

RHINOLOGY

Endoscopic ultrasonic curette-assisted removal of frontal osteomas

Curette per l'osso ad ultrasuoni per la rimozione degli osteomi del frontale

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SUMMARY

Indications for endoscopic resection of fronto-ethmoidal osteomas have been progressively expanded thanks to optimization of surgical exposure and the development of dedicated instruments. Curved cutting drills are still suboptimal to treat hard osseous neoplasms of the frontal sinus. We present two patients affected by frontal osteoma treated with an endoscopic procedure using an ultrasonic bone curette. The ultrasonic bone curette may be considered an effective tool to reduce soft tissue manipulation, optimize surgical time and accelerate the healing process. However, the technique requires significant shape innovations to reach the lateral recesses and to manage pure intrasinus lesions.

KEY WORDS: Frontal sinus • Sinusoidal osteomas • Ultrasonic curette

RIASSUNTO

Le indicazioni alla chirurgia endoscopica nel trattamento degli osteomi fronto-etmoidali si sono progressivamente estese grazie all'ottimizzazione dell'esposizione chirurgica ed allo sviluppo di una strumentazione dedicata. Le frese curve sono ancora subottimali nel trattamento di lesioni ossee eburnee del seno frontale. Presentiamo due pazienti affetti da osteoma frontale trattati con procedura endoscopica utilizzando la curette per osso ad ultrasuoni. La curette ad ultrasuoni può essere considerato un efficace strumento chirurgico per ridurre la manipolazione dei tessuti molli e per ottimizzare i tempi chirurgici e del processo di guarigione. Tuttavia è necessario migliorare la forma dello strumento per permettere di raggiungere i recessi più laterali e gestire lesioni localizzate interamente nel seno frontale.

PAROLE CHIAVE: *Seno frontale • Osteomi nasosinusalì • Curette ad ultrasuoni*

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Introduction

Osteomas of the sinonasal complex are benign bony tumours often incidentally discovered in asymptomatic patients during head imaging or neuroimaging. Their location and dimension may cause recurrent sinusitis, headache or orbital complaints¹⁻⁵.

Since the early 1990s, the indications for endoscopic resection of fronto-ethmoidal osteomas have been progressively expanded, with a constant refinement in the definition of contraindications and limits⁶⁻¹⁴. The evolution of the indications¹⁵⁻¹⁷ clearly reflects the optimization of the surgical exposure (i.e. use of the contralateral nostril in a Draf III procedure) and the development of dedicated instruments. Curved drills are usually adopted in this surgical setting, although all are limited by low speed and efficacy. Straight and 20° high-speed drills can be used, even though the need for aspiration and the bone dust produced may limit visualization and increase the tediousness and length of the procedure. Furthermore, minimizing mucosal trauma is essential to facilitate healing, prevent crusting and infection of denuded bone, reduce scar tissue formation and avoid

stenosis of the frontal recess. Since 2008, during extended transnasal approaches to the skull base we have combined high-speed microdrill and sonic bone emulsification in selected cases. The ultrasonic bone curette (Sonopet Ultrasonic Aspirator, Stryker®, Kalamazoo, MI, USA) was tested in two frontal osteomas to evaluate its cost efficacy and possible advantages in this specific setting. We selected small lesions located in the fronto-ethmoidal recess without complete filling of the frontal sinus. Preliminary evaluation of the device focused on the following endpoints: the traumatic impact of the device on surrounding mucosa, the balance among emulsification, irrigation, suction and endoscopic view, the lack of good visualization of the tip of the instrument in the lateral aspect of frontal sinus, and finally the speed and effectiveness of the healing process.

Materials and methods

Case 1

A 50-year-old woman was seen for symptoms (nasal obstruction, rhinorrhoea, headache) related to chronic

rhinosinusitis. She had previously undergone several endoscopic procedures at other institutions, with minimal improvement of symptoms. CT scan showed a radiodense mass suggestive for osteoma, occupying the right frontal recess with obstruction of the frontal drainage pathway (Fig. 2). Dishomogeneous ossification at the superior aspect of the lesion and its ground-glass pattern suggested a reduced consistence in its upper part. She underwent endoscopic transnasal removal (Fig. 3A); the operative time was about 2 hours and she was discharged on the 2nd postoperative day. Follow-up nasal endoscopy at 1 and 6 months confirmed adequate and quick healing with minimal scar formation (Fig. 3B). She was free from symptoms after 26 months of follow-up.

Case 2

This patient was a 40-year-old male with a clinical history of recurrent frontal sinusitis resistant to conventional conservative treatment. CT scan revealed a hyperdense lesion occupying the right frontal sinus abutting into the frontal recess (Fig. 4). He underwent endoscopic transnasal removal (Fig. 5); the operative time was about 2 hours and he was discharged on the 2nd postoperative day. Follow-up nasal endoscopy at 1 and 6 months confirmed adequate healing. He was free from symptoms at 24 months after surgical procedure.

In both cases, endoscopic evaluation 1 month after surgery showed complete healing without significant oedema or scar deposition.

Surgical procedure

Both patients were positioned supine, with hyperextension of the head (Fig. 1). After topical decongestion and injection of the upper part of the uncinate process with adrenaline and mepivacaine, endoscopic examination directly demonstrated the inferior aspect of the lesion in the first patient. The extent of the surgical approach has been tailored on a case specific basis (i.e. anterior ethmoidectomy, uncinectomy, middle turbinectomy, opening of an antero-superior septal window). In case 1, once the inferior aspect of the osteoma was identified to be covered by scarred mucosa, the ultrasonic bone curette

was introduced through the right nostril, running it over the endoscope; after blunt dissection of surrounding mucosa, the tip of the device was applied directly on the medial aspect of the lesion which was emulsified in 45 min under continuous close-up view. The residual lateral shell of bone was dissected and removed leaving the lamina papyracea intact.

In case 2, a type IIb Draf sinusotomy allowed exposure of the boundaries of the lesion which was gradually reduced



Fig. 1. Schematic drawing shows the position of the device running over the angled endoscope. Head extension improves the working angle.

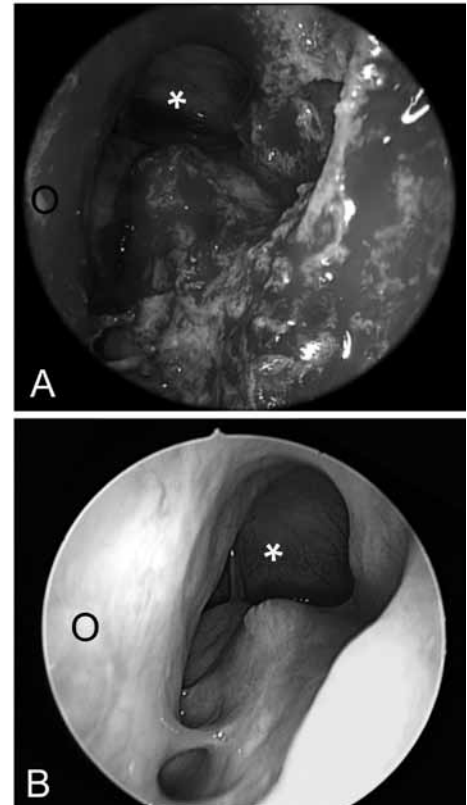


Fig. 3. Intraoperative and postoperative endoscopic views of case 1. A: after lesion removal the mucosa of the lamina papyracea is partially maintained. B: Postoperative examination at 6 months with angled telescope highlights complete healing with no stenosis of the frontal recess.

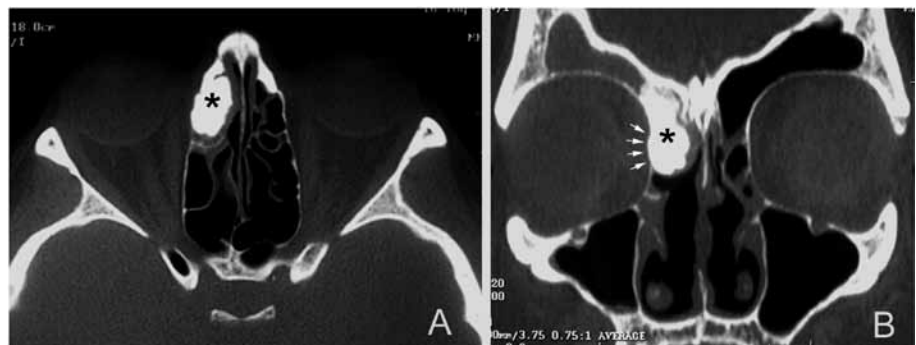


Fig. 2. Preoperative CT scan of case 1 shows an osteoma (asterisk) occluding the right frontal recess. Note the remodelled lamina papyracea (arrows) and the lesion attachment over the posteroinferior aspect of the frontal sinus. Axial (A) and coronal (B) plane.

with the use of the ultrasonic curette in about 1 hour. The Spetzler microclaw tip (Stryker®, Kalamazoo, MI, USA) was adopted in both cases allowing lesion emulsification with only one side of the tip, maximally preserving the surrounding mucosa (Fig. 5).

Discussion

Even if an external approach to the frontal sinus still has a role in the treatment of osteomas, multiple series published in the last 15 years support the efficacy and safety of an endoscopic approach through a transnasal corridor in properly selected fronto-ethmoidal lesions¹⁷. Moreover, the increasing surgical experience and development of dedicated instrumentation allow resection of selected frontal lesions even when extended over the orbital roof¹⁷.

The use of ultrasound curette in endoscopic transnasal procedures has been reported in the literature for inferior turbinoplasty¹⁸, sculpting of the nasal dorsum¹⁹, lateral orbital decompression²⁰

and removal of a fronto-ethmoidal osteoma²¹. This instrument delivers, in one hand piece, tissue fragmentation by rapid longitudinal motion, irrigation through coaxial flows around the tip to suspend fragmented tissue and cool the tip and aspiration with removal of fluid and fragmented tissue with a cannulated tip and suction.

In our Department, between 1996 and 2011, 20 patients underwent endoscopic transnasal removal of a frontal osteoma (17 frontal, 3 fronto-ethmoidal) with a mean operating time of 4.8 hours (1-12 hours; unpublished data). The heterogeneity of cases and progressive evolution of the learning curve are both factors influencing the surgical time. We endoscopically approached these tumours with a type II or III Draf sinusotomy depending on the site and size of the lesion. Standard endoscopic instruments were used to expose the caudal portion of the lesion; subsequently cavitation of the osteoma was performed using curve cutting drills to mobilize the peripheral fragments and minimize damage to surrounding tissues. In our preliminary experience, the ultrasonic bone curette does not increase the operating time in properly selected patients. Furthermore, the possibility to limit the working surface on one side of the device minimized mucosal damage, with subsequent easier care in the early postoperative course with almost no need to remove

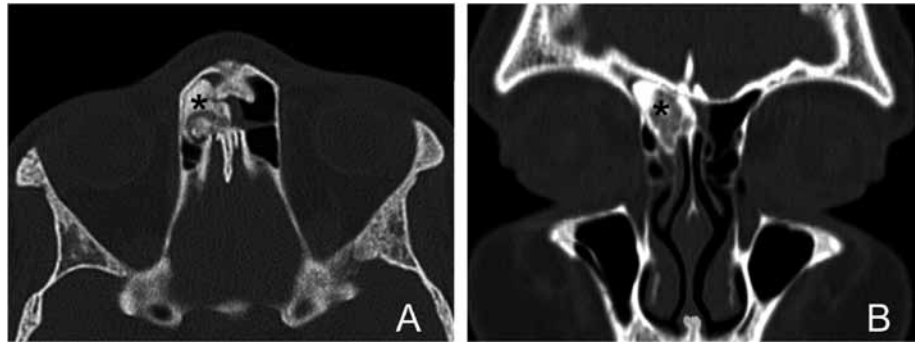


Fig. 4. Preoperative CT scan of case 2 shows an osteoma (asterisk) located in the right frontal recess and inserted at the anterolateral aspect of the right cribriform plate. Axial (A) and coronal (B) plane.

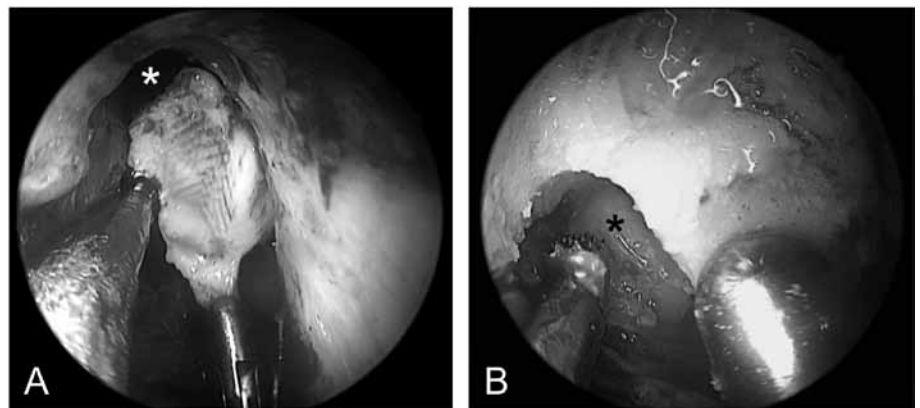


Fig. 5. Intraoperative images of case 2. After lesion cavitation and dissection from surrounding structures, the residual shell of bone is further reduced with a four-hand technique (white asterisk indicates the frontal sinus). B: close-up view. Note the mucosa surrounding the lesion (black asterisk), which is spared by the device.

granulation tissue or fibrin debris. During the procedure we never experienced slippage of the instrument, and its use was easy and straightforward compared to a traditional microdrill since this device integrates irrigation and aspiration and requires no pressure over the working surface. Quick healing was documented during follow up with minimal scar formation (Fig. 3B). Further experience will be essential to confirm the low morbidity, efficacy, speed and cost-effectiveness of this device. However, two main factors may contribute to a favourable application in transnasal approaches to the frontal sinus: the line of sight is improved since this device provides a bone emulsification-irrigation-suction mechanism in a single hand, and the oscillating energy of the working area is limited to a single side of the tip to prevent slippage. Moreover, minimal bone dust production and its constant aspiration consents continuous clear endoscopic view of the surgical field and the presence of dedicated tips improve the adaptability of the device to the working surface.

In contrast, the absence of curved tips designed specifically for frontal sinus endoscopic surgery limits its use to properly selected cases, and the costs of the tips are not negligible, even if the main unit can be shared among different departments of the same hospital.

Conclusions

Endoscopic surgery has a predominant role in the management of benign tumours of the sinonasal tract. Despite advances in image definition and instrumentation, visualization may still represent an issue, mainly during bone drilling in narrow spaces. State-of-the art curved cutting drills are still suboptimal to treat hard osseous neoplasms of the frontal sinus. Therefore, during endoscopic transnasal removal of frontal sinus osteoma, an ultrasound bone curette can be considered an effective tool to reduce soft tissue manipulation, optimize surgical time and speed the healing process. Furthermore, despite its straight configuration, this low profile device may be amenable for further developments and applications far lateral along the coronal plane in the frontal sinus, but which will require significant shape innovations to reach the lateral recesses and manage pure intrasinus lesions.

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