vellus hair cysts with carbon dioxide laser vaporization and manual lateral pressure

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Summary

Treatment of eruptive vellus hair cysts (EVHC) is often unsatisfactory. Laser treatment has been described as an adequate treatment in a few reports. Pulsed carbon dioxide (CO_2) laser has been used effectively for facial EVHC and erbium:yttrium–aluminium–garnet laser has been used to treat truncal EVHC with variable outcomes. We report our experience with CO_2 laser and lateral manual pressure to extract the cysts as an effective treatment in two cases of EVHC. Good cosmetic results were obtained in both cases. No lesion recurrence was observed after a follow-up of 10 years in the first case and 3 years in the second one. CO_2 laser vaporization and further extraction of cysts by manual lateral pressure might be an effective method to treat EVHC, achieving good cosmetic results and no recurrence.

Numerous treatment options have been proposed for eruptive vellus hair cysts (EVHS) but no completely satisfying therapy has been developed. Laser treatment is an option, although only a few cases have been described. Carbon dioxide laser (CO_2) has been used to treat EVHC on the face,[1] but not at other locations. Two previous reports evaluated the treatment of these lesions by erbium:yttrium–aluminium–garnet (YAG) laser;[2,3] the most recent reported early recurrence after laser treatment.

EVHC are usually situated deep within the skin, and total vaporization with a laser confers a high risk of scarring. On the other hand, superficial laser treatment minimizes the risk of scarring but increases the risk of recurrence.

We report two male patients with EVHC treated by superficial CO_2 laser vaporization followed by manual lateral pressure extraction of the cysts, which gave good cosmetic results and no recurrence.

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Conflict of interest: none declared.

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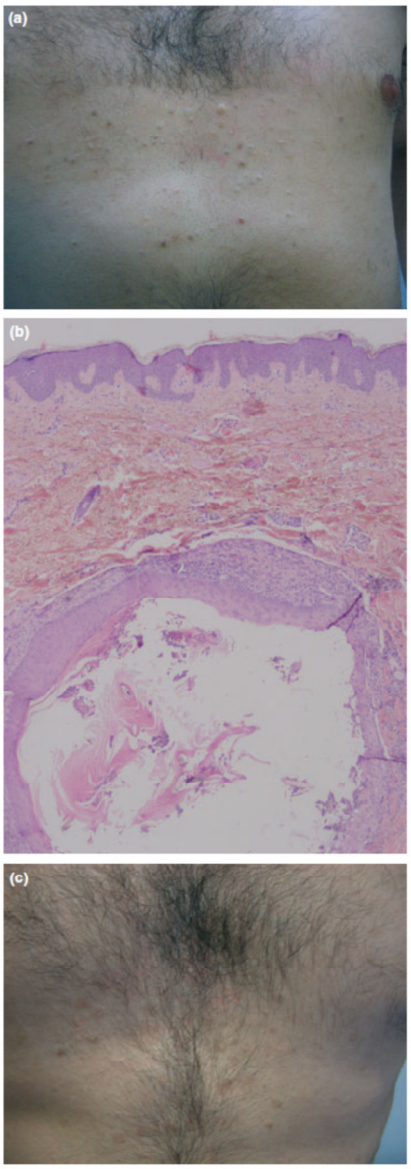
Report

Patient 1 was a 37-year-old man who presented with multiple, asymptomatic, firm, bluish papules 2–3 mm in size, on the anterior and lateral chest wall (Fig. 1a), which had appeared in early adolescence. Clinically, they resembled comedo papules or epidermoid cysts. The patient's medical history was unremarkable and there were no similar lesions in his family. Histological examination of a papular lesion showed a thin-walled cystic structure lined by three layers of keratinizing squamous epithelium and containing multiple vellus hairs and laminated keratinous material (Fig. 1b). These findings were consistent with the diagnosis of EVHC.

Patient 2 was a 25-year-old man who presented with multiple, asymptomatic, skin-coloured, papulocystic lesions, 3–4 mm in size on the mid chest and the upper abdomen, which had appeared in childhood. The patient was in good health and there was no family history of similar lesions. A biopsy specimen of a representative lesion revealed a cystic structure lined by plane-stratified epithelium. Vellus hairs and laminated keratinous material were seen within the cyst. Sebaceous glands were lacking within the cyst wall. These features were consistent with EVHC.



Both patients were treated with CO_2 laser (SE-20–30w Franckline; Intermedic, Barcelona, Spain). Before laser treatment, the skin was prepared with an antiseptic such as povidone–iodine or chlorhexidine. Local anaesthesia with 2% mepivacaine chlorhydrate without epinephrine was given.

The laser was used in focused mode (2 W/cm^2, 2–3 s pulse), with the laser applicator placed perpendicular to the surface of the skin, forming a small incision 2 mm in diameter in the lesion. The intact cyst could then be easily extracted by lateral manual pressure in most cases. EVHC are usually deep lesions and the incision must go through to the dermis. In some cases, extraction by lateral pressure was more difficult and a deeper hole had to be made. The larger lesions were usually more superficial and easily extracted than the small lesions and hence the incision was similar for both types.

After treatment, 2% mupirocin ointment and a light pressure dressing were applied. The wound was cleaned each day with normal saline serum, followed by application of mupirocin ointment and an occlusive, nonadherent dressing (Tulgrasum®; Desma Laboratories, Madrid, Spain). Scheduled visits at 2 and 4 weeks, and then every 6 months were performed for clinical assessment.

Excellent cosmetic results were obtained for both patients, except for the presence of post-inflammatory hyperpigmentation (Fig. 1c). No recurrences were observed after a follow-up of 10 years in the first case and 3 years in the second one.

EVHC are uncommon cystic developmental abnormalities of the vellus follicle that typically appear during adolescence or early adulthood. A tendency to spontaneous resolution is seen in about 25% of the cases after several months to years by transepidermal elimination or by foreign-body granuloma formation and dissolution, but they may persist for life without change.

Because EVHC are asymptomatic in most cases, treatment is usually not necessary. However, sometimes they became inflamed or may cause itch or tenderness. Patients may also want treatment for cosmetic reasons.

Several treatment options for EVHC have been reported with variable results, including topical and systemic retinoids,[4] chemical peeling with lactic acid

Figure 1 Patient 1. Multiple bluish papules on the anterior and lateral chest wall; (b) dermal cyst lined by keratinizing squamous epithelium and containing multiple vellus hairs and laminated keratinous material (haematoxylin and eosin, original magnification × 100); good cosmetic results 7 months after treatment.

12%, and washing with an abrading sponge followed by application of urea 10% cream application.[5] Surgical options include incision and drainage, curettage, cauterization and needle evacuation.[6,7] Many of these methods may cause scarring, lesion recurrence or an unacceptable result To date, the best results have been reported with laser treatment.

Kageyama *et al.*[2] reported the effective treatment of truncal EVHC with erbium:YAG laser in two patients. However, Coras *et al.*[3] described the early recurrence of facial EVHC in a female patient after erbium:YAG laser ablation, probably due to insufficiently deep enucleation of the cyst in an attempt to avoid the risk of skin atrophy or scarring. Pulsed CO_2 laser treatment has yet proved to be effective in the treatment of facial EVHC.[1]

EVHC are usually deep lesions, and total vaporization by laser implies a high risk of scarring. On the other hand, superficial laser treatment minimizes the risk of scarring but recurrence is common. The combination of laser with manual pressure minimizes the risk of secondary effects, and avoids recurrences. During the follow-up period of our two patients (10 and 3 years, respectively), no recurrence was observed.

The incision permitting the manual extraction of cysts could possibly be created with other methods such as electrocoagulation, but the CO_2 laser minimizes the risk of thermal damage and allows a large number of lesions to be treated in one session, which is easily repeatable if necessary.

We suggest that CO_2 laser vaporization followed by lateral pressure and manual extraction of the cysts is an effective therapeutic option that should be considered in EVHC, as no universally accepted treatment is available and many treatments have proven unsuccessful.

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Comentario:

Los quistes vellosos eruptivos son pequeñas lesiones profundas de tonalidad azulada que van apareciento de forma progresiva y se localizan en la cara anterior del tronco en la mayoría de las ocasiones. Se han descrito numerosos tratamientos para estas lesiones, pero ninguno muy satisfactorio por el hecho de ser lesiones múltiples y benignas. El láser de CO_2 es una de las alternativas descritas de tratamiento pero con unos índices de recidiva muy altos[101]. Dado que son lesiones profundas para conseguir un resultado cosmético lo mejor posible, diseñamos un tratamiento en el cual el láser de CO_2 tenía como función crear un pequeño orificio de entrada en la piel lo suficientemente produndo como para permitir la salida del quiste, y lo suficientemente pequeño como para minimizar en impacto cicatrizal. Así con orificios de unos 2 mm de diámetro y la presión lateral con un pinza la extracción de los quistes fue posible y el resultado estético a medio plazo excelente. Esta técnica de tratamiento que no había sido descrita con anterioridad consideramos que es la técnica electiva para el tratamiento de los quistes vellosos eruptivos.

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Journal of Dermatological Treatment. 2010; 21:49–53

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CASE REPORT

Actinic cheilitis: Evolution to squamous cell carcinoma after carbon dioxide laser vaporization. A study of 43 cases

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Abstract

Background: Actinic cheilitis (AC) is a precancerous lesion of the lip. Treatment of AC is indicated for prevention of squamous cell carcinoma (SCC), although the exact transition rate of AC to SCC is unknown. Carbon dioxide (CO_2) laser vaporization seems to be an adequate therapy for AC, but there are no references about the evolution rate of AC to SCC after this treatment. *Objective*: To evaluate the results obtained after treatment of AC by CO_2 laser vaporization in comparison with other treatment modalities and the evolution rate of AC to SCC after CO_2 laser treatment. *Methods*: A retrospective review identified 43 patients with AC treated with CO_2 laser vaporization at our hospital from 2002 to 2006. Clinical and therapeutic information was evaluated. All patients were followed for more than 15 months after treatment. *Results*: After a mean follow-up period of 29.4 months, 3/43 treated AC showed local recurrence. Another two patients developed SCC in the treated field. A residual scar was clinically evident in two patients. *Conclusions*: CO_2 laser vaporization with an adequate postoperative follow-up is an effective treatment for chronic AC. Nevertheless, some patients (4,6%) went on to develop lip SCC. The follow-up of these patients is mandatory.

Key words: *Actinic cheilitis, carbon dioxide laser, lip mucosa*

Introduction

Actinic cheilitis (AC) is a premalignant condition of the lip mainly caused by chronic exposure to solar irradiation. Most AC occurs on the vermilion of the lower lip of fair-skinned people older than 50 years of age who have had prolonged sunlight exposure. Nevertheless, additional factors may play a role in the aetiology of AC and squamous cell carcinoma (SCC), including tobacco use, lip irritation and poor oral hygiene.

Clinical manifestations of AC include erythema and oedema in early stages, and diffuse scaling, leukoplakia, inflammatory areas presenting as erythroplasia, linear fissures perpendicular to the long axis of the lip, an indistinct vermilion border, atrophy, ulceration, induration and nodularity in advanced stages of evolution (1).

Diagnosis of AC is mainly based on clinical findings but biopsy is mandatory if the lesion has indurate or persistent erosive areas suggesting a possible malignant degeneration.

Treatment of AC is indicated for prevention of SCC of the lip (2), the most common malignant tumour of the oral cavity, although the exact transition rate of AC to SCC is unknown.

The treatment options for AC include surgical and non-surgical methods such as chemical peeling with trichloroacetic acid, topical tretinoin, 5-fluorouracil, diclofenac, imiquimod, cryosurgery, electrocautery, dermabrasion, carbon dioxide (CO_2) laser, Er:YAG laser, scalpel vermilionectomy and photodynamic therapy (3).

AC is also a multicentric disease; although focal areas may be clinically significant, the widespread

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Figure 1. (A) Appearance of lower lip prior to CO_2 laser treatment; (B) normal aspect of the lower lip surface 6 months after CO_2 laser treatment.

nature should be considered in the election of treatment options (3). The concept of 'cancerization field' (4), currently used a lot, requires careful consideration in the treatment of these patients.

CO_2 laser vaporization seems to be an adequate therapy for AC, with low ranges of recurrences and adequate cosmetic outcome (5–7).

Although patients with lip SCC usually have previous AC and 5–14% of them will developed a second SCC (8), there are no references regarding the evolution rate of AC to SCC after CO_2 laser vaporization.

The purpose of this study was the retrospective evaluation of the results obtained in patients who had been treated by CO_2 laser vaporization for AC, comparison with other treatment modalities and, in particular, to evaluate the evolution rate of AC to SCC after CO_2 treatment.

Patients and methods

During the period from 2002 to 2006, 43 patients with AC were treated by CO_2 laser vaporization. Evaluated demographic and clinical data were the age, sex and ethnicity of each patient, as well as the location and the clinical features of AC.

All patients underwent treatment under local anaesthesia on an outpatient basis. The skin was previously prepared with an antiseptic, such as Betadine® or Clorhexidina®. Local anaesthesia with 2% mepivacaine chlorhydrate without epinephrine was injected subcutaneously beneath the surface to be treated. The ASE 20–30 W Franck Line (INTERmedic, Barcelona, Spain) CO_2 laser system was used to perform the treatments. In each lesion, several passes of laser were realized using the focalized mode at 2 W/cm^2. Laser passes were performed over damaged tissue until the superficial papillary dermis was visualized. Small lesions were treated in a single session while larger lesions required two or more sessions. After surgery, 2% mupirocin ointment and a mild pressure dressing were applied. Postoperative care consisted of daily cleaning of the lower lip with normal saline to remove any debris, application of mupirocin ointment and an occlusive, non-adherent dressing. A first follow-up visit was made 4 weeks postoperatively, and then every 6 months for clinical assessment (Figure 1). All patients in the study were followed for more than 1 year after the treatment, with a mean follow-up period of 29.4 months (range 13–60 months).

Results

In this group of 43 patients, there were nine women (mean age 80.5 years, range 69–93 years) and 34 men (mean age 67.9 years, range 40–89 years). All patients in the study were white individuals and many of them had evidence of actinic damage on the exposed skin as well as on their lips. The location of AC was on the lower lip in all cases but one. Most patients had at least 50% of the lip semimucosal surface affected. The most frequent clinical presentation of AC in our patients was white non-ulcerated lesions (67%), followed by mixed forms of white and erosive component (21%) and a small group of patients who only showed erosive lesions (12%).

In all cases, long-term follow-up was planned to detect future recurrences, new lesions, malignant transformation or any other possible complication. During the

Table I. Advantages and disadvantages of different treatment modalities in AC.

	Evidence	Advantages	Disadvantages	Indications
Chemical peels (9)	Poor histological cure	Easy to perform	Difficult to control. Intense oedema and erythema	Currently not used
Topical 5-fluorouracil (31011)	Recurrence index elevated	Easy to perform	Frequent therapy discontinuation by erythema oedema and ulceration	Initial cases
Diclofenac 3% gel (12)	Only one study with few patients	Easy to perform	Erythema and swelling moderate	More experience is necessary
Imiquimod (13,14)	Good clinical and histological results	Easy to perform. Treatment of cancerization field	Erythema, oedema, induration in 60% of cases	Promise option
Cryosurgery (15,16)	Good cure rates	Easy to perform. Good availability	Intense postoperative oedema	Focal areas of AC
Electrosurgery (17,18)	Good cure rate	More available than laser	Difficult to control, frequent scar formation	Focal areas of AC
Dermabrasion (19)	Only one study	No thermal damage	Difficult to control	Selected cases
CO2 laser (3,5–7,20–25)	High cure index and low recurrence index	Easy than surgical treatment, intraoperative bleeding control, low postoperative morbidity	No histological control. Healing time 21 days. Scarring and disaesthesia	Moderate to severe cases
Er:YAG laser (26)	Only one study. No comparative studies with CO_2 laser	Probably less morbidity than CO_2 laser	More intraoperative bleeding, less available than the CO_2 laser	More comparative studies are necessary
Surgical vermilionectomy (3,27–30)	Higher index of cure and low index of recurrences	Histopathologic study possible	Difficult, intraoperative bleeding, great postoperative morbidity, secondary effects	Moderate to severe cases
Photodynamic therapy (31–36)	Lower cure rates than laser or surgical vermilionectomy	Treatment of the cancerization field	Expensive. Low availability	People with high risk for invasive procedures. Promise technique

follow-up period, 3/43 patients showed a local recurrence of the AC which occurred 16, 14 and 13 months after the treatment. These patients improved after a new CO_2 laser treatment with total resolution of the lesions. The mean follow-up period after the second intervention was 12.3 months (range 9–14 months). Two patients developed SCC 12 and 20 months after CO_2 laser treatment. These patients were treated with surgical excision.

During follow-up of the 43 patients, clinically no abnormality or dysfunction of the lip was observed. Neither postoperative anaesthesia nor hypoaesthesia of the lip was reported. Contracted scars with secondary movement restriction at the vermilion edge were not observed, and only two patients had a minimal residual persistent scar without interference in the normal lip function. In all cases the procedure was well tolerated, the cosmetic results were satisfactory and the treatment had excellent patient acceptance.

Discussion

Treatment of AC is essential for prevention of lip SCC (2). Several procedures have been employed to destroy or remove the epithelium of the lip that has been chronically damaged by the sun. These options, summarized in Table I, include surgical and non-surgical methods. Conservative procedures include chemical peeling agents such as 50% trichloroacetic acid (9), topical application of 5-fluorouracil (10,11), diclofenac 3% gel (12) and imiquimod (13,14). These compounds have been used with variable results in the treatment of AC, but the rate of recurrences is higher than that associated with vermilionectomy or laser ablation.

Surgical procedures include cryosurgery (15,16), electrosurgery (17,18), dermabrasion (19), laser ablation, surgical resection (27–30) and photodynamic therapy (31–33). Cryosurgery is a cost-effective and readily available method which usually requires

no local anaesthesia. Some authors describe a cure rate of 96.2%, but no long series of patients have been tested. Postoperative oedema may be very important in treatment of significant surface areas. In this manner, cryosurgery might be the elective treatment for focal areas of AC. Electrosurgery, with an adequate technique, may also be a valid technique in limited areas of AC. In more extensive and persistent areas of AC, vermilionectomy and CO_2 laser ablation are the elective therapeutic modalities. Photodynamic therapy has been recently reported as an alternative treatment option for patients with AC which could be especially useful in people with higher risks for invasive therapeutic procedures (34–36).

CO_2 laser vaporization offers an effective and well-tolerated treatment modality for chronic AC (20–22). With the appropriate training this is a simple technique with low postoperative morbidity that achieves excellent therapeutic, cosmetic and functional results, with few recurrences. When comparing histological cure, cosmetic outcome and complication rate, CO_2 laser appears to be the most successful therapy for this condition (23,25).

To minimize peripheral thermal damage during treatment, several technical improvements have been incorporated such as the use of lower energy fluences, only one treatment pass with the laser (37), and progress in CO_2 technology with the superpulsed and ultrapulsed systems (24).

In comparison with surgical vermilionectomy, this procedure is relatively quicker and easier, intraoperative bleeding is easily controllable, and postoperative morbidity is lower. Nevertheless, no histopathological control may be performed and several secondary effects have been described, including delayed re-epithelialization (at least 21 days), aspect of lip initially no aesthetic, pain during the healing phase, oedema, secondary infection, scarring, and disaesthesia.

Orenstein et al. (26) reported 12 patients with AC treated by Er:YAG laser vaporization with excellent rates of cure and no recurrence, with a follow-up of between 8 and 36 months. Other series of patients with this laser modality and the comparison with CO_2 laser are necessary to determine the usefulness of this laser in the treatment of AC.

The rate of recurrences in our patients treated with CO_2 laser vaporization was low (three of 43 patients), as well as the rate of relevant secondary effects (two of 43 patients). These ranges are in accordance with other published series of CO_2 laser treatment.

Invasive SCC has been reported after CO_2 laser vaporization of AC (38). Nevertheless, to our knowledge, rates of SCC development after CO_2 laser treatment of AC have not been reported. Our series revealed that two of 43 patients (4.6%) developed SCC that required surgical treatment 12 and 20 months after this procedure. The recurrences and the development of SCC of the lip occurred in different patients. In this manner, five of 43 patients required new treatments (11.6%).

In summary, we report a series of 43 patients with AC treated by CO_2 laser vaporization. In our experience, CO_2 laser treatment with an adequate postoperative follow-up is an effective treatment modality for chronic AC. Patients should protect themselves from sun exposure after the treatment and long-term follow-up is recommended in order to early detect local recurrence, new lesions or SCC development.

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Comentario:

La queilitis actínica constituye unos de los tratamientos de elección del láser de CO_2. Desde que se ha generalizado su uso, la vemellectomía quirúrgica para el tratamiento de esta lesión precancerosa ha disminuido hasta casi no realizarse. En nuestro trabajo nos planteamos valorar la evolución de nuestros pacientes tras el tratamiento, y sobre todo, cuantos de ellos a pesar de recibir un tratamiento con láser de CO_2 iban a desarrollar posteriormente un carcinoma epidermoide. En la serie de 43 pacientes 3 desarrollaron una recidiva de la queilitis que fue tratada nuevamente con láser, y dos de ellos (un 4.6%) desarrollaron un carcinoma epidermoide tras un tiempo de seguimiento medio de 29,4 meses. Es el primer trabajo en la literatura que analiza la evolución a carcinoma epidermoide de estos pacientes, y dados los resultados nos obliga a un seguimiento a largo plazo de estos pacientes tras el tratamiento con láser.

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CASE REPORT

Variants of milia successfully treated with CO_2 laser vaporization

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Abstract

Background: Milia are a usual consultation in dermatologic practice and optimal treatment modalities are not established. *Objective*: To evaluate the efficacy and the safety of CO_2 laser vaporization in the treatment of milia. *Methods*: We report four patients, aged from 12 to 50 years old, with different variants of milia: milia en plaque, milia post-photodermatitis, multiple eruptive milia and milia post-trauma. They were treated with the CO_2 laser in superpulsed and focused mode at 2 W/cm^2, with two passes in each session. The follow-up was 12–36 months. *Results*: All patients showed marked improvement after a few sessions of CO_2 laser. No-one had recurrence or noticeable side effects. *Conclusion*: The CO_2 laser is an option in adult and child patients with multiple milia lesions or milia en plaque, obtaining good cosmetic results with minimal side effects.

Key Words: *CO_2 laser vaporization, milia*

Introduction

Milia are common, benign superficial keratinous cysts. Clinically they are tiny (1–3 mm), yellowish to pearly white papules and can appear in children or adults.

Recently, an updated milia classification has been reported (Table I) (1). Milia can occur in two settings: spontaneously, without known cause or association (primary milia); or associated with disease, medication or trauma (secondary milia). Although milia associated with genodermatosis are considered like primary milia, milia associated with epidermolysis bullosa and hereditary porphyrias are best classified as secondary milia.

Histologically the small cysts are lined by several layers of stratified squamous epithelium and a granular cell layer with central keratinous material, resembling a small epidermal cyst. Primary milia are connected to the external root sheath of vellus hair follicles, near the attach point of sebaceous ducts, and secondary milia are usually connected to eccrine ducts, or with less frequency to aberrant epidermis or hair follicles (1–4).

Milia are a common consultation in dermatologic practice. Optimal treatment modalities are not established. We report four cases of milia variants, successfully treated with CO_2 laser vaporization with good cosmetic results.

Methods

Before laser treatment, informed consent was obtained in all cases. The treatment was performed under local anesthesia, using mepivacaine 2% without adrenaline. A CO_2 laser was used to treat all patients (SE-20-30W Franck Line®; INTERmedic, Barcelona, Spain). Two laser passes were performed on each lesion within a single session. In the first pass, we used a continuous wave and focused mode, with a power density of 2 W/cm^2. After this pass, the detritus were manually removed with a saline-soaked gauze and cysts were removed using a tweezer. The second pass was performed with the same parameters.

After treatment, topical antibiotic ointment (mupirocin or fusidic acid ophthalmic gel) was applied on the area. A daily cleansing of the treated area, with mild soap and water, followed by application of the same antibiotic ointment for a period of 10 days, was performed.

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Table I. Classification of milia (Berk and Bayliss) (1).

Primary milia
Congenital
Benign primary milia of children and adults
Milia en plaque
Nodular grouped milia
Multiple eruptive milia
Nevus depigmentosus with milia
Genodermatosis associated
Secondary milia
Disease associated
Medication associated
Trauma associated

The new physician evaluation of the patients was made after 8 weeks of treatment. If it was necessary, another session was performed. Twelve sessions were performed in patient 1 and only a single session was needed in the other cases.

After the treatment, erythema on the treated area was observed. Minimization of this erythema occurred over time, within the following months. Patients have not had recurrence, or hypertrophic or keloid scarring in the months of follow-up (12–36 months).

Case reports

Case 1

A previously healthy 12-year-old male presented with many asymptomatic, yellowish, superficial and millimetric lesions on the left inner cantum since 6 months ago. There was no family or personal history of similar lesions, trauma, sunburn, irradiation, or topical or systemic drug therapy. A biopsy specimen of one lesion revealed an epidermal cyst inclusion. One month later, similar lesions appeared around the right inner cantus and the ears. The diagnosis was spontaneous multiple eruptive milia.

Treatment with topical isotretinoin 0.05% and erythromycin 2% gel once a day was performed with an unsuccessful result. A marked reduction in the number of milium cysts was noted after a single lesion of CO_2 laser treatment (Figure 1). A total of 12 sessions were needed for complete disappearance of the milia.

Case 2

A 50-year-old woman presented with an asymptomatic, well-defined, indurated, erythematous plaque, measuring 4 × 3 cm, containing multiple milia on her forehead since 8 months ago. There was no history of trauma, sunburn, irradiation, bullous dermatosis, cosmetics or medical creams. She had non-insulin-dependent diabetes mellitus treated with metformin and dyslipemia. A diagnosis of milia en plaque was made. After a single session of CO_2 laser vaporization, the milia en plaque disappeared. The patient has had no recurrence after 13 months of follow-up (Figure 2).

Case 3

A 13-year-old woman presented with a 12-year history of lesions on her thorax. The patient's mother related that the lesions appeared after an itchy eruption because of scratching. The lesions had not changed. Cutaneous examination revealed multiple, confluent, tiny, yellowish papules on the thorax. Milia secondary to trauma were diagnosed. A single session of CO_2 laser vaporization was performed with excellent results.

Case 4

A 30-year-old woman presented with grouped, millimetric, superficial, yellowish papules on the right wrist. A year before, she had allergic photodermatitis from topical application of ketoprofen with bullous lesions in the same area. Milia secondary to allergic

Figure 1. Multiple eruptive milia in a 12-year-old child before (left) and after treatment (right) with the CO_2 laser.

Figure 2. Milia en plaque in a 50-year-old patient before (left) and after treatment (right) with the CO_2 laser.

photodermatitis were diagnosed. The lesions were treated successfully with a single session of CO_2 laser. There has been no recurrence in 4 years of follow-up (Figure 3).

Discussion

Several treatments have been reported for milia but no optimal ones had been established.

Benign primary milia of children and adults tend to be more persistent than congenital lesions (1). The most effective treatment for superficial, located milia is simple evacuation. A superficial epidermal nick is made at the top of the lesion with a scalped blade, followed by application of tangential pressure to the milium with a comedo extractor, curette, tongue blade or the blunt edge of a scalped blade (5). Enucleation with a disposable hypodermic needle (5) and evacuation with a paper clip have been reported (6). Curettage, electrodesiccation and mild electrocautery have also been effectively used but may also result in residual scarring or postinflammatory changes (7). Successful therapy has been reported with the Er:YAG laser (8).

A rapid response of multiple eruptive milia to 0.1% topical tretinoin cream has been reported (9), but treatment with topical retinoids may not be successful (10). Curettage and electrocautery have had variable results (7,11).

Several treatments had been reported for milia en plaque: incision and expression (12,13), topical retinoids (13–20), oral retinoids (21), oral minocycline (12,19,22), photodynamic therapy with topical aminolevulinic acid 20% (23), excision (24), electrodesiccation (25), open spray cryosurgery (26), CO_2 laser (27) and dermabrasion (28). However, no optimal ones had been established.

To our knowledge, this is the first report of treatment of multiple eruptive milia with the CO_2 laser and the second report of milia en plaque treated with CO_2 that obtained good cosmetic results without side effects or recurrences.

CO_2 laser ablation is easy to perform, allows the treatment of multiple lesions in a minimal total time requirement and has minimal side effects. An adequate method, ability and postoperative care minimize the risk of residual scarring.

We think that CO_2 laser treatment for milia may obtain good cosmetic results, causes minimal postoperative complications, is easily repeatable in recurrences and should be considered as an option in adults and children with multiple milia lesions, multiple eruptive milia or milia en plaque.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

Figure 3. Milia secondary to photodermatitis in a 30-year-old woman before (left) and after treatment (right) with the CO_2 laser.

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Comentario:

Los quistes de millium o quistes de retención epidérmica son un motivo de consulta frecuente en Dermatología. Aparecen de forma espontánea o tras un proceso de cicatrización y para su resolución es necesario que se rompan y se vierta su contenido de restos de queratina. Una forma de tratamiento en los casos que son de larga evolución y no responden a queratolíticos tópicos o exfoliantes es el láser de CO_2. Aunque ya había sido descrito con anterioridad, en nuestro trabajo describimos varios casos de millia de diferentes etiologías, cuya respuesta al tratamiento con este sistema de láser fue excelente.

18. Piñeyro F, Del Pozo J, Pérez-Varela L, Fernández-Lojo R, Barja J, Fonseca E. ARTERIOVENOUS HEMANGIOMA ASSOCIATED TO CHRONIC HEPATIC INSUFFICIENCY. TREATMENT OF 5 CASES WITH CARBON DIOXIDE LASER VAPORIZATION. **Journal of Cosmetic and Laser Therapy 2010; 12: 151-154[225].**

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CASE REPORT

Arteriovenous haemangioma in liver disease. Treatment with carbon dioxide laser vaporization in five cases

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Abstract

Background: Arteriovenous haemangioma (AVH) is considered a rare, benign, acquired, cutaneous tumour of vascular origin. Recently, a variant associated with chronic hepatic disease has been described. The usual treatment is surgical resection but no other treatments have been reported. *Objective*: To evaluate the results obtained in the treatment of AVH with carbon dioxide laser vaporization. *Methods*: Every patient with AVH related to chronic hepatic disease treated in the laser unit was reviewed. Five patients were treated with carbon dioxide laser vaporization. The first pass of treatment was performed in defocused mode at 2 W/cm^2. After this, several passes were performed in order to clear the entire lesion. One session of treatment was necessary for three patients, and the other two patients needed two sessions. *Results*: The tumoral mass as well as the pulse disappeared in all lesions; total clearance was obtained in four of the five cases. In the postoperative time, no bleeding or haemorrhage were observed. No significant secondary effects of treatment were present. The cosmetic outcome was excellent in all cases. *Conclusion*: Carbon dioxide laser vaporization may be an alternative treatment for cases of AVH in chronic hepatic disease: the procedure is easy and with good cosmetic outcome.

Key Words: *Arteriovenous haemangioma, carbon dioxide laser*

Introduction

In 1974, Girard et al. (1) described a group of benign vascular lesions of the skin that they named arteriovenous haemangiomas (AVH). In 1977, Carapeto et al. (2) described 15 benign vascular tumours that they called acral arteriovenous tumours (AAVT). They believed that these lesions were identical to those described by Girard but without the direct arteriovenous shunts.

Previously, in 1956, Biberstein and Jessner described the cirsoid aneurysm of the skin (CA). The histopathological features were very similar to AVH and AAVT.

Conelly (4) and, afterwards, Enzinger and Weiss (5) revised these cases and concluded that these lesions were similar, and classified AVH in deep forms (CA) and superficial forms (AVH, AAVT).

Currently, arteriovenous haemangioma, also known as cirsoid aneurysm or acral arteriovenous tumour, is considered a rare benign acquired cutaneous tumour of vascular origin (6).

Recently, some variants of these lesions have been described:

- associated with a port-wine stain in a patient with Sturge-Weber syndrome (7)
- painful subcutaneous lesions associated with Banayan-Riley-Ruvalcaba syndrome (7)
- oral mucous cases (9)
- associated with chronic liver disease (10–13); no significant differences were identified in clinical features between these AVH in chronic liver disease and others.

Clinically, AVH in chronic liver disease are solitary, asymptomatic, reddish papules, measuring 5 ± 10 mm in diameter that show a predilection for facial skin. The natural evolution of the lesion is slowly progressive enlargement. The usual treatment of AVH is chirurgical resection because they are usually small lesions. No other therapeutic options have been described.

We report our experience with a series of five cases of AVH related to chronic liver disease successfully treated with carbon dioxide laser vaporization.

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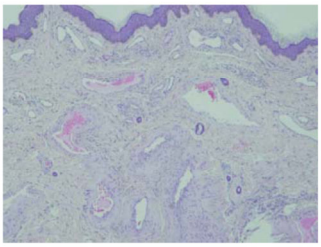

Figure 1. H&E stain showing a diffuse heterogeneous mixture of thick-walled and thin-walled vessels of various diameters.

Figure 2. Arteriovenous haemangioma on the right side of the nose (Patient Number 1).

Patients and methods

Every patient with AVH related to chronic hepatic disease treated in the laser unit was reviewed. Five patients were treated with the diagnosis of AVH.

In the first patient, diagnosis with a histopathological study was performed (Figure 1). In the other cases, the diagnosis was clinical. Treatment with carbon dioxide laser vaporization was proposed for these patients because the lesions were affecting areas of difficult chirurgic management and, in addition, the patients presented coagulation problems.

The demographic and clinical characteristics of the five patients treated with carbon dioxide laser are summarized in Table I.

Each lesion was photographed before treatment. The area was previously prepared with an antiseptic such as Betadine® or Clorhexidina®. Local anaesthesia with 2% mepivacaine chlorhydrate without epinephrine was administered. The SE-20-30w Franckline (Intermedic) carbon dioxide laser system was used to perform the treatments.

The first pass of each laser session was performed in defocused mode at 2 W/cm^2 in order to achieve a contraction of the tissue and an immediate flattening of the surface of the lesion was observed. A cotton-tipped applicator soaker in saline solution was used to remove vaporized debris. Subsequently, several passes, according to each lesion, were performed until the full lesion was removed.

After surgery, 2% mupirocin ointment and a mild pressure dressing were applied. The wound was cleaned each day with normal saline solution, mupirocin ointment and application of an occlusive, non-adherent dressing (Tulgrasum®). Visits scheduled at 2 and 4 weeks, and then every 6 months were performed for clinical assessment.

Results

After treatment with the carbon dioxide laser, all lesions presented a marked improvement. The tumoral mass as well as the pulse disappeared in all lesions. Total clearance was obtained in four of the five cases. In the postoperative time, no bleeding or haemorrhage were observed. No significant secondary effects of treatment were present. The cosmetic outcome was excellent in all cases.

Three patients were treated in one session and the other two patients needed two sessions of treatment.

Representative images of two cases are presented in Figures 2–5.

Discussion

According to the ISSVA scheme (International Society for Study of Vascular Anomalies), the majority of cutaneous vascular lesions can be designated as either tumour or malformation (14); nevertheless, AVH have features of both entities. Active endothelial cells are a constant feature in AVH consistent with a growing vascular lesion, but it is unclear whether the endothelial proliferation is a primary event or results from vascular expansion by means of haemodynamic mechanisms.

Table I. Summary of our patients with arteriovenous haemangioma.

Sex	Age	Aetiology of hepatic dysfunction	Portal hypertension	Evolution time	Sessions	Evolution of liver disease
♂	75	VHC	No	11 years	1	Estable
♂	38	Alcoholic	No	12 years	1	Deceased
♂	44	Alcoholic	CHILD B	5 months	1	Estable
♂	60	VHC	CHILD C	7 years	2	Deceased
♀	72	VHC	CHILD A	21 years	2	Estable

VHC = hepatitis C virus [TFN].

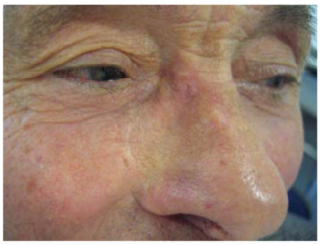

Figure 3. The aspect after carbon dioxide laser vaporization (Patient Number 1).

Few cases of AVH related to chronic liver disease have been published. Nevertheless, we think that their true incidence is underestimated. Probably, in some cases, they are present in patients with a bad general status and they are not a significant problem for the patient.

In a clinical examination of our cases the presence of a pulse was constant. This fact is not referred to in other publications but it is noted in other variants of AVH, and in some cases of CA. It is possible that AVH related to chronic hepatic disease is deeper than classic cases of AVH, and that vessels with a larger diameter are implicated.

Several cutaneous vascular lesions have been described in patients with hepatic problems (15), including spider nevus, palmar erythema, unilateral nevoid telangiectasia (16) and AVH. The occurrence of AVH with chronic liver disease does not seem to be related to any specific liver disease, but rather may be related to chronic liver dysfunction itself.

Different from other lesions with arteriovenous shunts as arteriovenous malformations, these lesions usually present no recurrences after treatment and, in addition, they are usually small lesions. In this respect, the main therapeutic option is surgical removal. Nevertheless, because of the subjacent liver disease these patients had abnormal coagulation values and, in some cases, a chirurgical approach might have been a risk.

Carbon dioxide laser vaporization was performed with local anaesthesia and the procedure was easy in spite of the coagulation problems. Small vessels were coagulated with laser. Several secondary effects of carbon dioxide laser treatment, such as hypertrophic scarring and textural changes of pigmentary alterations, may be present. With an adequate technique and postoperative care, these problems may be minimized.

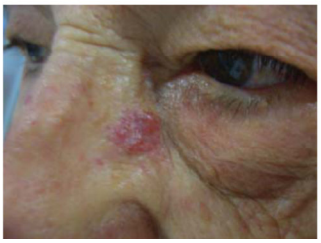

Figure 4. Patient number 5 with an arteriovenous haemangioma.

Figure 5. Patient number 5 after treatment with the carbon dioxide laser.

In summary, we present an alternative treatment of cases of AVH in chronic hepatic disease which is easy to perform and has a good cosmetic outcome. We think that carbon dioxide laser vaporization may be an adequate treatment for AVH related to chronic liver disease.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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Comentario:

El hemangioma arteriovenoso asociado a enfermedad hepática ha sido descrito en el año 1998. Se trata de lesiones que generalmente se localizan en la cara, a diferencia de la variante clásica de hemangioma arteriovenoso acral, en pacientes con una insuficiencia hepática avanzada. En su examen clínico es característica la presencia de un latido a la palpación. Su etiopatogenia en estos pacientes parece estar relacionada con la falta de aclaramiento de factores proangiogénicos debido a la disfunción hepática. Estas lesiones suelen crecer de forma progresiva y habitualmente el tratamiento descrito para ellas había sido el tratamiento quirúrgico. Nuestro trabajo recoge por primera vez el tratamiento con láser de CO_2 de estas lesiones con excelente resultado. Es característico que cuando se termina de hacer el tratamiento con láser, si repetimos la palpación de las lesiones ya no se objetiva el latido.

19.- Del Pozo J, [226]Rosende L. Basal cell carcinoma. Treatment with carbon dioxide laser vaporization. **Advances in Cancer Research&Treatment** Vol. 2013 (2013), Article ID 442049, DOI: 10.5171/2013.

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Research Article

Basal Cell Carcinoma. Treatment with Carbon Dioxide Laser Vaporization

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Abstract

Background: Basal cell carcinoma (BCC) is the most common malignant epidermal tumor of the skin. Several treatment options for BCC have been described including ablative and other laser systems.

Objectives: To evaluate the efficacy of carbon dioxide (CO2) laser vaporization in the treatment of superficial and nodular BCC.

Method of treatment: All treatments were performed with local anaesthesia. In the first pass, superpulsed and focused mode, with a power density of 5 to 10 W/cm2, to eliminate the superficial layer was used. When the necrotic debris was eliminated a flaming red surface appeared with central bleeding surrounded by a pink peripheral area that corresponds to unaffected skin. In the next passes, this area must disappear.

Results: In all patients BCCs are adequately removed after treatment. After a year of follow-up no recurrences were observed. Our patients presented three secondary effects: persistent and transitory erythema, hypopigmented areas and textural alterations.

Discussion: CO2 vaporization shows some advantages in the treatment of BCC, in patients with numerous and large lesions, it had a highly precise and confined tissue damage.

The treatment offers a virtually bloodless intraoperative field, the postoperative evolution by a minimal postoperative pain and it is easy to repeat the treatment if necessary.

Conclusion: "97% long-term cure rate in patients with BCC treated with the CO2 laser can be achieved." Although surgical excision remains the treatment of choice for basal cell carcinoma, CO2 laser ablation offers many advantages in specific situations."

Keywords: Basal cell carcinoma, Carbon dioxide, laser vaporization.

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Introduction

Basal cell carcinoma (BCC) is the most common malignant epidermal tumour of the skin that's derived from the basal layer of the epidermis. The tumour infiltrates tissues in a three-dimensional fashion (Braun et al 2005) usually with a slow growing, and metastases are extremely rare (Lo et al 1991). Tumor-related morbidity results from local tissue invasion and destruction that might be very important in some areas such as the face.

BCCs vary greatly in appearance and several clinical types had been described including nodular, cystic, superficial, sclerosing, keratotic, and pigmented.

Dermatologists usually perform clinical diagnosis of BCC. Diagnostic accuracy is enhanced by dermoscopy (Felder et al 2006) and confirmed by histopathological examination. Biopsy is also indicated when clinical doubt exists or when the histological subtype of BCC may influence treatment selection and prognosis (Telfer et al 2008).

Histological subtypes are mainly three: nodular, expansive and infiltrative. The most important form is the infiltrative pattern that usually corresponds to a sclerosing clinical pattern because it has the worst prognosis.

An important histopathological characteristic of BCC, like in other tumours, is the neoangiogenesis process, crucial requirement for tumour nutrition and growth, manifested as an increased in the number of blood vessels in the tumour. BCC contains a basket-like capillary plexus interwoven throughout the tumour bed, with many abnormal blood vessels with luminal diameters of 20 μm and more (Van der Geer et al 2009). This vascular component is used as a target in the treatment of BCC with some specific vascular lasers.

Several treatment options for basal cell carcinoma have been described including surgical excision (Walker et al 2006), curettage (Barlow et al 2006) and cautery (Spiller et al 1984), cryotherapy (Mallon et al 1996, Kokoszka 2003), radiotherapy (Al-Othman 2001), photodynamic therapy (Star et al 2006, Chapas et al 2006, Brathen et al 2007), micrographic surgery (Bieley et al 1992, Rowe et al 1989)), ablative laser (Goldman and Wilson 1964, MacGuff 1966, Goldman et al 1968, Adams and Price 1979, Wheeland et al 1987, Fairhurst et al 1992, Grobbelaar et al 1997, Krunic et al 1998, Humpreys et al 1998, Horlock et al 2000, Nouri et al 2002, Campolmi et al 2002, Robinson et al 2003, and Smuckler et al 2008), other laser systems (El-Tonsy et al 2004, Moskalik et al 2009, Allison et al 2003, Campolmi et al 2008, Shah et al 2009, Konnikov et al 2011, Ibrahimi et al 2011), topical treatment with 5-fluorouracil and immunomodulators, such as imiquimod (Kagy and Amonette 2000, Schulze et al 2005) and intralesional agents as interferon (Greenway et al 1986).

The selection of treatment in each patient depends on several factors, such as some definable prognostic factors (Telfer et al 2008), that classify these tumours with low or high risk:

1. Tumour size (increasing size confers higher risk of recurrence)
2. Tumour site (lesions on the central face, especially around the eyes, nose, lips and ears, are at higher risk of recurrence)
3. Definition of clinical margins (poorly defined lesions are at higher risk of recurrence)
4. Histological subtype (certain subtypes confer higher risk of recurrence)
5. Histological features of aggression (perineural and / or perivascular involvement confers higher risk of recurrence)
6. Failure of previous treatment (recurrent lesions are at higher risk of further recurrence)
7. Immunosuppression (possibly confers increased risk of recurrence)

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Surgery and radiotherapy (RT) remains the treatments of choice for the majority of high-risk lesions, nevertheless, with the recent development of more effective topical and nonsurgical therapies, the treatment options for many low-risk lesions are extended (Bath-Hextall et al 2007).
Patient specific factors, like general fitness, coexisting serious medical conditions, and the use of antiplatelet or anticoagulant medication may also influence the choice of treatment. A conservative approach to asymptomatic, low-risk lesions will prevent treatment causing more problems than the lesion itself. Even when dealing with high-risk BCC, aggressive management may be inappropriate for certain patients, especially the very elderly or those in poor general health, when a palliative rather than a curative treatment regimen may be in the best interests of the patient (Telfer et al 2008).

Finally, factors including patient choice, local availability of specialized services, together with the experience and preferences of the involved specialist may influence treatment selection.

In this manner, there are some instances when an easy destructive modality as carbon dioxide laser vaporization may be preferred:

1. In patients with numerous tumours or basal cell carcinomas of large size,

2. In locations with difficult surgical solution, such as inferior lower lip,

3. In patients with basal cell nevus syndrome or immunosuppression who may develop literally dozens to hundreds of tumours,

4. In elderly patients with multiple comorbidities, who take multiple medications which sometimes include anticoagulants, may not be ideal surgical candidates.

Therefore, we present the carbon dioxide laser vaporization as a good alternative treatment of BCC in selected cases and instances.

Method of Treatment

The treatment of BCC with carbon dioxide laser was performed under local anaesthesia of 2% mepivacaine without epinephrine. An adequate informed consent signed by the patient is obtained before performing the treatment. Usually several laser passes were necessary in order to eliminate all tumoral tissues. The number of passes of laser required depends on the type of BCC and the time of evolution.

The superpulsed mode of carbon dioxide laser emits high fluence (energy density) with short pulse time of exposition, providing a good degree of vaporization with minimal surrounding thermal tissue damage.

It was not difficult to delimitate the lesion by experienced doctors. The researchers carried out another pass after the tumoral tissue has been completely removed with a security margin of 5 mm around the suspected tissue. All the cellular detritus might be retired in order to achieve a good healing and if possible, a good cosmetic result. A cure with topical antibiotic ointment until the total resolution of the lesion was prescribed.

In the first pass, the researchers used superpulsed and focused mode (beam diameter 1 mm), with a power density of 5 to 10 W/cm2, to eliminate the superficial layer. They used a focused mode in the first pass because with this mode, the deep penetration of the carbon dioxide laser is higher, the elimination of the tumoral tissue is more effective, and the possibility of recurrence is reduced. After this pass, the partially desiccated tissue was manually removed with a saline-soaked gauze. When the necrotic debris was eliminated, a flaming red surface appears with central bleeding surrounded by a pink peripheral area that corresponds to unaffected skin appears. In the next passes, this area must disappear because it

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represents tissue infiltrated by tumour, according to the neoangiogenic induction produced by BCC. The flaming red surface is the guide to the surgeon. The decision of number of passes required to eliminate the tumour was made on the histologic type and the time of evolution of the lesion. When a superficial basal cell carcinoma was treated, usually only two of three passes were necessary, except in lesions with several years of evolution. When the treatment was performed in nodular BCC, five or six passes were considered to be necessary, so a residual scar after healing was expected.

After laser treatment, topical antibiotic ointment was applied to the wound, and covered with a dressing. A daily wound cleaning of the treated area with mild soap and water, followed by application of antibiotic ointment for a period of 2 weeks, was indicated. A new physician evaluation was made after 6 weeks of treatment.

Results

This paper presents some cases of BCC treated with CO2 laser vaporization in order to illustrate this treatment modality.

In Figure 1, a BCC with Several Years of Evolution on Preauricular Area was Presented. If Surgical Treatment was Performed, a Flap or Graft Should be Necessary. The Researchers Performed a Vaporization of the Lesion with Carbon Dioxide Laser, the Cosmetic Result was Excellent Except by a Slight Erythema of Treated Area, and No Recurrence was Observed after one Year of Follow-Up.

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In Figure 2, A Nodular BCC in the Dorsum of the Nose was Treated with Carbon Dioxide Laser Vaporization. Besides Residual Hypopigmentation, the Cosmetic Result of Carbon Dioxide Laser Treatment was Excellent. Figures 3 and 4 Shows Another Nodular BCC before and after Treatment with Carbon Dioxide Laser Vaporization. In this Case, the Cosmetic Result was Excellent.

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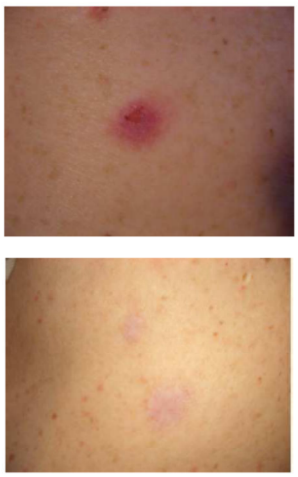
Figure 5 Represents a Frontal Nodular and Pigmented BCC. after Treatment, a Residual Depressed Scar Appeared (Figure 6). In this Case, more than 5 Passes of Treatment were Necessary to Completely Remove the Lesion.



Figures 7 and 8 Shows a Superficial BCC before and after Carbon Dioxide Laser Vaporization. A Hypopigmented Area Appeared after the Treatment but it Tended to Spontaneously Fade over Time. Although Hypopigmentation Completely Resolves with Time, in Some Cases it was Permanent Albeit Improved.

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Discussion

Several laser therapy options for the treatment of basal cell carcinoma have been described including carbon dioxide laser (Adams and Price 1979, Wheeland et al 1987, Fairhurst et al 1992, Grobbelaar et al 1997, Krunic et al 1998, Humpreys et al 1998, Horlock et al 2000, Nouri et al 2002, Campolmi et al 2002, Robinson et al 2003), erbium:YAG laser (Smuckler et al 2008), Nd:YAG laser (El-Tonsy et al 2004, Moskalik et al 2009), pulsed dye laser (Allison et al 2003, Campolmi et al 2008, Shah et al 2009, Konnikov et al 2011), alexandrite laser (Ibrahimi et al 2011) and photodynamic therapy (Star et al 2006, Chapas et al 2006, Brathen et al 2007).

With non-ablative lasers as pulsed dye laser (Allison et al 2003, Campolmi et al 2008, Shah et al 2009, Konnikov et al 2011), Nd:YAG laser (El-Tonsy et al 2004, Moskalik et al 2009) and alexandrite laser (Ibrahimi et al 2011), the treatment of BCC is based on the angiogenic component presented in this tumour. Usually, several sessions of treatment should be performed in order to eliminate the lesion. The elimination of deep lesions was not achieved by these techniques due to the limited depth of penetration of these lasers.

With ablative lasers as carbon dioxide laser (Adams and Price 1979, Wheeland et al 1987, Fairhurst et al 1992, Grobbelaar et al 1997, Krunic et al 1998, Humpreys et al 1998, Horlock et al 2000, Nouri et al 2002, Campolmi et al 2002, Robinson et al 2003) and erbium:YAG laser (Smuckler et al 2008), the angiogenic component being a guide to the surgeon that indicates the elimination of the tumour, the lesion can be vaporized as deep as possible with the increase of the passes number. The ability to vaporize of carbon dioxide laser is higher than erbium:YAG laser and the majority of studies concerning the treatment of BCC with ablative lasers was performed with CO2 laser.

CO2 laser treatments treatments might be used in the treatment of superficial or nodular BCC. In morpheiphorm or infiltrative cases, these destructive techniques were not indicated because they do not allow histopathological study of the lesion margins. It is possible save a minimal amount of tissue previous to laser vaporization for histopathological confirmation of the diagnosis, but the absence of tumour infiltration in the lesion margins cannot be defined.

Carbon dioxide laser treatment of BCC have been largely described several years ago but few studies have been performed and they showed very different results (Adams and Price 1979, Wheeland et al 1987, Humpreys et al 1998, Horlock et al 2000, Campolmi et al 2002).

Adams and Price (1979) reported the use of the carbon dioxide laser to treat BCC in 1979 using a continuous output laser. They treated 25 BCCs with a single non-overlapping pass and performed postoperative histologic analyses with persistence of the tumour on treated skin in 50% of biopsies.

Wheeland et al (1987) treated 370 superficial BCCs with one to three passes of a continuous mode CO2 laser in conjunction with curettage between passes. They followed patients clinically for a period of 6 to 65 months (mean 19.9 months) and found no evidence of recurrence in the treated tumours. Although hypertrophic scarring occurred in 5% of patients, the authors emphasize the advantages of laser treatment, including minimal postoperative pain, rapid healing and superior cosmetic results.

Horlock et al (2000) treated 21 superficial, 28 nodular and 2 infiltrative basal cell carcinomas with multiple passes until clinical resolution was obtained and subsequently treated with two additional passes. Nodular tumours less than 10 mm diameter were completely ablated if they were vaporize to a depth of the lower dermis or deeper, whereas large nodular tumors greater than 10 mm had a high incomplete ablation rate. The study did not include long-term clinical evaluations of the patients.

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Iyer S et al (2004) performed a retrospective review of patients with both nodular and superficial BCCs treated with the UltraPulse CO2 laser. Of the 61 tumours treated, clinical recurrence was observed in two cases (3.2%). Adverse effects included significant hypertrophic scarring in one patient and hypopigmentation in the other.

Destruction of superficial and nodular BCC may be accomplished successfully and safely with the UltraPulse CO2 laser with a cure rate of 97% (Jung et al 2011).

The main secondary effects after CO2 laser treatment were persistent erythema, hypopigmented areas and textural alterations. Persistent erythema appeared in all cases when important areas were treated. It is a vascular temporal reaction induced by the healing tissue. Hypopigmented areas resulted from the elimination of the melanocytes during laser treatment. In the healing process, the pigmentation of the treated area was recovered by the peripheral or follicular melanocytes, but in some cases it was not possible and this secondary effect was permanent. Textural alterations appeared when a deep vaporization was performed and medium or deep dermis was destroyed.

Superficial and nodular BCC are usually the most adequate types to be treated with carbon dioxide laser vaporization, with excellent results. Sclerodermiform or morpheiphorm variants of basal cell carcinoma not been due treated with this modality.

Ultra-Pulse CO2 ablation confers the following advantages in:

1. In patients with numerous and large lesions, CO2 laser had minimal postoperative morbidity and shorter postoperative healing time,

2. The highly precise and confined tissue damage and therefore potentially better cosmesis,

3. The treatment therefore offers a virtually bloodless intraoperative field,

4. The postoperative evolution by a minimal postoperative pain,

5. The follow-up it is easy to repeat the treatment if it is necessary.

The main limitations of carbon dioxide laser vaporization of basal cell carcinomas are the following:

1. The disponibility and the price of the treatment,

2. The absence of histopathological control of the treatment,

3. The experience of the surgeon who performs the treatment,

4. The presence of secondary effects, essentially scarring and hypopigmentation. These secondary effects are more frequent in nodular cases of basal cell carcinoma because of the fact that more deep treatment is necessary to clear the tumour.

At this moment the evidence level is: Carbon dioxide laser ablation may be effective in the treatment of low-risk BCC. (Strength of recommendation C, quality of evidence III). Nevertheless, the results show that carbon dioxide laser might be an effective treatment with low recurrences. More studies are necessary in order to increase the evidence level.

Conclusion

"97% long-term cure rate in patients with basal carcinoma treated with the UltraPulse CO2 laser can be achieved. Although surgical excision remains the treatment of choice for basal cell carcinoma, CO2 laser ablation offers many advantages in specific situations as previously discussed."

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Comentario:

Los carcinomas basocelulares son la forma más frecuente de neoplasia maligna cutánea en la clínica. Sin embargo a pesar de ser una lesión maligna, su capacidad invasiva es fundamentalmente local y el desarrollo de metástasis en estas lesiones es excepcional. Por ello en los últimos años se han desarrollado técnicas alternativas a la cirugía convencional que de forma general sigue siendo la técnica de elección. El tratamiento de estas lesiones con láser de CO_2 podría estar indicado en pacientes con numerosas lesiones o cuando éstas son de gran tamaño, en localizaciones de difícil solución quirúrgica como el labio inferior, en pacientes con síndrome de Gorlin o inmunosuprimidos que pueden desarrollar desde decenas a cientos de tumores, y en pacientes con múltiples comorbilidades que suelen precisar mucha mediación como tratamientos anticoagulantes y que por tanto son malos candidatos a la cirugía. A pesar de ello el trabajo solo se refiere a casos de carcinoma basocelular de tipo superficial o nodular y en ningún caso para aquellos de patrón morfeiforme en los que no estaría indicado.

2.2. OTRAS ACTIVIDADES RELACIONADAS CON EL LÁSER DE CO2

1. COMUNICACIONES EN CURSOS Y CONGRESOS

1. Del Pozo J, Martínez W, Verea M, Almagro M, Pazos JM, García-Silva J, Peña C, Fonseca E. Nevus ecrino ductal poroqueratósico y poroqueratosis de Mibelli. Tratamiento con láser de CO2. Comunicación libre a la XI Reunión del **Grupo Español de Cirugía Dermatológica, Oncología Cutánea y láser**. Santiago de Compostela, 13-14 noviembre 1998.
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5. Del Pozo J, Ferré A, San Román B, Rodríguez Lozano J, Peña Penabad C, Pérez M, Fonseca E. Eritroplasia de Queyrat. Tratamiento con láser de CO2. Comunicación Oral a la XXXII **Reunión de la Sección Gallega de la AEDV**. Santiago de Compostela, 24 de mayo de 2003.
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8. Del Pozo J, Cuerda E, Piñeyro F, Fernández-Torres R, Pérez-Varela L and Eduardo Fonseca. CARBON DIOXIDE LASER VAPORIZATION 0F RINOPHYMA. A GOOD OPTION TO CORRECT NASAL DEFORMITIES, BUT NO TO PREVENT THE SUBYACENT ROSACEA. **European Society of Laser Dermatology**. Annual Scientific Meeting 18th EADV CONGRESS BERLIN 2009 7 October 2009 09:30 -17:30.
9. J del Pozo, MM Bonet, JL Felgueiras, V Nespereira, J García Silva, M Almagro. Queratoacantomas de difícil acceso quirúrgico: tratamiento con láser de dióxido de carbono. **Comunicación Oral a la XLII Reunión de la Sección Gallega de la AEDV**. Lugo, 4 de Mayo de 2013.
10. Bonet MM, Del Pozo J, Felgueiras J, Almagro M. Sarcoma de Kaposi clásico. Vaporización con láser de CO2 en 6 casos con afectación cutánea exclusiva. Comunicación oral. (5 min) **XXVI Reunión del Grupo Español de Dermatología Quirúrgica, Láser y Oncología Cutánea de la AEDV.** Pamplona 18, 19 Pctubre 2013.

2. PONENCIAS EN CURSOS

1. **Segundo Symposium de Dermatología Hospital Juan Canalejo** (Dermatología Pediátrica). A Coruña 28, 29 Abril y 1 Mayo de 1999. TRATAMIENTO CON LASER DE LESIONES VASCULARES Y PIGMENTARIAS (20 min).
2. **Congreso de Enfermería Dermatológica.** TRATAMIENTO CON LÁSER EN DERMATOLOGÍA Y DERMOCOSMÉTICA. La Coruña 31 de Mayo, 1,2 Junio de 2002. (20 minutos).
3. **Curso precongreso XVIII Congreso Nacional de la Sociedad Española de Cirugía oral y Maxilofacial**. EL LÁSER DE CO_2 EN LAS LESIONES CUTÁNEAS FACIALES. La Coruña, 9-13 mayo 2005. (20 min).
4. **XX Reunión Grupo de Dermatología quirúrgica, láser y oncología cutánea de la AEDV**. OTRAS INDICACIONES DE LÁSER DE CO_2. León, 16,17 noviembre 2007. (10 min).
5. **Reunión Nacional de Neurofibromatosis.** EL PAPEL DEL LÁSER EN LA NEUROFIBROMATOSIS. Madrid, 1 Marzo 2008 (15 minutos).
6. **VII Curso Internacional de Avances en Cirugía Dermatológica y Melanoma**. NEVUS EPIDÉRMICOS TRATADOS CON LÁSER DE CO_2. Pamplona, 6-8 Marzo 2008. (15 min).
7. **I Curso Teórico Práctico de láser de CO2**. BASES TEÓRICAS DEL LÁSER DE CO_2. A Coruña, 22-23 Enero 2010 (20 min).
8. **I Curso Teórico Práctico de láser de CO2**. EL LÁSER DE CO_2 EN LAS ANOMALÍAS VASCULARES. A Coruña, 22-23 Enero 2010 (20 min).
9. **II Curso de Láser CO2 aplicado en Dermatología, Cirugía Plástica y Medicina Estética**. INDICACIONES Y PROTOCOLOS DE TRATAMIENTO CON LÁSER DE CO_2 EN DERMATOLOGÍA. Hospital Beata María Ana, Madrid, 12 Febrero 2010 (60 min).
10. **III Curso de Láser CO_2 aplicado en Dermatología, Cirugía Plástica y Medicina Estética**. INDICACIONES Y PROTOCOLOS DE TRATAMIENTO CON LÁSER DE CO_2 EN DERMATOLOGÍA. Clínica. Isabel Moreno, Valencia, 17 abril 2010 (60 min).

11. **Curso de Iniciación a la Rinoplastia.** TRATAMIENTO CON LÁSER DE CO_2 DEL RINOFIMA. TEORÍA Y CASOS PRÁCTICOS**.** Servicio de ORL. Hospital del Henares, Madrid, 11-13 mayo 2011.
12. **XXXIX Congreso Nacional de la AEDV** Simposio: **Otras utilidades de nuestros láseres**: Moderador. EL LÁSER DE CO_2 EN PATOLOGÍA TUMORAL MALIGNA. CASOS SELECCIONADOS. (15 min). 8-11 Junio Santiago de Compostela.
13. **XV Congreso Nacional de la AEDV**. VALORACIÓN DE RESULTADOS DEL LÁSER ABLATIVO EN EL PRECÁNCER CUTÁNEO. Ponencia dentro del Symposium tratamiento actual del precáncer cutáneo. Viernes 8 junio 2012, 20 min.
14. **XXV Reunión del GECIDOC de la AEDV**. EL LÁSER DE CO_2 COMO HERRAMIENTA QUIRÚRGICA. Ponencia oral. Granada 30 noviembre y 1 de diciembre de 2012.
15. **Máster Avanzado es Técnicas Estéticas y láser**. LÁSER QUIRÚRGICO. 17º MÓDULO - LÁSER IV. Terapia fotodinámica y láser quirúrgico. CEU, Universidad Cardenal Herrera, Fundación Hospitales Niza, Valencia. 11,12 de Enero 2013 Cláse teórica y práctica. 6 horas.
16. **12 Wordl Congress in Pediatric Dermatology**. ABLATIVE LASER IN CHILDREN. Ponencia oral. Madrid, 25-27 Septiembre 2013. (20 min).
17. **XXVI Reunión del Grupo Español de Dermatología Quirúrgica, Láser y Oncología Cutánea de la AEDV.** NOVEDADES EN LÁSER DE CO_2. Ponencia oral. Pamplona, 18,19 Octubre 2013. (20 min).
18. **XXVI Reunión del Grupo Español de Dermatología Quirúrgica, Láser y Oncología Cutánea de la AEDV.** BERMELLECTOMÍA QUIRÚRGICA CON LÁSER DE CO_2. Video en la sección de videos quirúrgicos. Pamplona, 18, 19 Octubre 2013. (10 min).
19. **II Máster Avanzado es Técnicas Estéticas y láser**. LÁSER QUIRÚRGICO. 17º MÓDULO - LÁSER IV. Terapia fotodinámica y láser quirúrgico. CEU, Universidad Cardenal Herrera, Fundación Hospitales Niza, Valencia. 17,18 de Mayo 2014. Clase teórica y práctica. 6 horas.

20. **XLII Congreso Nacional de la AEDV. Mas Palomas 4-7 junio 2014. (15 min).** APLICACIONES PRÁCTICAS DE LAS FUENTES DE LUZ EN CIRUGÍA Y TRATAMIENTOS ABLATIVOS. Comunicación oral en el Symposium Aplicaciones prácticas de láser, IPL y TFD. 15 min.
21. **Máster Avanzado es Técnicas Estéticas y láser**. LÁSER QUIRÚRGICO. 17º MÓDULO - LÁSER IV. Terapia fotodinámica y láser quirúrgico. CEU, Universidad Cardenal Herrera, Fundación Hospitales Niza, Valencia. 8,9 de mayo 2015. Cláse teórica y práctica, 6 horas.
22. **XLIII Congreso Nacional de la AEDV**. En: Seminario, Complicaciones en Dermatología Estética. LASER FRACCIONAL. CONSEJOS PARA EVITAR COMPLICACIONES. Sevilla, 16 de mayo de 2015. 6 minutos.

3. ORGANIZACIÓN DE CURSOS

1. I curso Teórico Práctico de láser de CO2.

FECHA: 22 y 23 Enero 2010

LUGAR: Hospital Abente y Lago. Paseo de Sir John Moore 1. A Coruña.

2. I Curso de básico de láser de CO2 para ginecólogos. Centro Experimental, INIBIC, CHU A Coruña. 11 Febrero 2015 (4 horas).

CONCLUSIONES

1. Nuestra búsqueda bibliográfica demuestra que las indicaciones de láser de CO_2 han crecido con los años de forma exponencial

2. Nuestros resultados aportan nuevas indicaciones de tratamiento con láser de CO_2 como son el nevus ecrino ductal porqueratósico, la hipertrofia labial que acompaña a las manchas en Vino de Oporto, el angioqueratoma circunscrito neviforme, el tratamiento paliativo del xantogranuloma necrobiótico de los párpados, el tratamiento paliativo de las malformaciones venosas localizadas en la cavidad oral, el tratamiento paliativo de la mucinosis nodular, los hemangiomas arteriovenosos asociados a insuficiencia hepática crónica y el tratamiento combinado de láser de CO_2 y presión lateral de los quistes vellosos eruptivos.

3. El láser de CO_2 continúa siendo el tratamiento de elección en los hidrocistomas apocrinos y en las tuberosidades asociadas a las manchas en Vino de Oporto, y continúa siendo una opción importante en los lagos venosos, en la eritroplasia de Queyrat con afectación uretral, la enfermedad de Bowen, los diferentes tipos de Milia y en los carcinomas basocelulares de tipo superficial y nodular.

4. Nuestras series aportan que el factor pronóstico más importante para el tratamiento de los nevus epidérmicos con el láser de CO_2 es el grosor que presenten las lesiones en el momento del tratamiento

5. Al hacer un seguimiento medio de 29,4 meses de los pacientes tratados de queilitis actínica, vemos que el desarrollo de carcinoma epidermoide de labio inferior tras el tratamiento con láser de CO_2 es de un 4,6% de los casos.

6. El desarrollo de satelitosis tras un tratamiento de un granuloma piogénico con láser de CO_2, es una complicación no descrita de estos sistemas de láser.

7. El láser de CO_2 tiene un importante potencial quirúrgico y es una herramienta de gran utilidad en un Servicio de Dermatología de un Centro público. Para los que habitualmente utilizamos el láser de CO_2, se convierte en una herramienta de trabajo prácticamente imprescindible.

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