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# Editorial Board

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EDITORIAL

# Excision margins for primary melanomas: A controversial issue

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Surgical excision is the principal treatment for primary cutaneous melanoma[1]. The selection of optimal excision margins is crucial to maximize outcomes and minimize morbidities[1–5]. Insufficient resection may lead residual tumor cells to disease recurrences[1,6]. However, unnecessarily tissue excisions might cause greater morbidities, along with bad functional and cosmetic results[1–3]. The determination of melanoma excision margins has been an important issue since the earliest descriptions of melanoma[4]. In 1907, Handley stated that the excision of cutaneous melanoma should include a 5–10 cm-wide excision margin[7]. The doctrine of extensive resection margins for melanomas was not challenged until the 1970s, when the studies showed that narrower excision margins (3–5 cm) presented no difference in melanomas survival[8].

Randomized clinical trial conducted in 1991 by the WHO Melanoma program on 3-cm and 1-cm excision margins showed 1 cm as a safe excision margin for primary cutaneous melanomas not thicker than 1 mm[9]. Another study on 2-cm versus 1-cm excision margins for patients with 1–2 mm melanomas showed that a 1-cm resection margin was associated with an increase in local recurrence, but with a similar overall survival[5].

In order to narrow the resection margins for cutaneous melanoma thicker than 2-mm treatment, a randomized clinical trial in 2004 compared 3-cm and 1-cm resection margins, where a 1-cm excision margin was correlated with a significantly greater risk of regional recurrences that did not impact overall survival[3]. However, another randomized controlled trial on 4-cm versus 2-cm resection margins suggested 2 cm as a sufficient and safe resection margin for cutaneous melanomas thicker than 2 mm[2]. Furthermore, a recent study comparing 3-cm versus 1-cm excision margins for primary cutaneous melanomas thicker than 2 mm declared that a 1-cm excision margin is inadequate for such cutaneous melanomas on the trunk and limbs[10]. Nevertheless, another cohort study on melanomas thicker than 2 mm, which underwent tumor excision with either 2-cm or 1-cm safety margin, could not detect any statistically significant differences in melanoma outcomes[1].

In spite of existing controversies in the various guidelines, a summary of guidelines regarding margin size based on tumor depth is provided in **Table 1**. All in all, these controversies cause heterogeneity among surgeons regarding width of excision margins for cutaneous melanomas. As a result, further multicenter clinical trials are demanded to assess the efficacy of these various guidelines in the reduction of recurrences and improvement of survival while minimizing the morbidities of treatment[11].

**Table 1.** Recommended clinical margin for excision of primary melanomas*

| Breslow's depth | Recommended excision margin (cm)# |
|---|---|
| *In situ* | 0.5–1.0 |
| Thin melanoma (less than 1-mm thick) | 1.0 |
| Intermediate melanoma (1–4-mm thick) | 1.0–2.0 |
| Thick melanoma (more than 4-mm thick) | 2.0 |

*Table summarizes current existing guidelines
#Recommended excision margins might vary according to different guidelines

## Conflict of interest

The author declares no potential conflict of interest with respect to the research, authorship and/or publication of this article.

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SHORT COMMUNICATION

# The story behind cryosurgery

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***Keywords*:** Cryosurgery; history; cryogens

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## Introduction

Cryosurgery is used to describe the controlled destruction of tissue by freezing. Today, cryosurgery is widely practiced in medicine, so it would be interesting to know how the story of cryosurgery began. Here are some short stories behind the discovery and evolution of cryosurgery.

### The earliest therapeutic uses of cold

The first use of cold as a means of physical treatment dates back to the age of the ancient Egyptians, as described by an Egyptian papyrus document. As early as 2500 B.C., the ancient Egyptians identified the analgesic and anti-inflammatory effects of cold. They noted that cold application soothes sites of trauma, minimizes pain and reduces inflammation.

Later, Hippocrates (460–370 B.C.), an ancient Greek physician commonly referred to as the father of medicine, found that local cold exposure has the ability to reduce swelling, bleeding and pain.

Also, tissue cooling by surface application of snow and ice was used to produce anesthesia before the amputation of soldiers in Napoleon's Grand Army[1].

### Modern cryosurgery begins

The "modern" cryosurgery is relatively of young age and its birth is closely intertwined with developments in low temperature physics, engineering, and instrumentation.

It is only during the last few centuries that cold treatment has evolved from generalized application to specific, focal destruction of tissue in today's cryosurgery.

English physician James Arnott, "the father of modern cryosurgery", was the first person to use extreme cold locally for the destruction of tissue. He used a mixture of salt and crushed ice for the palliation of tumors, with resultant reduction of pain and local hemorrhage. Arnott won the prize medal at the Great Exhibition of London of 1851 for his cold equipment that allowed reducing tissue temperature to -20 ºC[2,3].

### End of the 19th century: The race for liquefied gases begins

In the late 1800s, along with tremendous scientific advances, there was an interest in liquefying gases. Oxygen was first liquefied in small quantities in 1877. Over the next few years, all of the so-called "permanent gases" (oxygen, nitrogen and hydrogen) were liquefied. In 1895–1896, commercial liquefaction of air was established by Carl Von Linde. The term "cryogen" came into use during those years[4].

### The day liquid air became available to physicians

Campbell White in 1899 was the first one to use liquefied gas in medicine. He used liquid air (-195 °C) for the treatment of diverse skin diseases. White used a glass flask that acted as a liquid air sprayer, which became the first handheld cryosurgery device. In 1907, Whitehouse used sprayed liquid air to treat a wide variety of skin conditions that ranged from epitheliomas to lupus erythematosus to vascular nevi[5].

### Liquid oxygen quits the race

Because of its similar properties to liquid air, liquid oxygen (-182.9 °C) was used as a cryogenic agent in a similar way as liquid air, particularly during the 1920s and 1930s. However, liquid oxygen soon became obsolete as a cryogenic agent because of safety considerations related to fire[6].

### Carbon dioxide snow gains interest

In parallel to the investigation on the medical use of liquid air (1907), the use of carbon dioxide snow (-78.5 °C) was

favored by William A. Pusey[7]. After 1910, liquid air was seldom used, and solid $CO_2$ became the most popular cryogenic agent because it was cheaper and more readily available than liquid air. The carbon dioxide was held in liquefied state by pressure (about 800 psi). When released into air, the decrease in pressure causes freezing and formation of a white snow that was then compressed into various shapes suitable for different treatments. John F. Hall-Edwards first described his carbon dioxide collector and compressor in 1911[4].

## Liquid nitrogen comes ahead

Liquid nitrogen (-196 °C) became commercially available and was introduced into clinical practice in 1950 by Herman V. Allington, who described the technique of using cotton swabs dipped in liquid nitrogen for the treatment of a variety of non-neoplastic skin diseases[8].

## Application and storage of refrigerants

Generally, refrigerants were applied either by direct painting onto the skin or by means of a dipped cotton wool applicator into liquid air. However, the depth of freezing achieved was inadequate for the treatment of tumors. In 1907, Whitehouse designed a spray bottle of liquid air which provided much lower minimum temperatures[5].

The physical chemist James Dewar solved the problems of transportation and storage of liquid gas. He invented a flask with two silvered walls separated by an evacuated air chamber, thus insulating the inside from the outside of the flask. Even today the containers used to keep liquid nitrogen have much of the same design and are still called "Dewar flasks".

Through the collaboration between a physician, Irving Cooper, and an engineer, Arnold Lee, the first cryosurgical probe was built in 1961, which became the prototype for the subsequent liquid nitrogen cryosurgical probe. In 1963, Cooper described the use of liquid nitrogen probe for brain surgery. This new piece of equipment opened up the way for many new inventions in the area of cryosurgery[9].

## Handheld cryosurgical apparatus

A more widespread use of cryosurgery in medical practice came with the design of handheld devices that can be easily used in the physician's office. Various cryosurgical apparatuses were developed using liquid nitrogen, nitrous oxide, carbon dioxide and other cryogens. In 1965, Dr. Douglas Torre developed a liquid nitrogen spray device that could also be equipped with cryoprobe tips of different sizes and shapes[10,11]. Finally, in 1967, Dr. Setrag Zacarian designed a handheld cryosurgical device using liquid nitrogen. Zacarian brought the term "cryosurgery" into use for the first time. A series of different designs followed, which gave rise to several models of handheld cryosurgical units[12,13].

## Cryosurgical equipment and techniques nowadays

Liquid nitrogen (-196 °C) is the most popular cryogen in current use; it is the coldest and can destroy a large volume of tissue required for treatment of malignant lesions. Handheld devices using liquid nitrogen are the most commonly used units nowadays. Basically, they are small containers with storage capacity of 250–500 mL, most commonly used as a spray, and less often as a closed system with cryoprobes of different sizes and shapes (contact therapy)[13,14]. A unique technique, "intralesional cryosurgery", was later introduced in 1993 by Egyptian dermatologist Dr. Ahmed Hani Weshahy, who used needles called "Weshahy cryoneedles" to deeply freeze lesion irrespective of lesion volume, while cells at the surface, particularly melanocytes, are much less affected, hence minimizing surface reactions[15].

## The story of cryosurgery has never reached an end

After nearly two centuries, cryosurgery is gaining more interest in several fields of medicine, including dermatology. Over the years, cryosurgery has become a well-established treatment modality for a wide variety of benign skin lesions and is also highly effective treatment for premalignant lesions as well as for selected cases of malignant skin lesions. Dermatologic Cryosurgery has become widely applicable and has now reached a unique status, with new indications and novel uses still being described.

# Conflict of interest

The author declares no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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SHORT COMMUNICATION

# IC plasty for reconstruction of axillary defect

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***Keywords*:** Axillary hidradenitis suppurativa; axillary defect; IC plasty

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## Introduction

Reconstruction of axillary defects following surgery or trauma has always been a significant challenge for plastic surgeons. A variety of reconstruction options are available, including directed cicatrization, skin grafts and local flaps, but all of these procedures may allow skin contracture and leave unsightly scars[1,2]. Free flap is a useful option but it requires an experienced surgical staff, expensive instruments and plenty of time.

IC plasty is a simple and reliable technique using the adjacent healthy skin for coverage of axillary defects. It was first described in 1960 by Colson *et al.*[3], and then by Baux *et al.*[4] in 1985 in the treatment of post-burn axillary contractures. This technique is a derivative of Z plasty, in which only one flap is transposed. The defect constitutes the I, while the C is drawn on intact skin (*e.g.* brachial or axillary region) after the determination of a neutral point not moving during the abduction of shoulder (point of rotation of the flap) (**Figure 1**). The C flap is elevated from the deep healthy skin, and transferred to the recipient site for covering axillary skin defect. The donor site is closed with a suction drain left in place[5].

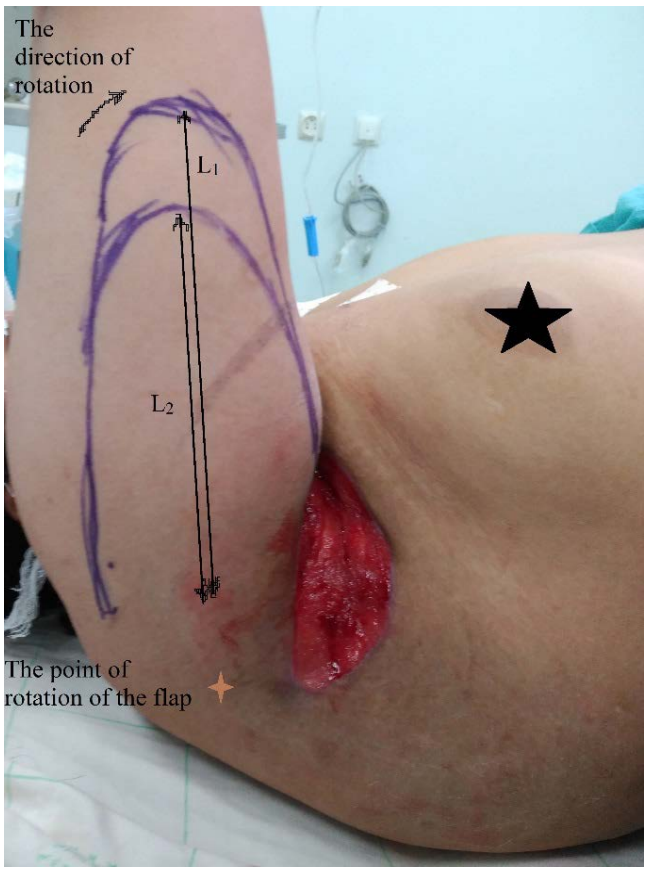


**Figure 1.** IC plasty design. L: The length of the flap depending on diameter of defect

## Case presentation

We report the case of a 17-year-old, right handed, without past medical history, presented with a severe, medically intractable, right axillary hidradenitis suppurativa for two years. Surgical removal of all the diseased skin left a large defect (**Figure 2**). Reconstruction was performed under general anesthesia with IC cutaneous brachial flap; post-operative courses were uneventful (**Figure 3**). The patient

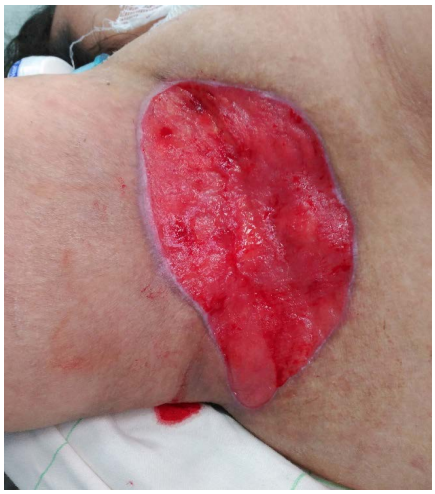

**Figure 2.** Right axillary defect following surgical excision of hidradenitis suppurativa

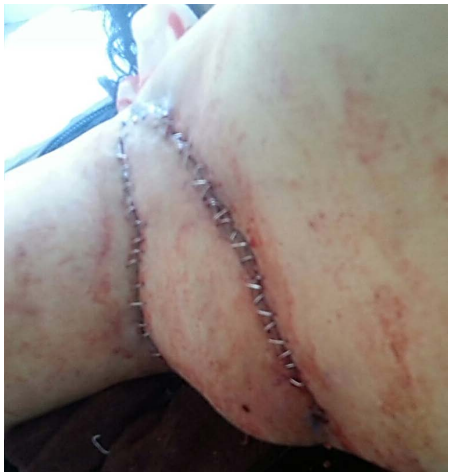

**Figure 3.** Immediate post-operative appearance

was followed-up clinically for three months; her shoulder mobility was perfectly preserved with a normal abduction.

IC plasty is a valuable and a versatile plasty, and its applicability can be extended to the other major joint defects (*e.g.* inguinal and popliteal fossae). It gives a successful functional outcome (a large range of joint mobility) if it is designed well and performed properly.

## Conflict of interest

The authors declare no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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CASE REPORT

# Granuloma due to sweet almond oil injection: Difficulties of diagnosis and treatment

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***Abstract*:** Foreign body granuloma reaction is a tissue response to some extraneous materials which incite a characteristic pattern of granulomatous reaction. Several cases of foreign body granulomas on the face have been reported, especially after the injection of dermal fillers. Oleoma or paraffinoma is defined as a foreign body granuloma resulting from the injection of oily substances into the skin or subcutaneous tissue. We report a case of an adult woman who had developed foreign body granulomas due to a self-injection of sweet almond oil into the glabella and periorbital area. The diagnosis was based on a thorough interrogation, clinical features and histopathological findings. Treatment of foreign body granuloma is challenging. At first, oral prednisone was initiated with the improvement of the inflammatory signs and reduction of the lesions' dimension, but recurrence of the lesions occurred when the dose was decreased. After research of literature, a low-dose minocycline regime was prescribed for its beneficial effects in granulomatous diseases, with encouraging results.

***Keywords*:** Silicone oils; foreign-body granuloma; minocycline; treatment; paraffinoma; granulomatous reaction

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## Introduction

Foreign body granuloma (FBG) reaction is a tissue response to some extraneous materials which incite a characteristic pattern of granulomatous reaction[1]. Several cases of FBG on the face have been reported, especially after the injection of dermal fillers. However, we report a case of an adult woman who has developed FBG due to a self-injection of sweet almond oil into the glabella and periorbital area. The diagnosis was based on a thorough interrogation, clinical features and histopathological findings.

Treatment of FBG is difficult and various regimes have been used with a high rate of failure[2]. Based on previous reports on FBG treated with minocycline for its beneficial effects in granulomatous diseases, we opted for its use as the main therapy in this case[3,4].

## Case report

A 51-year-old woman came to our department complaining of facial swelling, which was most pronounced around the left eye and the glabellar area. Erythematous, poorly circumscribed nodules were noted at those locations. They were not attached to the deeper tissues and presented an overlying erythema (**Figures 1A** and **1B**). According to the patient, the lesions appeared ten months prior as small, non-tender nodules that grew gradually over that period.

Sarcoidosis and cutaneous lymphoma were considered as possible diagnoses. The patient was submitted for skin biopsy, which showed granulomatous dermatitis with numerous histiocytes. The idea of infectious diseases as a cause was discarded after use of special stainings (Ziehl-Neelsen, PAS and Grocott).

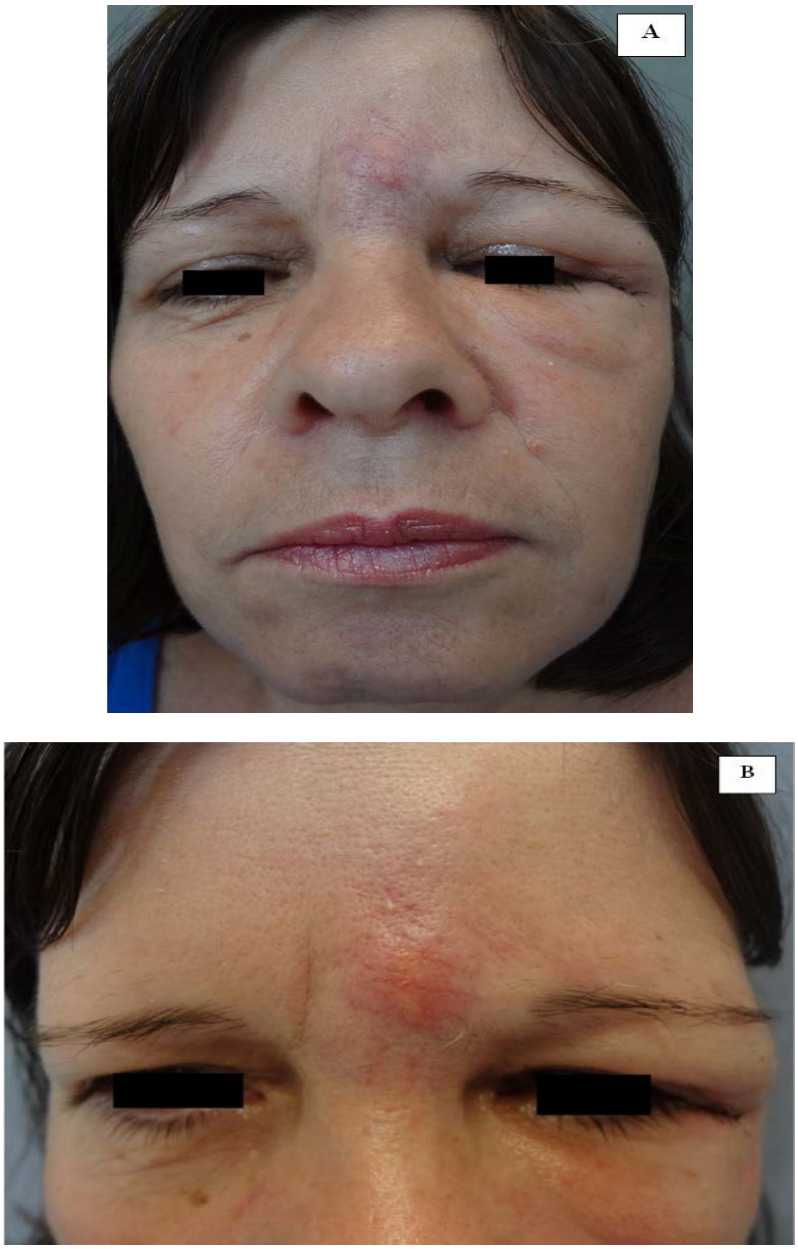


**Figure 1.** (A) and (B): Swelling and erythematous poorly circumscribed nodules around the left eye and the glabellar area

A new hypothesis of periorbital xanthogranuloma was suggested. However, immunohistochemistry did not confirm this diagnosis and excluded histiocytosis. The second biopsy revealed histiocytes multinucleate foreign body type whose cytoplasm displayed many vacuoles of sizes and different locations, without compromising perifollicular region (**Figure 2**).

After denying it many times, the patient finally admitted that she had self-injected sweet almond oil for aesthetic purposes. She claimed to have used her diabetic son's new syringe for the procedure.

A diagnosis of FBG was established and oral prednisone (40 mg per day) was initiated and maintained for four weeks. Improvements of the inflammatory signs and reduction of the lesions' dimension were noted, but a recurrence occurred when the dose was decreased.

After literature research, a low-dose minocycline regime (100 mg once daily) was prescribed. Within four weeks of treatment, the swelling and erythema improved substantially. Minocycline was continued and 10 months after the initiation of the drug, the patient's condition was still improving, showing an excellent regression of induration and erythema (**Figure 3**). Side effects, such as pigmentation, did not occur.

## Discussion

FBG reaction is a tissue response to some extraneous materials that incite a characteristic pattern of granulomatous reaction. There are several factors that may influence on clinical presentation regarding the injection of the material, such as mode of entry, tissue reaction to it and infection [1,5] .

Injection of oily materials can lead to the formation of FBG, also called as oleoma or paraffinoma. Several substances have been previously described as possible agents of oleoma: paraffin, petrolatum, vegetable oils, liquid petrolatum, hydrous wool fat (lanolin), sesame oil and beeswax[6]. We describe a case of oleoma due to injection of sweet almond oil, a vegetable oil commercialized in regular pharmacies.

Histopathologically, FBGs may present as many different forms. Paraffinoma due to injection of oils results in a "Swiss cheese" appearance of holes containing lipids[6]. There is variable fibrosis and granulomatous inflammation. Despite highly prevalent in granuloma, the presence of giant cells is not pathognomonic of the oleoma. Giant cells are the result of fusion of macrophages and can be found in others diseases[5]. This can be similar to the reactions after the silicone implant, but can be differentiated based upon special fat staining, which is positive in paraffinoma.

Pathogenesis of FBG is still unknown. The injection of large volumes as a causative reason has been discussed but is still lacking statistical proof. FBG rate of almost all fillers decreased after products improvement over the years, showing the relationship between chemical and particulate impurities present in such products[5].

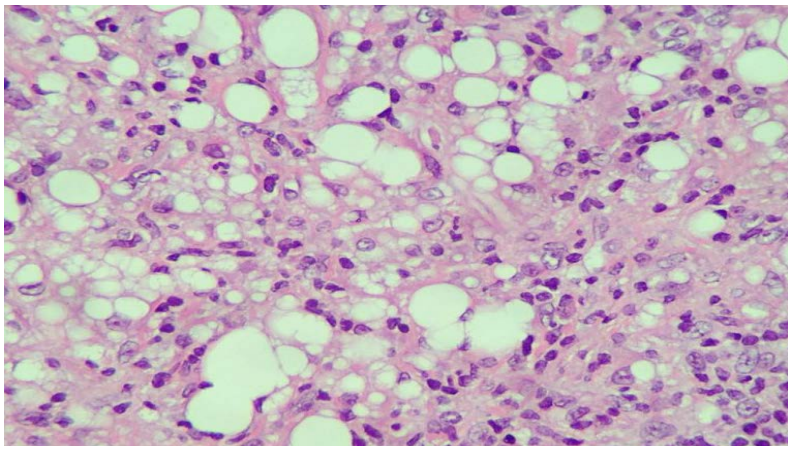

**Figure 2.** In histological section, there is histiocytic reaction with diffuse lymphocytic infiltrate. There are histiocytes multinucleate foreign body type whose cytoplasm displays many vacuoles of sizes and different locations.

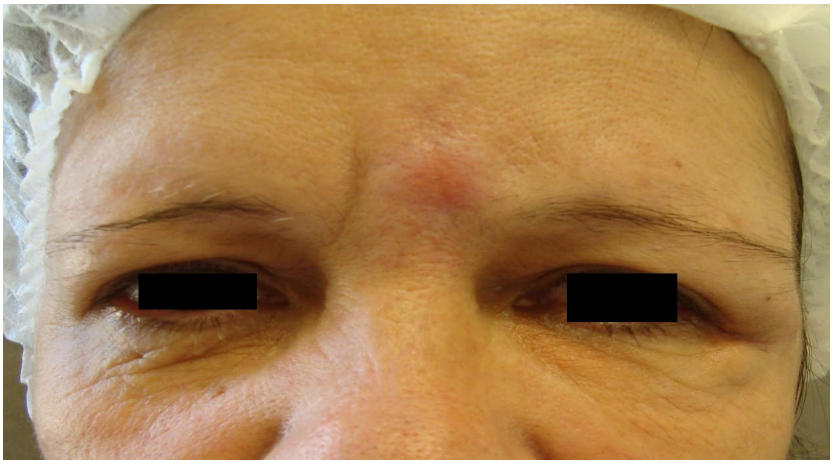

**Figure 3.** Improvement of the swelling and inflammatory characteristics of the nodules after the use of minocycline


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Treatment of FBG is difficult and various regimes have been used. Surgical excision has been suggested; however, total removal may not be possible or may require extensive debridement[2]. Injections of steroids or treatment with oral steroids have beneficial effects on the treatment of granulomatous diseases; however, a relapse is often seen when the dose is tapered[3]. Retinoids, pentoxifylline and allopurinol have been used in some sporadic cases of FBGs, with variable results[2].

In previous reports describing minocycline in the treatment of silicone granuloma, it was administered in a higher dose (100 mg twice daily) either as monotherapy or in combination with oral prednisone. The rationale for the administration of minocycline in granulomatous tissue reactions is its anti-inflammatory, immunomodulatory, and anti-granulomatous effect[3,4]. Tetracycline, doxycycline and minocycline have anti-inflammatory properties secondary to their capacity in decrease production of neutrophil chemotactic cytokines. Minocyclines suppress T-cells, resulting in a dose-dependent inhibition of T-cell proliferation and a reduction in the production of IL-2, IFN-α and TNF-α. They suppress α-amylase and phospholipase $A_2$, which is important to activate inflammatory mediators as prostaglandins[7].

Our data highlights the prolonged course of the disease, which sometimes necessitates treatment of long duration. This case supports a role for minocycline in the management of severe granulomas induced by foreign substance use, when surgical excision is not possible[3]. In our opinion, minocycline monotherapy represents a useful treatment option for FBGs.

## Conflict of interest

The authors declare no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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CASE REPORT

# Laugier-Hunziker syndrome: A diagnostic dilemma?

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***Abstract*:** Laugier-Hunziker syndrome (LHS) is an idiopathic hypermelanotic condition that displays a characteristic pattern of mucosal, acral and nail pigmentation. The etiology is unknown, while its benign nature has been repeatedly highlighted. Owing to close resemblance to more serious disorders, it is necessary that the diagnostic features are understood; and thereby we report two sporadic cases of LHS in different age groups displaying varied presentations with identifiable features.

***Keywords*:** Laugier-Hunziker syndrome; Hutchinson's sign

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## Introduction

Laugier-Hunziker syndrome (LHS) is an idiopathic hypermelanotic condition that displays characteristic mucosal, acral and nail pigmentation[1]. The etiology is unknown, while its benign nature has been repeatedly highlighted[1-3]. Previous literatures have outlined a total of 180 cases merely as case reports; however, being a diagnosis of exclusion, unrecognized cases seem likely[4]. However, owing to its close resemblance to more serious disorders, it is necessary that a correct diagnosis be made. Herewith we report sporadic cases of LHS in different age groups with varied presentation.

## Case reports

### Case 1

A 14-year-old girl presented with asymptomatic lip pigmentation since 6 years of age. She also noted darkening of nails since last 4 months. There was no history of drug intake, similar family history or systemic features. Examination revealed multiple hyperpigmented macules over lips, buccal mucosa, tongue and dorsa of hands with pigmentary bands and homogenous pigmentation of fingernails were discerned as seen in **Figures 1 A–F**. Blood pressure, blood chemistry, serology (HIV) and thyroid function tests were within normal limits. Ultrasonography showed normal findings. The patient was counseled and reassured of the benign course.

### Case 2

A 55-year-old man presented with asymptomatic dark macules over the feet since 2 years, hands for 6 months, and nail discoloration since 2 years. Initial small pinpoint lesions progressed up to 1 cm in size. There was no history of tobacco addiction, drug intake, similar lesions in family members or systemic complaints. On examination, multiple well-defined light-brown-to-black macules up to 1 cm in size were observed over labial mucosa, buccal mucosa, hard palate, distal phalanges of hands, soles, and prepuce of penis, with varied patterns of nail pigmentation, as noted in **Figures 2 A–E**. A few macules involved the proximal and lateral nail folds exhibiting a pseudo-Hutchinson's sign. An evaluation of vitals, blood chemistry, serology (HIV), ultrasound and upper gastrointestinal endoscopy revealed normal findings. Despite relief over its benign nature, the extensive evaluation and lack of affordable therapeutic options were not comforting to the patient.

## Discussion

A classical description by Laugier and Hunziker in the year

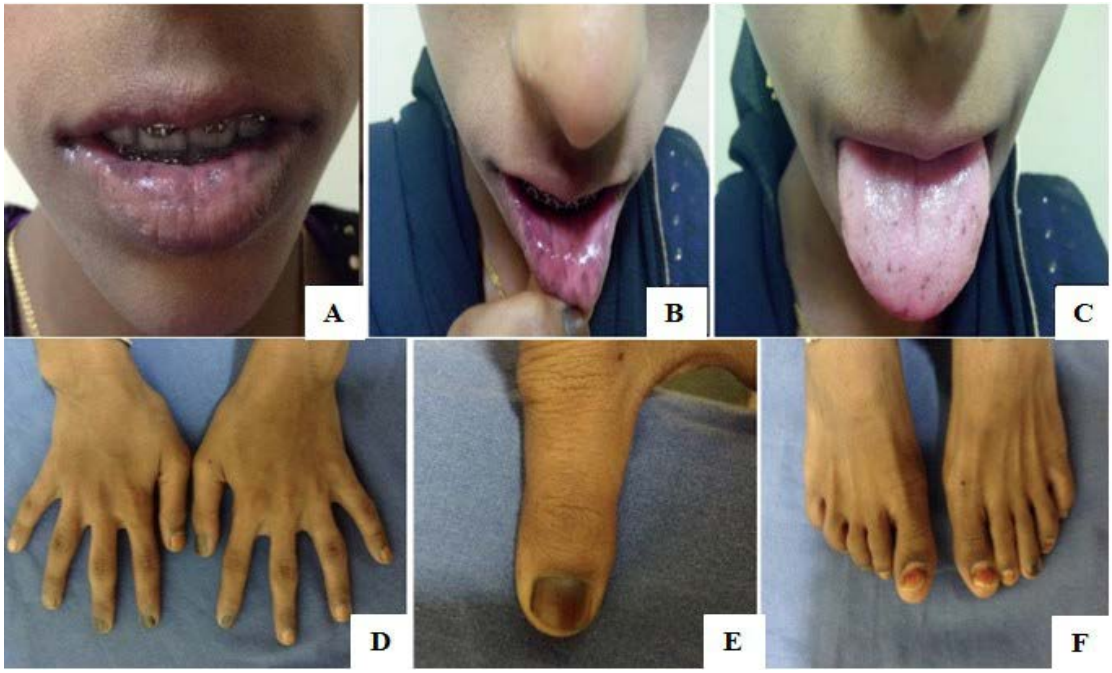


**Figure 1.** (A)–(C) Multiple discrete dark brown macules over lips, labial mucosa, and dorsum of tongue. (D)–(F) Varied pigmentation of nails.

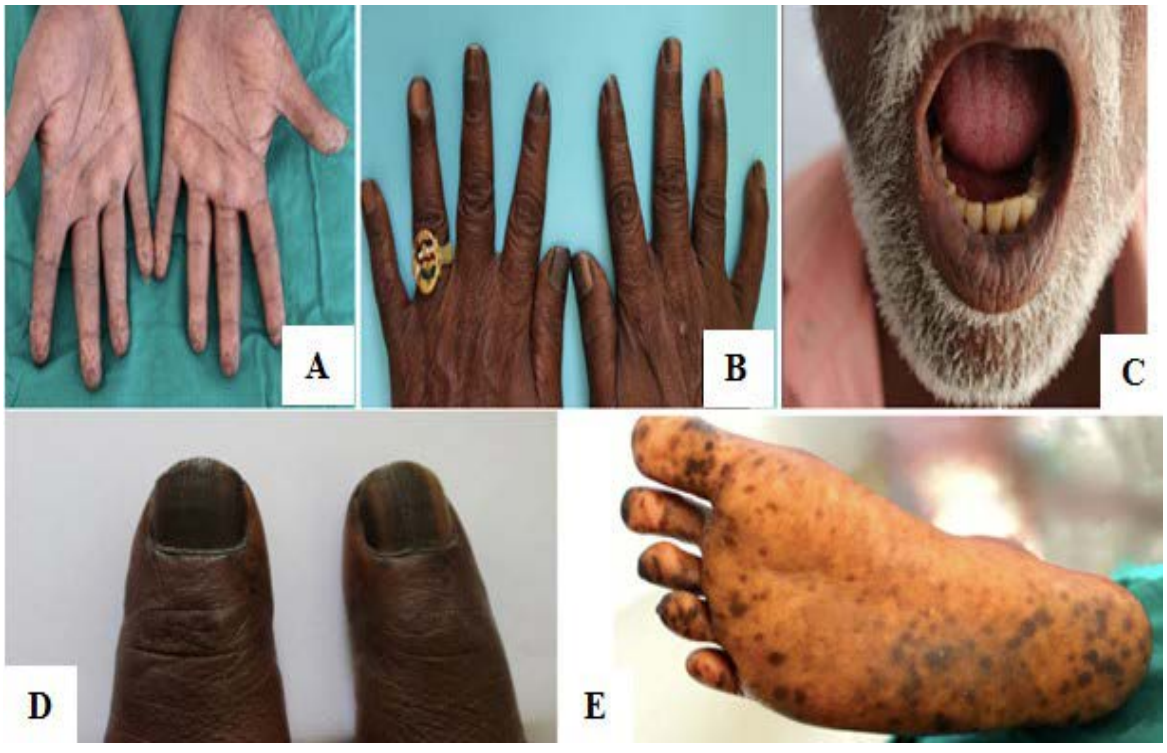


**Figure 2.** (A) Well-defined dark brown to black macules grouped over distal phalanges of hands. (B) Varied patterns of nail pigmentation with a few discrete hyperpigmented macules on dorsal hands. (C) A few dark brown macules on lower lips. (D) Discoloration and longitudinal ridging of nails with pseudo-Hutchinson's sign. (E) Brownish black macules and patches over the sole.

1970 under the term "idiopathic lenticular mucocutaneous syndrome" was light-to-dark-brown blotchy macules less than 5 mm, limited to fingertips, soles and mucosal surfaces, with striking involvement of nail folds exhibiting a pseudo-Hutchinson's sign[5,6]. The nail involvement is described as four types: single 1–2 mm longitudinal streaks, double 2–3 mm lateral longitudinal streaks, radial or ulnar half homogenous pigmentation, and complete pigmentation[7]. A similar presentation is seen herewith, with more prominent involvement in older age. It may be known that varied presentations have been reported previously as isolated tongue, neck and trunk pigmentation, however, these are rare[4,7–11].

A higher incidence in Chinese population follows a genetic influence of either autosomal dominant or, less commonly, autosomal recessive; in contrast, isolated sporadic case reports occur in other Asian continents[6,12]. The proposed mechanism of LHS is the presence of altered melanocytes, thereby leading to increased melanogenesis[13]. Findings of basal layer pigmentation, large dendritic L-3, L-4 dihydroxyphenylalanine reactive intraepithelial melanocytes, and a few dermal melanophages with electron microscopic features of multiple mature melanosomes within keratinocytes and melanophages, confirm the benign nature[14]. Despite its benign nature, there are rare associations such as esophageal melanocytosis, actinic lichen planus, hypocellular bone marrow and thrombocytopenia that may be kept in mind and does not necessitate evaluation[8].

The disorders closely simulating LHS by appearance are Addison's disease, Peutz-Jeghers syndrome, and lentiginosis profuse[8]. The features differentiating Laugier-Hunziker syndrome from other disorders are striking by mere clinical evaluation, as outlined in **Table 1**. Nonetheless, majority of cases are reported following repeated invasive procedures such as colonoscopy, gastroscopy and barium enema[11].

As for both cases outlined herewith, no treatment was necessary due to absence of cosmetic concern and summed up to reassurance alone. This outlook has been favorable according as Ergun *et al.* highlighted the resistant nature with recurrence following laser therapy[15].

## Conclusion

Despite the strikingly unique features of LHS, the categorization of it as a diagnosis of exclusion may be noted as leading to a battery of investigations, thereby causing undue anxiety upon patients. It may thus seem necessary to make aware that the disorder is relatively

**Table 1.** Differentiating features of disorders exhibiting mucosal and cutaneous hyperpigmentation[7,8,11,12].

| | Laugier-Hunziker syndrome | Peutz-Jeghers syndrome | Addison's disease | Cronkhite-Canada syndrome | Lentiginosis profusa |
|---|---|---|---|---|---|
| **Mechanism** | Hyperactive melanocytes | Germline mutation in *STK11/LKB1* tumor suppressor gene on chr 19p13.3 | Excess adrenocorticotrophic hormone stimulates melanocytes. | Protein losing enteropathy | Mutations in gene for protein-tyrosine phosphatase, non-receptor type 11 |
| **Inheritance** | Sporadic/Autosomal dominant | Autosomal dominant | Nil | Nil | Autosomal dominant |
| **Onset of lesions** | Early to middle adulthood | Childhood | Variable, insidious | Adult | At birth |
| **Skin manifestations** | Multiple, 1–5 mm light-to-dark-brown macules over distal aspects of digits and soles | 1–5 mm dark brown macules at perioral, nose, digits, hands, feet and perianal sites | Generalized hyperpigmentation; more pronounced on sun-exposed areas, palmar creases, knuckles, elbows, knees and scars | Multiple light-to-dark-brown macules on extremities, face, palms, soles | Multiple brown macules and patches up to several cm in size, involving around 80% of body surface area |
| **Mucosal features** | 1–5 mm hyperpigmented macules involving labial, buccal, gingival, palatal, tongue and genital mucosae | 1–5 mm hyperpigmented macules involving buccal and gingival mucosae | Hyperpigmented patches over dentogingival margins, buccal, vaginal and perianal mucosae | Usually spared. Buccal mucosa occasionally affected. | Multiple brown macules on buccal mucosa and sclera |
| **Nail changes** | Longitudinal melanonychia or homogenous pigmentation | Clubbing | Nail bed pigmentation | Dystrophic changes | Occasional longitudinal pigmentary bands |
| **Associations** | Esophageal melanocytosis, actinic lichen planus, hypocellular bone marrow and thrombocytopenia. | Intestinal polyposis, malignancy | Nausea, vomiting, diarrhea, steatorrhea, dizziness, myalgia and arthralgia | Gastrointestinal polyposis and alopecia | ECG changes, ocular hypertelorism, pulmonary stenosis, abnormal genitalia, retarded growth and deafness |


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common among both juveniles and adults with no plausible hereditary component.

## Conflict of interest

The authors declare no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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CASE REPORT

# Necrotising fasciitis—A rare complication of split-thickness skin graft donor site

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***Abstract*:** Split-thickness skin grafting (STSG) is commonly used to cover raw areas of various aetiologies. Donor sites are known to get infected sometimes, but necrotising fasciitis is not often reported. We report here a case of donor-site necrotising fasciitis and its successful management. There is a need for surgeons to stay vigilant for this rare but probable complication of skin grafting.

***Keywords*:** Skin grafting; necrotising fasciitis; donor site

***Citation*:** Bamal R and Kain R. Necrotising fasciitis—A rare complication of split-thickness skin graft donor site. J Surg Dermatol 2017; 2(3): 174–176; http://dx.doi.org/10.18282/jsd.v2.i3.141.

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## Introduction

Split-thickness skin grafting (STSG) forms an important part of the armamentarium for raw-area coverage for burns, trauma and other aetiologies. These days, STSG is considered a gold standard for covering skin wounds with a large surface area[1]. Donor sites of STSGs are managed as per standard departmental protocol at our institute, which includes donor site haemostasis followed by a tight dressing with padding after covering the donor site with paraffin gauze. The dressing falls off by itself upon healing or is opened three weeks post-operation, unless there is some complication such as systemic or local signs of infection, gross soakage in the dressing and so on.

## Case report

A 35-year-old male presented to our out-patient department (OPD) with a raw area involving the left gluteal region developed as a result of necrotising fasciitis post intra-muscular injection administration. Patient's gluteal region was debrided at an outside facility and was referred for the raw area coverage. The patient did not have any history suggestive of immunocompromised status. After a few dressings, raw area around 35 × 15 cm remained with healthy granulation tissue that was split-skin grafted. Anterior, lateral and posterior surfaces of the right thigh and posterior surface of the right leg were used as donor sites for STSG. There was 95% graft take at the left gluteal region with normal healing of the thigh donor sites without any evidence of infection on the 21st post-operative day (**Figure 1**).

The right leg donor site's dressing was found to be partly soaked. On opening the dressing there was evidence of skin necrosis, seeping of dishwater-coloured fluid along with necrosis of subcutaneous tissue till the level of deep fascia. The involved area was half of the overall donor site's area, *i.e.* an area of 5 × 4 cm (**Figure 2**). Clinical diagnosis of necrotising fasciitis was established with a positive finger test, which was characterized by the lack of resistance to finger dissection in a plane between deep fascia and subcutaneous tissue. There were no systemic signs and the infection was localised under donor site dressing only. Immediate surgical debridement (**Figure 3**) was done and the patient was put on antibiotics. Antibiotic used was amoxicillin (500 mg) with clavulanic acid (125 mg) three times a day for seven days. Culture returned as mixed growth of organisms with commensals. The patient underwent dressings for his disease on OPD basis and the prepared wound was later skin grafted.

## Discussion

STSG is a very common surgery in all plastic surgery and burn units worldwide. Recipient area management is an important part of patient care, but we should also

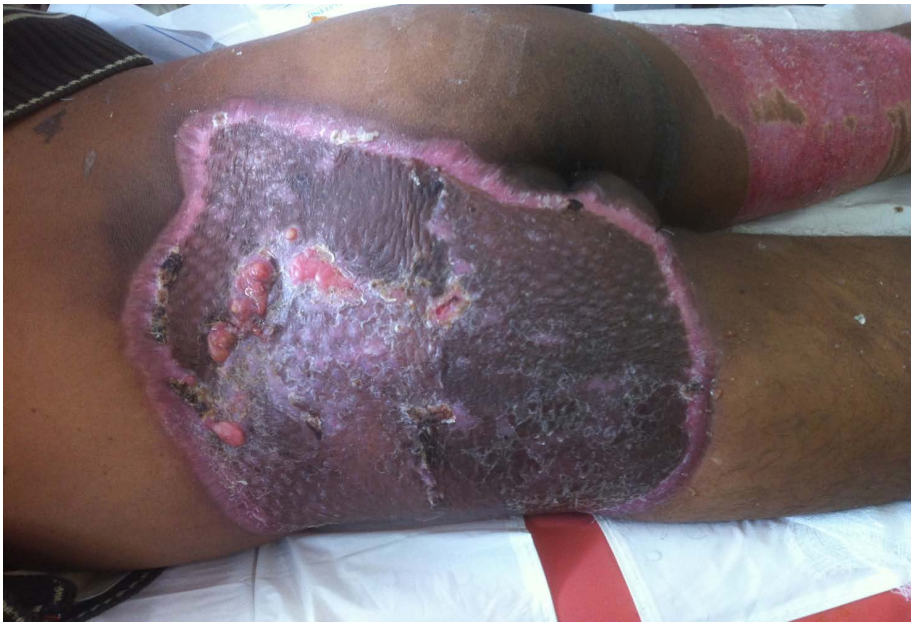

**Figure 1.** Left gluteal recipient site with good graft take and healed right thigh donor region

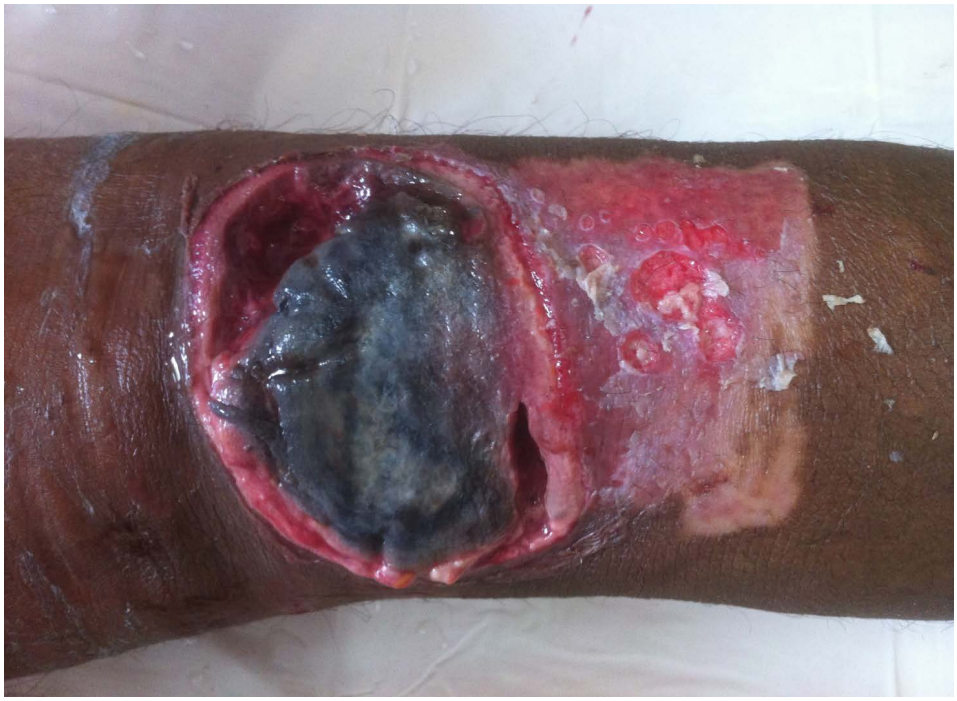

**Figure 2.** Right leg donor site's necrotising fasciitis

keep at the back of our minds that donor site care is also equally important. Donor site morbidities such as pain, risk of infection, discolouration and scarring can be more troublesome for patients than the primary wounds themselves[2,3]. Early complications of donor site include infection and itching, as mentioned in literature[4]. This case highlights a complication of the donor site, which can be disastrous if not detected and treated in time. There is a paucity of literature reporting necrotising fasciitis as a complication of STSG donor site. The authors could not find any mention of the same during their exhaustive attempts for cross-referencing this report.

The authors would like to attribute the second episode (donor site) of necrotising fasciitis in this patient to

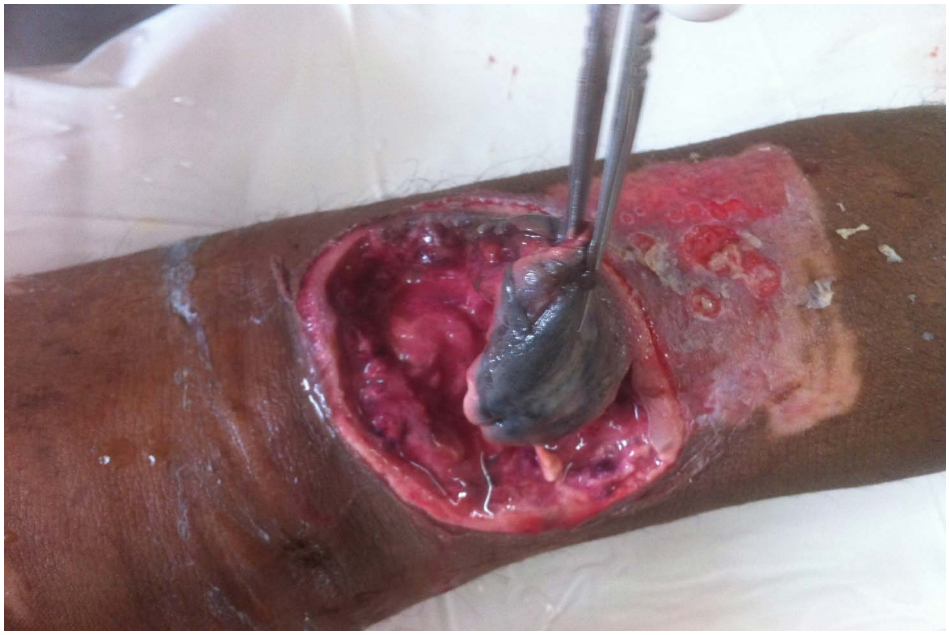

**Figure 3.** Debridement being done of the infected donor site

neglect. Patient underwent multiple dressings near his home before reporting back to our hospital on the 21st post-operative day with soakage of his dressing. Thorough and more vigilant inspection of his donor site might have triggered the opening of dressing at an early stage. A single episode of necrotising fasciitis after intramuscular injections is not very uncommon, especially in the periphery where steps to maintain sterility are not always taken. A second episode of necrotising fasciitis was hidden under the donor site dressing and was very limited in area (5 cms in maximum dimension). The patient was well preserved with other well-healed donor sites and did not exhibit any sign or symptom to suggest an overt immunocompromised status.

The authors conclude with a recommendation of having a low threshold for opening and checking donor site dressings irrespective of post-operative duration if there is any sign or suspicion of infection. We should also learn from the present case that strict instructions should be given at the time of referral for diligent inspection and care of donor site dressing by the patient as well as by the local doctor or general practitioner.

## Conflict of interest

The authors declare no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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CASE REPORT

# A propulsion injury following a spontaneous electronic cigarette explosion

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***Abstract*:** Electronic cigarettes (e-cigarettes) have become increasingly popular at an alarming rate. This coincides with the public perception that they are a safer mean of nicotine consumption. Unregulated devices carry unrecognized safety risks that have led to numerous cases of burns, associating with spontaneous combustions of e-cigarettes.

***Keywords*:** E-cigarette; electronic cigarette; spontaneous combustion; burns

***Citation*:** Chan CY, Ilenghoven D, Mohd Yussof SJ, Ibrahim S. A propulsion injury following a spontaneous electronic cigarette explosion. J Surg Dermatol 2017; 2(3): 177–179; http://dx.doi.org/10.18282/jsd.v2.i3.144.

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## Introduction

Electronic nicotine delivery systems (ENDS) include electronic cigarettes (e-cigarettes) and personal vaporizers[1]. The use of these devices has gained popularity worldwide. The battery-powered electronic nicotine-delivery device resembles a cigarette designed for the purpose of providing inhaled doses of nicotine by way of a vaporized solution to the respiratory system[2]. While e-cigarettes have been linked in some preliminary studies to decrease the use of traditional cigarettes, the devices themselves pose unrecognized risks to users[3]. There have been documented events in the media of spontaneous combustion events involving the electronic cigarette devices causing thermal, blast and chemical burns[2].

## Case report

We report a case of a 15-year-old girl who sustained a burn injury to the right dominant hand following the spontaneous ignition of an e-cigarette battery that was stored in her bag. The patient was attempting to reach for her e-cigarette, during which she reported a sudden explosion followed by a charred smell and burning sensation to the right hand.

She presented to our department with complains of severe pain to the right hand. On assessment, the ring and middle fingers appeared dusky with a partial thickness burn injury to the flexor zone II region with full thickness burn injuries and a penetrating wound to the right middle and ring fingers over the distal interphalangeal joint (**Figure 1**). Sensation was reduced to pinprick and light touches over these two fingers. Neurovascular status over the non-affected fingers was normal. An x-ray of the right hand showed radio-opacities over the underlying tissue of the affected fingers (**Figure 2**).

A wound debridement was done under general anesthesia a day after the incident took place. Intra-operatively, noted black liquid substance was embedded in the underlying tissue and along the tendon sheath, extending down to the middle phalanx of the ring and middle fingers (**Figure 1**). Upon exploring, a blast injury was identified involving the tendon sheaths and the radial digital neurovascular bundle at the level of the middle phalanx of the middle finger. Capillary refill time of the right middle finger post-operatively was documented at more than two seconds. Intravenous antibiotics of Cefuroxime and Metronidazole were commenced and dressings with constant milking of the wound for toileting purposes were done.

The distal phalanx of the middle finger progressed to dry gangrene and this was treated conservatively. The pulp of the middle finger auto-amputated three months after the initial injury. Patient has currently developed a flexion contracture of the affected distal interphalangeal joint with loss of pulp of the right middle finger and a mallet deformity of the right ring finger (**Figure 3**).

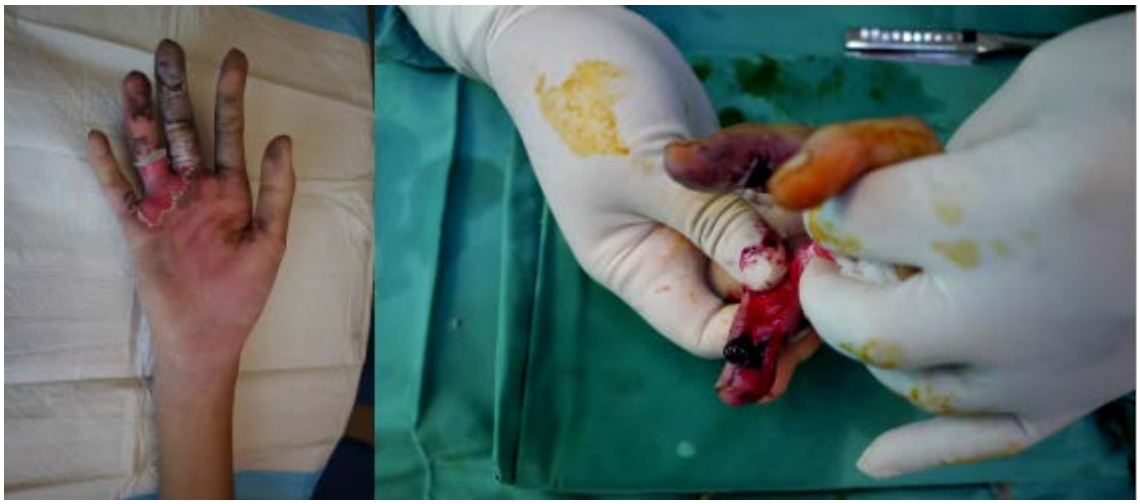

**Figure 1.** Patient's burned right hand and evidence of black liquid noted intraoperatively

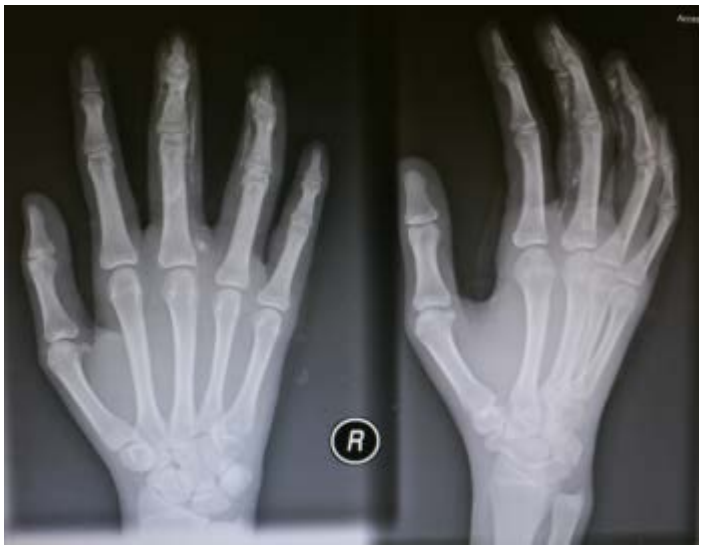


**Figure 2.** X-ray of the right hand demonstrating radio-opaque deposits

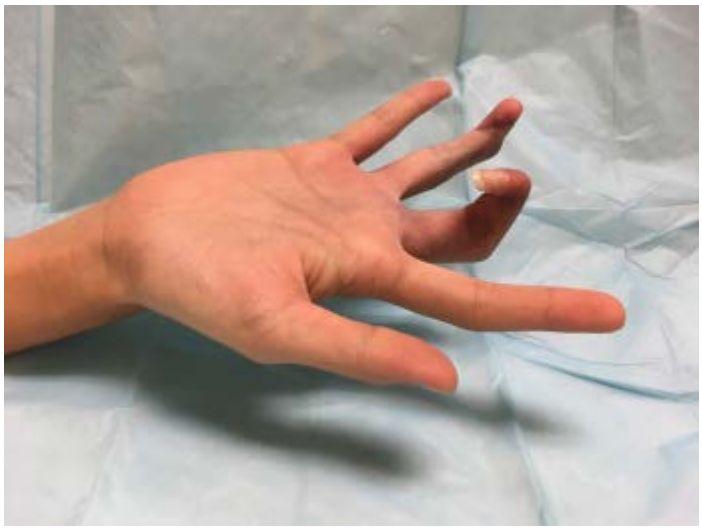

**Figure 3.** Flexion contracture of the distal interphalangeal joint of the right middle finger


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## Discussion

E-cigarettes are vaporized products which include cartridges containing a liquid mixture composed primarily of nicotine, flavoring, water, glycerin and propylene glycol[4]. These devices simulate smoking by heating the nicotine-containing solution using a battery-powered heating element, producing an aerosol that the user inhales[3,4].

Lithium batteries are used due to their benefits of portability and storage of large amounts of energy in a compact space; however, it carries a risk of creating a "thermal runway" whereby the internal battery overheating causes an internal fire or explosion[4,5]. The device's poor design, use of low-quality materials, manufacturing flaws and defects, improper use and handling of the device, combined with the inherent flammability of e-liquid, could lead to a major public health concern[3].

The device's lack of carcinogenic additives was thought to be a safer means of nicotine consumption and as a tool to aid smoking cessation; however, the unrecognized risks to end-users are still poorly understood[3]. In Malaysia, it was reported that the number of users vary from 500,000 to one million as of 2015[6].

There have been reports of electronic cigarettes that have malfunctioned while charging and have exploded when in use, leading to various harm including thermal and blast injuries, which may range from mild to severe burns and may even carry the risk of losing a limb as presented in this case report. Given the blast component here, this has caused a propulsion injury whereby the black liquid, pushed forward by high pressure, causes extensive spread and damages the skin and soft tissue, tendon sheaths and digital neurovascular bundle resulting in the outcome as shown in **Figure 3**.

## Conclusion

While the public views e-cigarette devices as safer means to consume nicotine, awareness on the potential serious burns injuries from malfunctioned device is important.

The prohibition of sales of e-cigarettes has been implemented in several states in Malaysia as of 1st January, 2016. Increasing e-cigarette taxes may also be an apparent effort to reduce smoking[5].

## Conflict of interest

The authors declare no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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ORIGINAL RESEARCH ARTICLE

# The efficacy and safety of a 70% glycolic acid peel with vitamin C for the treatment of photoaging

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***Abstract*:** Glycolic acid peels have been shown in many studies to improve the appearance of photoaged skin. Vitamin C is known to be a potent natural antioxidant and plays an important role in the collagen biosynthetic pathway. In this study, we report our clinical experience with 70% glycolic acid peel added with vitamin C. We found that all parameters of photoaging, in particular the composite wrinkling score, discolouration score and the global photoaged score, showed statistically significant improvement. Patient satisfaction also revealed improvement in keeping with the physician assessment. It is also associated with an excellent safety profile. In conclusion, a combination of 70% glycolic acid with vitamin C chemical peel is a well-tolerated effective treatment of photoaging in Asian skin.

***Keywords*:** Chemical peel; vitamin C; photoaging; pharmacology

***Citation*:** Yang SS, Liau MM, Heng JK, Toh HSM, Aw CWD, *et al.* The efficacy and safety of a 70% glycolic acid peel with vitamin C for the treatment of photoaging. J Surg Dermatol 2017; 2(3): 180–186; http://dx.doi.org/10.18282/jsd. v2.i3.80.

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## Introduction

Chemical peels, also known as chemoexfoliation or derma peeling, have been used for many years in dermatological practice in the treatment of photoaged skin. Although deep peels such as phenol peels are associated with the best results, superficial and medium-depth peels such as alpha hydroxy acid (AHA) and trichloroacetic acid (TCA) peels also yield excellent results without causing excessive skin damage[1].

Glycolic acid is the smallest organic acid in the AHA group. When applied to the skin, its peeling effect results in the discohesion of keratinocytes in the stratum corneum[2] and the stimulation of biosynthesis of glycosaminoglycans (GAGs) especially hyaluronic acid and collagen fibres[3]. The resultant thickening of the dermis layer is postulated to be the main mechanism for the improvement of photoaged skin.

Patients who seek treatment for photoaging are offered various options including topical medications, chemical peels, microdermabrasion and laser resurfacing. We report our experience with a commercial preparation of 70% glycolic acid and vitamin C chemical peel (VCi, Ocean Health, USA).

## Materials and methods

Over a six-month period, a total of 15 patients from the dermatology clinic of National University Hospital, Singapore, with clinically evident photoaged facial skin

underwent a series of three 70% glycolic acid peels with vitamin C, each four weeks apart. These patients had no history of oral retinoid or chemical peels within the past six months, no topical retinoid application within the past one week or laser ablative procedures within the last month prior to embarking on the priming regime. They had no active facial dermatitis or infection.

## Treatment regimen

### Priming

All patients were instructed to apply a 10% glycolic acid solution (Therapeutic Dermatologic Formula, VCi® Clarify, Ocean Health, USA) and facial moisturizer (Therapeutic Dermatologic Formula, VCi® Hydrate, Ocean Health, USA) twice daily. Sunscreen (Therapeutic Dermatologic Formula, Sunscreen, PA +++ UVA/UVB SPF 50+) was also to be applied once daily in the morning. This continued daily for one month.

### Peeling

Four weeks later, the patient received the first chemical peel. A single pass of 70% glycolic acid and vitamin C peel (Therapeutic Dermatologic Formula VCi) was applied for 3–5 min depending on patient's tolerance. Spot neutralization (Therapeutic Dermatologic Formula VCi® Peel Neutralizer) was performed on areas of erythema, with subsequent full neutralization upon the termination of the peel.

### Post peel care

For the first three days of each peel, patients were instructed to use 10% vitamin C serum (Therapeutic Dermatologic Formula, "C"-Scape Serum) twice daily, a facial moisturizer (Therapeutic Dermatologic Formula VCI® hydrate) twice daily, another facial moisturizer (Therapeutic Dermatologic Formula VCI® Quick recovery cream) as required, and sunscreen once daily. From day 4 until the next peel, Quick Recovery Cream (Therapeutic Dermatologic Formula VCi® Clarify) twice daily was substituted for 10% glycolic acid solution.

## Clinical evaluation

Grading of photoaging was performed based on the following 10 clinical parameters:

1. Fine peri-orbital wrinkles (FPW)
2. Coarse peri-orbital wrinkles (CPW)
3. Upper lip wrinkles (ULW)
4. Lower lip wrinkles (LLW)
5. Melasma
6. Solar lentigines
7. Guttate hypomelanosis
8. Poikiloderma
9. Solar keratosis
10. General skin texture graded from smooth to severe roughness

A rating of nil (1), mild (2), moderate (3) and severe (4) was scored for each parameter. The sum obtained constituted the global photoaging score. A visual analogue scale (VAS) of photoaging by both physician and patient was also performed at each visit. This was a 10 point scale (1–10), with "1" meaning no visible features of photoaging and "10" being severe photoaging features.

In addition, a safety assessment score according to five clinical parameters of redness, swelling, oozing or crusting, hyperpigmentation and scarring was obtained after the administration of each peel at weeks 4, 8 and 12 using a rating of absent (1), mild (2), moderate (3) and severe (4). All ratings were made by the managing dermatologist.

# Ethics statement

Approval for this study was obtained from the national ethics review board, National Healthcare Group (NHG) Domain Specific Review Board (Reference no.: 2015/00848).

# Results

## Study population

All patients, except one, were female, and skin types ranged from Fitzpatrick skin type II to IV. The mean age was 53.7 years (range 38–64 years). 2 patients (13.3%) withdrew from the study: one experienced severe contact dermatitis whereas the other withdrew for personal reasons.

## Physician scores

### Wrinkle score

The wrinkle score was composed of the sum of scores for FPW, CPW, ULW and LLW. The composite score (**Figure 1**) for each participant ranged from 1 to 16. There was a trend towards improvement (*i.e.*, decrease) in wrinkle score with statistically significant improvement noted at week 12, which was sustained till week 16

### Discolouration score

The discolouration score was composed of the sum of scores for melasma, solar lentigines, guttate hypomelanosis and poikiloderma. The composite score for each participant ranged from 1 to 16 (**Figure 2**). There was similarly a trend towards improvement (*i.e.*, decrease) in the discolouration score with a statistically



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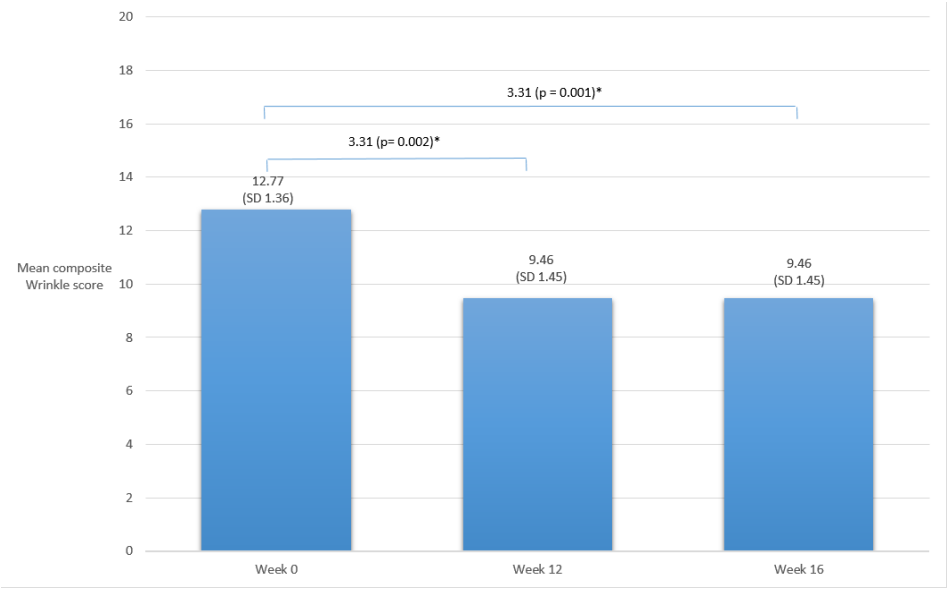


**Figure 1.** Wrinkle scores (*Wilcoxon signed rank test of change)

significant improvement noted at week 12, which was sustained till week 16 (**Figure 2**).

### Global photoaging score

There was a high statistically significant reduction in this global score at week 12 compared to baseline, and this improvement was also sustained till week 16 (**Figures 3**, **4A** and **4B**)

### Visual Analogue Scale

There was an overall improvement in both physician and patient VAS scores over the course of the study (**Figure 5**).

At every time point after the commencement of the peels, patient VAS scores were consistently slightly higher than the physicians. At week 16, physician and patient VAS scores reduced by approximately one-third of the baseline.

## Safety assessment

None of the patients had oozing/crusting, hyperpigmentation or scarring at any time. For redness and swelling, a downward trend was noted (**Table 1**). At week 16, all side effects had resolved, except in two patients who reported with mild erythema (score 2).

# Discussion

Glycolic acid peels have been shown in many studies to improve the appearance of photoaged skin. Isoda and colleagues reported that after a single session of GA peel, elastic fibres were increased after 2 weeks and significantly increased after 28 days[4]. Kubiak *et al.* compared 70% GA with 15% TCA peels and found clinical improvement in hydration and elasticity parameters as well as improvement in UV-induced post-inflammatory pigmentation in both groups. However, patients' satisfaction rates for GA peels were higher because of a superior side effect profile[5]. **Table 2** is a comparative table of other studies evaluating the use of glycolic acid chemical peels in the treatment of photoaging.

Vitamin C is a potent natural antioxidant and it plays an important role in the collagen biosynthetic pathway. Numerous studies have supported its use in the protection and rejuvenation of photoaged skin. A six-month double-blind, vehicle-controlled study of moderately photoaged patients using 5% vitamin C cream on the neck and forearms produced a highly significant decrease in the deep furrows with histological evidence of elastic tissue repair[6]. Our study shows encouraging results with the use of a combination 70% glycolic acid–vitamin C peel in the treatment of photoaged skin, and that the treatment is well-tolerated.

This was noted to affect all parameters of photoaging, in particular the composite wrinkling score, discolouration scores and also the global scoring. Of note, patient satisfaction scores also revealed an improvement in keeping with the physician assessment. Statistically significant results were seen in all scores by week 12 and these were sustained at week 16, four weeks after the final peel.

Furthermore, there was an excellent safety profile with reports of primarily mild redness, which also resolved by week 16.



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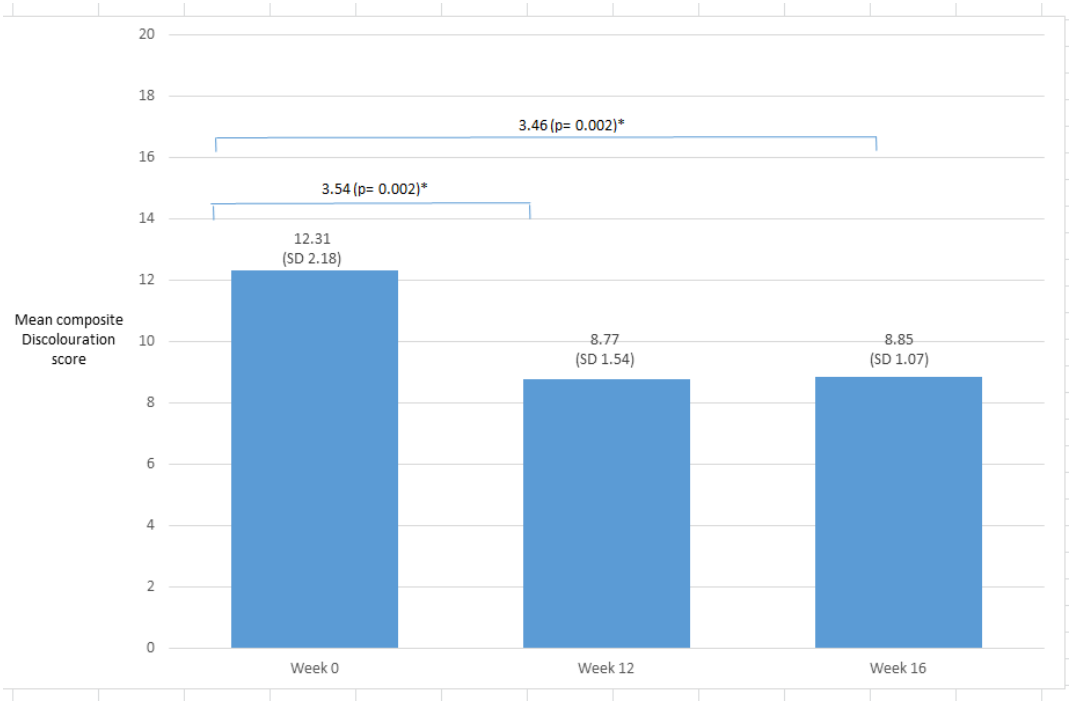


**Figure 2.** Discolouration scores (*Wilcoxon signed rank test of change)

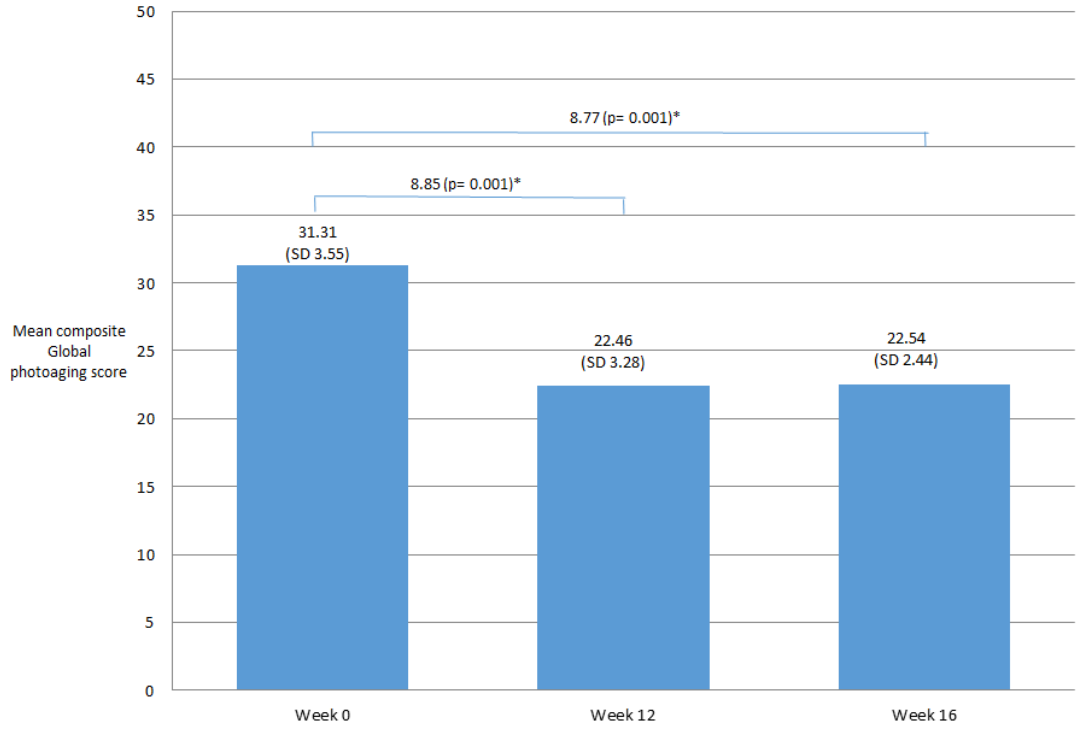


**Figure 3.** Global photoaging scores (*Wilcoxon signed rank test of change)



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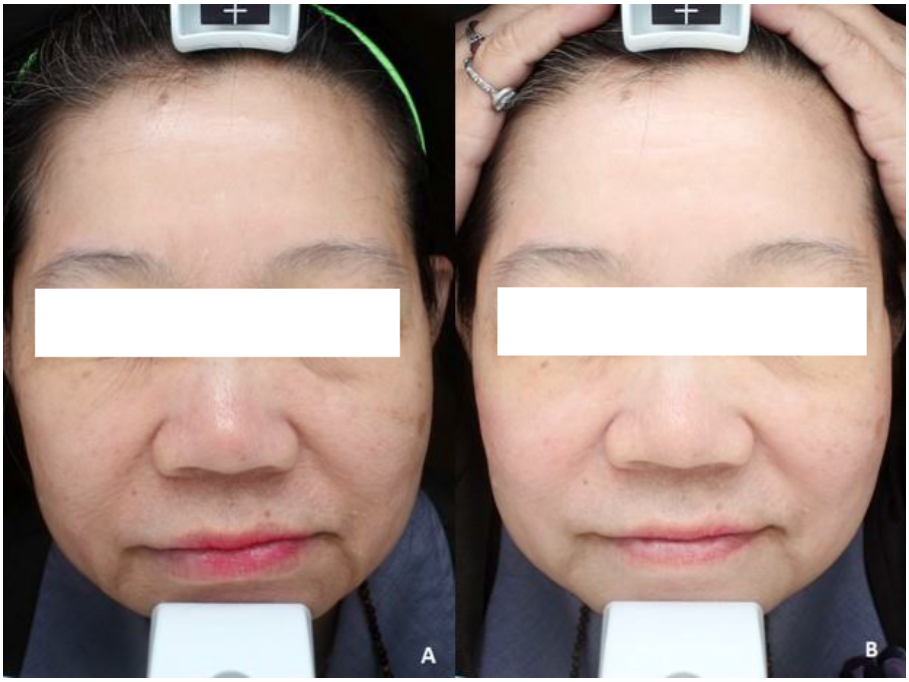


**Figure 4.** A 62-year-old patient at (A) Week 0, pre-treatment and (B) Week 16, after 3 sessions of 70% glycolic acid peel with vitamin C

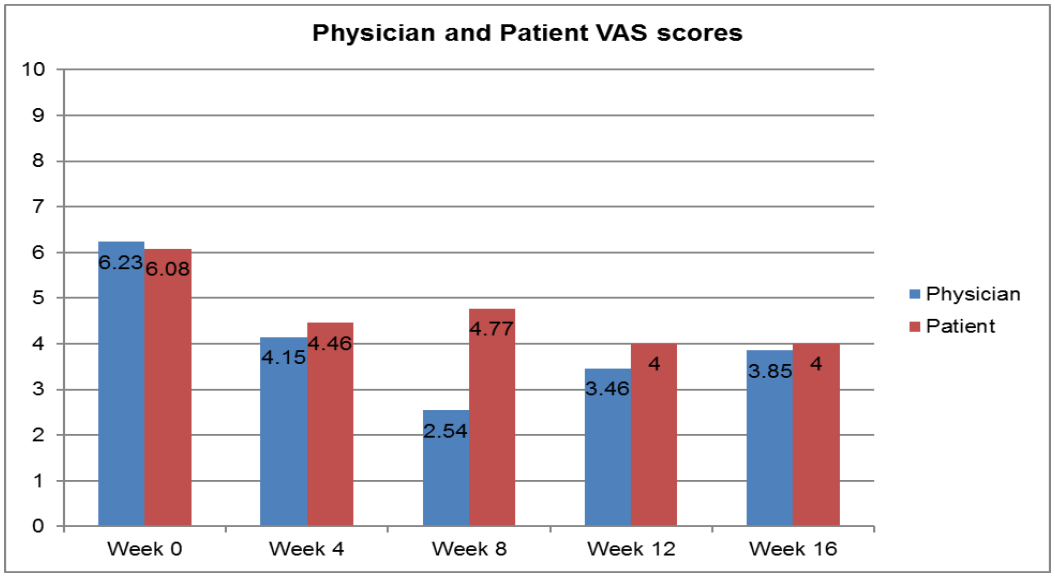


**Figure 5.** Physician and patient's VAS scores

**Table 1.** Safety assessment score post chemical peel

| Side effect | | Mean score (SD) | | |
|---|---|---|---|---|
| | | Week 4 | Week 12 | Week 16 |
| 1. | Redness | 2.38 ± 0.83 | 2.23 ± 0.49 | 1.15 ± 0.36 |
| 2. | Swelling | 2.08 ± 0.83 | 1.38 ± 0.49 | 1 ± 0.00 |
| 3. | Oozing/crusting | 1.00 | 1.00 | 1.00 |
| 4. | Hyperpigmentation | 1.00 | 1.00 | 1.00 |
| 5. | Scarring | 1.00 | 1.00 | 1.00 |



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**Table 2.** Comparative table of other studies evaluating the use of glycolic acid chemical peels in the treatment of photoaging

| Article | Compound used | Parameters (physician measured) | Advantage/efficacy | Side effect profile |
|---|---|---|---|---|
| Evaluation of 70% glycolic peels versus 15% trichloroacetic peels for the treatment of photodamaged facial skin in aging women[5]. | Glycolic acid (GA, 70%) *vs*. trichloroacetic acid (TCA, 15%) | • Skin elasticity<br>• Epidermal hydration<br>• Reduction in melanin intensity | Overall 70% GA higher efficacy | • Stinging (TCA 27%; GA 63%)<br>• Erythema (TCA 7%; GA 63%) |
| Clinical improvement of photoaged skin with 50% glycolic acid. A double-blind vehicle-controlled study[7]. | 50% glycolic acid *vs*. vehicle gel | • Rough texture<br>• Fine wrinkling<br>• Coarse wrinkling<br>• Solar keratosis<br>• Lightening of solar lentigines<br>Histological improvement (thinning of stratum corneum, granular layer enhancement, epidermal thickening, increase in dermis collagen thickness). | Overall 50% GA higher efficacy for all parameters measured, except coarse wrinkling | • Erythema, scaling, irritant dermatitis reported in 50% GA group.<br>• Neither caused post-inflammatory hyper- or hypo-pigmentation, scarring or persistent erythema |
| A clinical and histologic evaluation of two medium-depth peels. Glycolic acid versus Jessner's trichloroacetic acid[8]. | 70% GA + 35% TCA (GA-TCA) *vs*. Jessner's solution + 35% TCA (JS-TCA) | • Removal of actinic keratosis<br>• Lightening solar lentigines<br>• Neoelastogenesis<br>• Histological improvement (thicker Grenz zone) | Overall GA-TCA higher efficacy in all parameters, except lightening solar lentigines (equal efficacy)<br>Postulation: 70% GA as initial wounding agent may allow TCA to penetrate deeper and produce deeper histological wound | • Erythema, crusting and swelling reported in both groups<br>• Neither caused post-inflammatory hyper- or hypopigmentation, persistent erythema, persistent erosions, or milia |
| Short contact 70% glycolic acid peels as a treatment for photodamaged skin. A pilot study[9]. | 70% GA peels, half of subjects randomized to a 10% GA-based moisturizer twice daily | • Tactile roughness<br>• Fine and course wrinkling<br>• Mottled pigmentation<br>• Sallowness<br>• Laxity<br>• Overall severity<br>• Number of actinic keratosis<br>• Optical profilometry<br>• Histological improvement | Overall, 70% GA + 10% GA moisturizer twice daily has higher efficacy, except for histological improvement | • Patients in both groups tolerated therapy well |
| Clinical tolerance and efficacy of capryloyl salicylic acid peel compared to a glycolic acid peel in subjects with fine lines/wrinkles and hyperpigmented skin[10]. | 20%–50% GA *vs*. 5%–10% salicylic acid, capryloyl salicylic acid (LHA). | • Reduction in fine wrinkling<br>• Reduction in hyperpigmentation | Overall 5%–10% LHA peel greater efficacy | • Erythema, dryness and scaling reported in both groups |



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## Conclusion

In conclusion, a combination of 70% glycolic acid with vitamin C chemical peel is a well-tolerated effective treatment of photoaging in Asian skin. As this was a retrospective evaluation, a major limitation was the lack of control group. A longer period of follow-up reviews would be useful in determining the long-term sustainability effect of this chemical peel.

## Author contributions

SS Yang and JK Heng administered the chemical peeling treatment, collected all data and wrote the manuscript. MM Liau and HSM Toh performed data and statistical analysis, besides being involved in the manuscript's writing. CWD Aw and S Ho wrote and edited the manuscript.

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## Conflict of interest

The authors declare no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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ORIGINAL RESEARCH ARTICLE

# Subungual glomus tumour excision: The nail plate flap technique

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***Abstract*:** Subungual glomus tumours, though rare, cause distressing symptoms and merit surgical treatment with minimal morbidity. Approaches to the nail bed over the years have varied from earlier nail excisions to trans/sub/periungual techniques. Nail plate preservation has beneficial effects on pain, and cosmesis and surgical modifications to ensure the same are desirable. We employed a simple nail preservation technique on six patients over the last seven years. After an accurate localization of the lesion based on pin test and Magnetic Resonance Imaging (MRI), a proximally-based nail plate flap was marked and elevated beyond the glomus. The tumour was removed through a linear nail-bed incision, following which the nail plate flap was reposited without suturing. All cases had gratifying relief of symptoms. Within a few weeks of the excision, no nail distortion was noticeable. No recurrences were noted on follow-up for one year. The nail flap transungual approach relies on accurate preoperative tumour localization. It ensures a protective post-operative cover with reduced pain. A minimalistic approach with no skin incisions ensures less morbidity and improved cosmesis with no nail deformity. The nail plate flap technique can be employed in selected cases for improved outcomes.

***Keywords*:** Glomus tumour; subungual; nail plate; flap

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## Introduction

The glomus body is a physiological arteriovenous anastomosis which regulates blood flow and has a thermoregulatory function. Glomus tumours, which were described nearly two centuries ago, are small, commonly benign neoplasms frequently arising in the dermis or subcutaneous tissues of the extremities[1]. Although not limited to the nail bed, 50%–75% occur subungually[2]. The proliferation of this angiomatous tissue within the confined space of the nail bed results in exquisite pain. The classical triad of pain disproportionate to the lesion, severe tenderness and hypersensitivity to cold characterizes these lesions. Nail distortion, discolouration and bony changes are rarely prominent to be noted. The rarity of this tumour, coupled with low awareness and minimal objective findings, often leads to incorrect or delay in diagnosis. Literature attests that patients suffer for many years and are often subjected to irrational treatment prior to correct management.

The excision of glomus tumour under the nail bed requires techniques for adequate exposure which necessitates dealing with the overlying nail. Approaches till recently relied on complete nail removal for ease of access and complete excision. This resulted in a tender, exposed fingertip and post-operative nail deformity. Alternate methods rely on trans/peri/subungual incisions with nail folding or resection for access. Resuturing of the removed nail is also resorted to for the protection of the raw area and to decrease pain. Variations of the transungual approach include subperiosteal excision and have been advocated for improved outcomes. Improved diagnostics and accurate localization permit precise surgery with pain-free and aesthetic outcomes. Recently, nail-preserving excisions have been described by flipping the proximal nail plate. We present a case series of six subungual glomus tumours managed over the last seven years by employing a simple proximally-based nail plate flap.

## Materials and methods

All of the patients, referred over the last seven years with symptoms of subungual pain, tenderness or cold sensitivity suggestive of glomus tumour, were evaluated. Detailed histories of symptoms and treatments were taken and followed with clinical and radiological valuation. Magnetic Resonance Imaging (MRI) was done in all except one case. On confirmation of diagnosis, patients were advised surgery under wrist block. A finger tourniquet was employed by rolling down a cut loop of latex glove till the finger base. Magnification using a 4X loupe was employed on as-needed basis.

### Surgical technique

Accurate pre-operative clinical mapping was done by employing Love's pin test. This is the test in which a pinhead was used to apply pressure to the lesion. The point at which intense pain was experienced would confirm the affected area containing the glomus tumour. This was correlated with MRI findings, and the glomus site was hence marked precisely. A rectangular flap of nail plate was then marked over and beyond the glomus site. This was based proximally and elevated over the nail bed, leaving a rim of normal nail as a perimeter (**Figure 1A**). The underlying nail bed was incised in linear fashion at the flap bed and the glomus tumour was excised (**Figure 1B**). Following hemostasis and repair of the nail bed, the nail plate flap was replaced back and left unsutured (**Figures 1C** and **1D**). This would allow any collection to leak out. A firm crepe dressing was placed over Vaseline gauze, and the patients were called for review on the next available slot in the Out-patient department (OPD). Oral analgesics were advised for three days and no antibiotics were administered. The dressing was changed at the first visit and patients were thereafter called for review after two weeks. Follow-up for nail growth and deformity was advised at three-month intervals for six months post-operatively. An OPD review or telephone follow-up was done after 12 months for symptoms or recurrence.

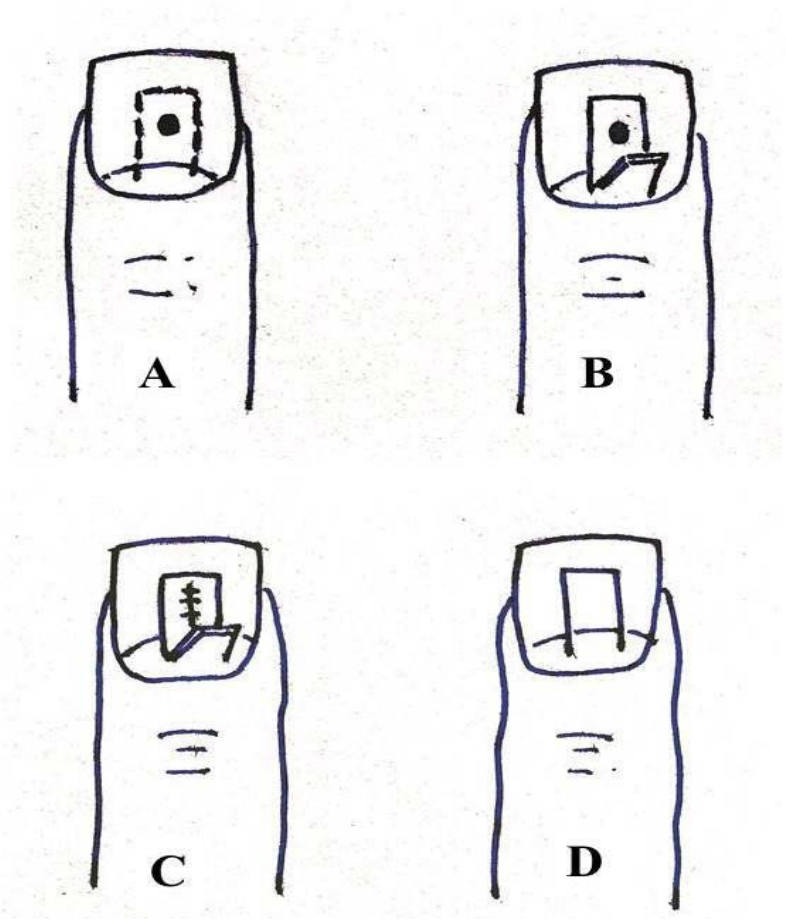


**Figure 1.** Clockwise from top left: (**A**) glomus and flap marking, (**B**) nail plate flap raised on proximal base to expose glomus, (**C**) tumour excision and nail bed repair, and (**D**) flap replacement on nail bed


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## Results

Our patients ranged from 16–54 (average: 32.7) years old and all were females. The right hand was involved in four patients. All patients presented with classic symptoms of exquisite pain and tenderness but only three cases had cold sensitivity. Symptoms' duration ranged from 1–6 years (average 2.8 years) and all patients had been to various practitioners for treatment. One young girl of 19 years old had been undergoing psychiatric consultation for a year prior to referral. X-rays were done in all cases and were reported as normal except in one case where terminal phalanx revealed erosion. All except one case underwent an MRI for confirmation and localization of lesion. The MRI showed a typical bright star enhancement in all scans.

Accurate MRI-based localization permits a nail-preserving proximal nail plate flap approach. This could be achieved in all six cases. The nail plate flap was raised beyond the lesion, leaving a perimeter of intact nail, and the glomus excised. The tumour was usually evident as a tense, well-limited, non-encapsulated pearly white swelling of 1–3 mm size (**Figures 2A** and **2B**). In all six cases, the planned flap encompassed the tumour and permitted complete excision. No nail plate flaps required alterations, additional nail incision or excision. All patients reported immediate relief of symptoms and appeared pleasantly surprised at the outcome. Two patients remained reluctant to touch the area out of fear till pain relief was demonstrated. Histopathological examination (HPE) confirmed glomus tumour in all six cases. Early follow-up revealed minimal discoloration at the flap bed, which resolved in 3–4 weeks (**Figure 2C**). No obvious nail deformity was evident after three months. Normal nail growth was observed in the operated digit, and was comparative to the normal remaining digits. This can be appreciated in the henna-coloured nails of one of our patients (**Figure 2D**).

## Discussion

Glomus tumours are rare ectodermal tumours arising from the glomus body, which regulates blood flow and thermal regulation. Also called paragangliomas and by a

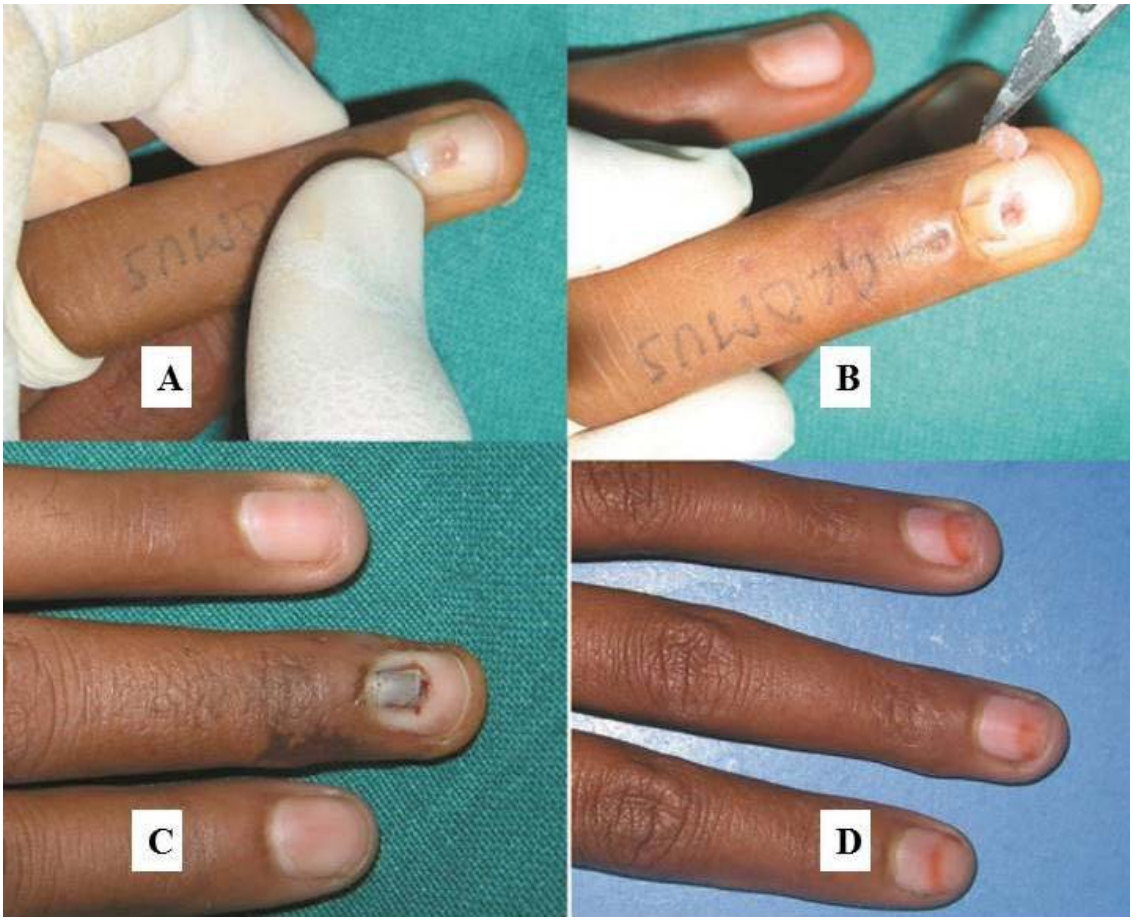


**Figure 2.** (**A**) A proximal-based rectangular nail plate flap was elevated and flipped back to expose the pearly white glomus. (**B**) Excision of the tumour; the raised flap was evident. (**C**) Two weeks post-operative, the unsutured reposited flap was merging with the remaining nail plate. (**D**) Three months post-op; no obvious deformity was evident, with normal nail growth comparative to the other digits, as evident from the henna-stained nails.

variety of names such as chemodectomas, glomangioma or receptomas, they are notable by their rarity[3]. Being of neural crest origins and part of the diffuse neuroendocrine system, the cells have similar functions and histological appearance. The glomus is a normal neuromyoarterial arteriovenous shunt with temperature regulation function[4]. Sympathetic paragangliomas arise from the adrenal medulla and visceral autonomic ganglia whereas parasympathetic paragangliomas are found throughout the body.

The subungual location is classical, and it is rare to see a glomus tumour in soft tissues of other parts of the body. Very rarely, glomus tumours may display unusual features such as large size, deep location or infiltrative growth. Local invasion is exceptional, and malignancy and metastasis too are rarely reported[5].

The surgical approach has undergone changes over the years, with greater concern for minimizing morbidity and improving cosmesis. A nail excision approach was employed till recently[6]. Though ensuring wide exposure and complete excision, it left a tender and exposed nail bed, with chances of distorted nail if the matrix was injured. Resuturing of the excised nail was sometimes done to provide cover to the tender nail-exposed nail bed. This technique was gradually replaced by a subungual or periungual approach based on the tumour location[7]. Nazerani *et al.* advised nail removal and replacement as a template following excision, while Tomak *et al.* advocated radial/ulnar incisions and folding of the nail[8,9]. Nail ridging is a concern, and modifications using a subperiosteal approach have been advocated. Recently a nail-preserving approach has been described by Lee *et al.* The authors employed diagonal nail-fold incisions, with elevation and the flipping over of the proximal nail plate. After tumour removal, the nail plate was reposited and folds resutured. The authors felt that a wide exposure permitted complete excision and decreased recurrences. They also recommended proximally-based nail flipping in cases of distal glomus tumours[10].

We employed MRI for precise localization of the glomus. The characteristic image of glomus tumours on these scans is a high signal central dot surrounded by a zone of lower signal intensity[11]. They show low signal intensity on T1-weighted images, high signal intensity on T2-weighted images, and enhancement on T1-weighted images after gadolinium injection. MRI is additionally useful as it delineates the size of the tumour and its precise location. Multiple lesions are also identified and this increases the chance of complete excision[12]. The approach we have employed was simple and different compared to the nail-preserving surgery described by Lee *et al*. We raised a smaller flap from the insensate nail plate itself. We based this flap proximally over the pliable lunula and everted it for access to the nail bed and tumour. The flap was raised, ensuring that a perimeter cuff of healthy nail was retained all around (**Figure 1**). Following the nail bed incision, the tumour was delineated and excised. The nail bed was repaired and the nail plate flap reposited over the same without suturing. On follow-up of our cases, there was no evidence of nail deformity. The proximal-based nail plate flap technique appears to be a satisfactory option for subungual glomus, mainly the central lesions. There was no need to suture back the nail flap and we relied on a firm cohesive crepe bandage to ensure its repositioning. Though we did not have the occasion to do so, radial/ulnar- or distally-based nail plate flaps may be feasible in selected cases. The protective cover provided by the nail plate flap appears to have beneficial effects in pain relief and safety against trauma. As commonly agreed to, currently both pain relief and aesthesis are important considerations in managing subungual glomus tumours.

The nail flap technique requires precise pre-operative localization of the lesion. This can be achieved to within millimetric accuracy either clinically by a pin test or by MRI. Earlier operators did not have the luxury of pinpoint localization afforded by MRI, but the current easy availability of this technique and its typical findings ensure that nail plate flaps can be planned without risk of flap malpositioning, while also ensuring that multiple lesions, though rare, are not missed. This also prevents overly extensive excision that may induce further unnecessary trauma on the patient and lead to chances of post-operative nail deformity if the nail matrix is injured[13]. We did not have the occasion to change our approach in any of the six cases including the one in which only clinical localization was done. No recurrences were observed on one-year follow-up.

## Conclusion

It is felt that the nail plate flap approach may be a useful addition to the available surgical approaches in dealing with a subungual glomus, especially the central lesions. Though difficult to demonstrate the comparative efficacy of post-operative pain relief between the different approaches, it is reasonable to accept that at least an intact nail plate will be protective. The good cosmetic outcomes, which are apparent within weeks, are an added advantage of the minimalistic approach.

## Conflict of interest

The author declares no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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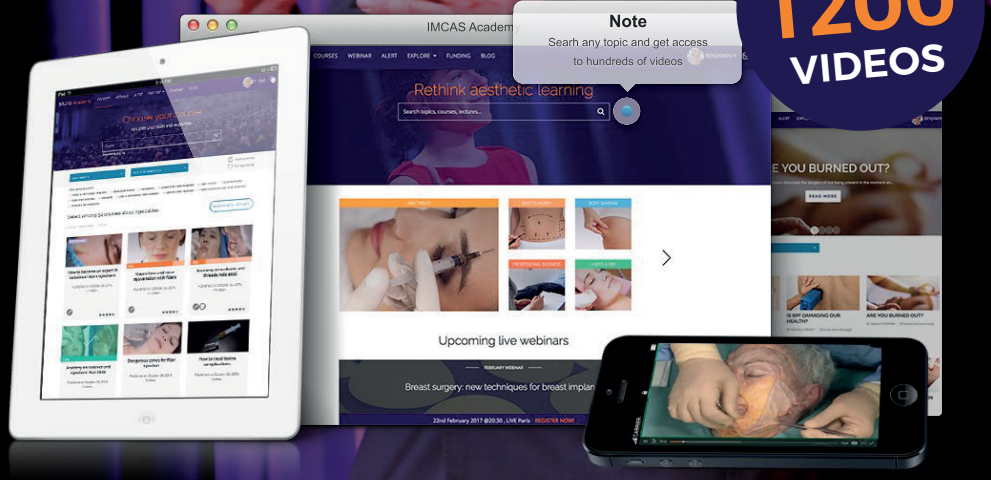


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