Endoscopic ultrasonic curette-assisted removal of frontal osteomas

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

A. Bolzoni Villaret, A. Schreiber, I. Esposito, P. Nicolai
Department of Otorhinolaryngology, University of Brescia, Italy

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 intrasinusal lesions.

KEY WORDS: Frontal sinus • Sinunasal osteomas • Ultrasonic curette

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 complaints. 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 limits. The evolution of the indications 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, rhinorrhea, 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...
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 lesions. Moreover, the increasing surgical experience and development of dedicated instrumentation allow resection of selected frontal lesions even when extended over the orbital roof. The use of ultrasound curette in endoscopic transnasal procedures has been reported in the literature for inferior turbinoplasty, sculpting of the nasal dorsum, lateral orbital decompression and removal of a fronto-ethmoidal osteoma. 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 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 intrasinusal lesions.

References

1. Pagella F. Transnasal endoscopic approach to symptomatic sinonasal osteomas. Am J Rhinol Allergy 2012;26:335-9.
2. Viswanatha B. Maxillary sinus osteoma: two cases and review of the literature. Acta Oto Rhino laryngol Ital 2012;32:202-5.
3. Ciorba A, Aimoni C, Bianchini C, et al. Bilateral osseous stenosis of the internal auditory canal: case report. Acta Otorhino laryngol Ital 2011;31:177-80.
4. Dispensa C, Martines F, Dispensa F, et al. Frontal sinus osteoma complicated by palpebral abscess: case report. Acta Oto Rhino laryngol Ital 2004;24:357-60.
5. Bertoletti F, Capolunghi B, Bertolini G, et al. Giant osteoid osteoma of ethmoid sinus: role of functional endoscopic sinus surgery. Acta Otorhinolaryngol Ital 2004;24:297-301.
6. Draf W, Weber R, Keesl R, et al. Current aspects of frontal sinus surgery. Part I: Endonasal frontal sinus drainage in inflammatory diseases of the paranasal sinuses. HNO 1995;43:352-7.
7. Schick B, Steigerwald C, el Rahman El Tahan A, et al. The role of endonasal surgery in the management of frontoethmoidal osteomas. Rhinology 2001;39:66-70.
8. Chiu AG, Schipor I, Cohen NA, et al. Surgical decisions in the management of frontal sinus osteomas. Am J Rhinol 2005;19:191-7.
9. Castelnuovo P, Giovannetti F, Bignami M, et al. Open surgery versus endoscopic surgery in benign neoplasm involving the frontal sinus. J Craniomax 2009;20:180-3.
10. Castelnuovo P, Valenti V, Giovannetti F, et al. Osteomas of the maxillofacial district: endoscopic surgery versus open surgery. J Craniomax 2008;19:1446-52.
11. Bignami M, Dallan I, Terranova P, et al. Frontal sinus osteomas: the window of endonasal endoscopic approach. Rhinology 2007;45:315-20.
12. Dubin MG, Kuhn FA. Preservation of natural frontal sinus outflow in the management of frontal sinus osteomas. Otolaryngol Head Neck Surg 2006;134:18-24.
13. Seiberling K, Floreani S, Robinson S, et al. Endoscopic management of frontal sinus osteomas revisited. Am J Rhinol Allergy 2009;23:331-6.
14. Ledderose GI, Betz CS, Stelter K, et al. Surgical management of osteomas of the frontal recess and sinus: extending the limits of the endoscopic approach. Eur Arch Otorhino laryngol 2011;268:525-32.
15. Georgalas C, Goudakos J, Fokkens WJ. Osteoma of the skull base and sinuses. Otolaryngol Clin North Am 2011;44:875-90.
16. Gil-Carcedo LM, Gil-Carcedo ES, Vallejo LA, et al. Frontal osteomas: standardising therapeutic indications. J Laryngol Otol 2011;125:1020-7.
17. Turri-Zanoni M, Dallan I, Terranova P, et al. Frontoethmoidal and intraorbital osteomas: exploring the limits of the endoscopic approach. Arch Otolaryngol Head Neck Surg 2012;138:498-504.
18. Greywoode JD, Van Abel K, Pribitkin EA. Ultrasonic bone aspirator turbinoplasty: a novel approach for management of inferior turbinate hypertrophy. Laryngoscope 2010;120(Suppl 4):S239.
19. Pribitkin EA, Lavasani LS, Shindle C, et al. Sonic rhinoplasty: sculpting the nasal dorsum with the ultrasonic bone aspirator. Laryngoscope 2010;120:1504-7.
20. Cho RI, Choe CH, Elner VM. Ultrasonic bone removal versus high-speed burring for lateral orbital decompression: comparison of surgical outcomes for the treatment of thyroid eye disease. Ophthal Plast Reconstr Surg 2010;26:83-7.
21. Pagella F, Giourgos G, Matti E. Removal of a fronto-ethmoidal osteoma using the sonopet omni ultrasonic bone curette: first impressions. Laryngoscope 2008;118:307-9.

Address for correspondence: Andrea Bolzoni Villaret, Department of Otorhinolaryngology, University of Brescia, Italy. Tel. +39 030 3995319. E-mail: dr.bolton@libero.it

Received: January 14, 2013 - Accepted: June 27, 2013