

MAXILLO FACIAL SURGERY

Trans-nasal endoscopic and intra-oral combined approach for odontogenic cysts

Approccio combinato trans-nasale endoscopico e intra-orale alle cisti odontogene

P. PROCACCI¹, L. LANARO¹, G. MOLteni², D. MARCHIONI², F. LONARDI¹, S. FUSETTI³, P.F. NOCINI¹, M. ALBANESE¹

¹ Section of Dentistry and Maxillo-facial Surgery, ² Section of Otolaryngology, Department of Surgical Sciences, Paediatrics and Gynaecology, University of Verona, Italy; ³ Section of Dentistry and Maxillo-facial Surgery, Department of Neuroscience, University of Padova, Italy

SUMMARY

Maxillary cysts are a common finding in maxillofacial surgery, dentistry and otolaryngology. Treatment is surgical; a traditional approach includes Caldwell-Luc and other intra-oral approaches. In this article, we analyse the outcomes of 9 patients operated on using a combined intra-oral and trans-nasal approach to the aforementioned disease. Although the number of patients is small, the good results of this study suggest that the combined approach might be a reliable treatment option.

KEY WORDS: Maxillary cysts • Maxillofacial surgery • Otolaryngology • Trans-nasal endoscopic surgery

RIASSUNTO

Le cisti mascellari sono un'evenienza comune nella pratica clinica degli specialisti del settore Odontoiatrico maxillo-Facciale e Otorinolaringoiatrico. Il trattamento della patologia è esclusivamente chirurgico. Tradizionalmente gli approcci chirurgici descritti per il trattamento di questa patologia sono di tipo intra-orale (ad esempio la chirurgia secondo Caldwell-Luc, mutuata dalla chirurgia per la sinusite). In questo articolo basato sulla revisione retrospettiva di 9 pazienti operati con approccio combinato per cisti del seno mascellare, abbiamo analizzato i risultati di questa procedura. Anche se il numero dei pazienti è esiguo e i risultati sono da validare su un campione più ampio, il risultato di perfetta guarigione, i dati sul tempo di ospedalizzazione e la mancanza di gravi complicazioni suggeriscono che il trattamento sia valido.

PAROLE CHIAVE: Cisti mascellari • Chirurgia maxillo-facciale • Otorinolaringoiatria • Chirurgia endoscopica trans-nasale

Cite this article as: Acta Otorhinolaryngol Ital 2018;38:439-444. <http://dx.doi.org/10.14639/0392-100X-1915>
© Società Italiana di Otorinolaringologia e Chirurgia Cervico-Facciale

Introduction

Odontogenic cysts are a common pathological finding in oral and maxillofacial surgery. The most common are radicular cysts, followed by dentigerous cysts and odontogenic keratocysts ¹.

Maxillary cysts can expand through maxillary sinus walls causing subtotal or total occupation of the sinus, and can also reach the nasal floor and nasal septum. Nasal obstruction, sinusitis, infraorbital nerve dysfunction, disruption of the normal bone profile of the maxilla, the nasal floor or the medial wall of the maxillary sinus are possible consequences ².

Imaging plays a key role in the diagnosis of maxillary odontogenic cysts, which are usually characterised by

eroding neo-formations that tend to erode the maxillary bone and/or dislocate cranially the floor of the maxillary sinus. Hypo-dense areas of these cysts are in continuity with one or more teeth, which can be included in case of follicular odontogenic cysts or in continuity with dental root/s in case of odontogenic inflammatory cysts. If these signs are present, mucocele can be excluded, since it usually does not erode the maxillary bone or alter cortical bone. Differential diagnosis between ameloblastoma and keratocyst is not simple using radiographical images alone. There are some characteristics that are suggestive and can be used during the diagnostic phase: ameloblastomas tend to erode the dental root, while odontogenic cysts tend to not do so. In the end, the only definitive diagnosis is made by biopsy.

Maxillary odontogenic cyst and neoplasm have been treated for the last decades by open trans-oral or trans-facial surgical approaches³⁻⁵ keratocystic odontogenic tumour (KCOT). These procedures require a trans-oral incision and most of the affected teeth are extracted alongside with the cyst walls. Morbidity includes oroantral fistulas, need for extensive reconstruction, loss of surrounding dentition and chronic rhinosinusitis⁶.

Trans-nasal endoscopy has been recently described as a useful surgical option in several approaches to the facial skeleton and skull base; however, the exclusive endoscopic trans-nasal approach for odontogenic cyst is seldom possible. Endoscopy provides less invasive surgery and high definition direct view on the lesions^{7,8}, and therefore a combined trans-nasal and trans-oral approach was chosen to treat the dental pathology in the same surgical session. This series describes the use of a combined endoscopic trans-oral and trans-nasal surgical approach for the management of large maxillary odontogenic cysts.

Description of the clinical technique

Nine patients diagnosed with maxillary odontogenic cyst were referred to our department and operated on between March 2013 and June 2017. Informed consent was obtained from all patients. Due to the retrospective nature of the study, it was granted exemption by the Verona University institutional review board. Seven patients presented with a cyst born in the maxillary sinus, one patient presented with a cyst of the premaxilla and one presented a large lesion of the infratemporal fossa.

Oral health was accurately investigated looking for active dental pathologies such as periodontitis, caries, etc. Each patient was administered a preoperative SNOT20 questionnaire. Most patients reported few nonspecific symptoms like swelling and mild pain. However, when asked specific questions (as those present in the SNOT20) their score was suggestive for a specialist consult, and interestingly these symptoms, and the related SNOT20 score, did not correlate with severity of disease.

All patients underwent the same preoperative examination: Panorex and CT of the maxillofacial complex and paranasal sinuses; CT scans were evaluated to assess Lund-Mackay score for each subject. The radiological examination allowed to establish the precise boundaries of the lesion that the surgeon would find during the endoscopic dissection (Fig. 1).

Patients underwent surgery after a preoperative antibiotic therapy with ciprofloxacin (500 mg/day for 7 days).

Surgery started with the trans-nasal endoscopic approach. Nasal cavities and paranasal sinuses were thoroughly ex-

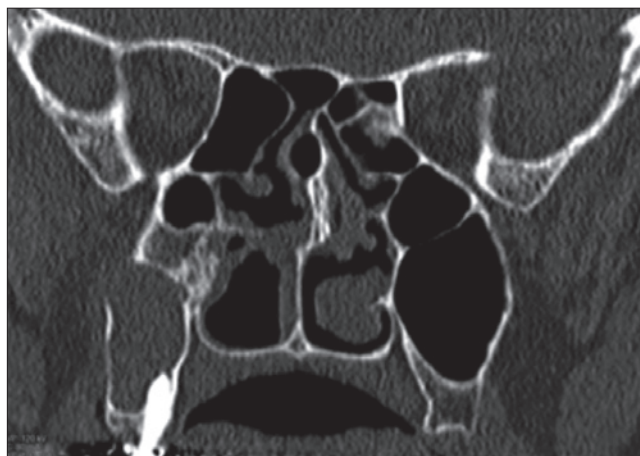


Fig. 1. Maxillary cyst CT scan coronal view.

plored and analysed to evaluate extension of the disease and possible presence of sinusitis. A direct 4 mm 0°, 45° or 70° endoscope was used (Karl Storz GmbH & Co KG, Tuttlingen, Germany).

In case of clear pathological involvement of the paranasal sinuses, anterior and posterior ethmoidectomy and frontal sinusotomy were performed. Once the anatomical key-points were identified, a maxillary antrostomy was performed allowing the surgeon to directly reach the medial-posterior side of the lesion occupying the maxillary sinus.

The unattached portion of the maxillary cyst was delivered from the lateral and anterior side of the sinus and debulked. In order to access the inferior portion of the maxillary sinus, an endoscopic maxillary mega-antrostomy was performed in the standard fashion⁹ poor mucociliary clearance may result from long-standing inflammation or scarring from previous surgery. This subset of patients often has persistent sinus disease despite medical therapy and adequate antrostomy: endoscopic maxillary mega antrostomy (EMMA).

In case of lesions invading the bony structure of the premaxilla, the nasal floor was accurately investigated to detect any mucosal or bone defect.

Once endoscopic dissection had been performed, a crestal incision was sculptured to elevate a mucoperiosteal flap and expose the lateral aspect of the maxillary bone and the underlying neoplasm. In four cases, teeth involved in the lesions were extracted at this point; the cysts were then dissected from the residual maxillary bone (Fig. 2).

In one patient, the lesion involved 10 teeth (1.5 to 2.5). In this case, the endoscope was used to magnify periapical lesions to obtain accurate dissection of the lesions from teeth.

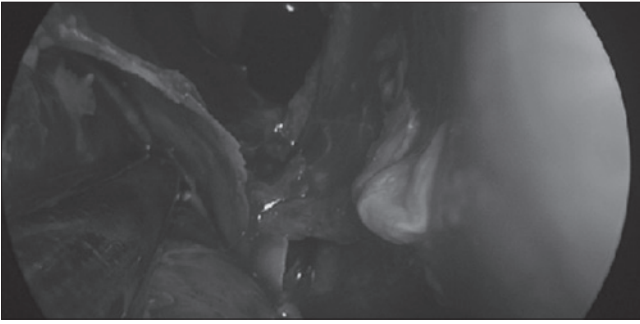


Fig. 2. Maxillary cyst endoscopic view: the cyst is mobilised from the medial wall of the maxillary sinus.

In one patient, the lesion was located in the pterygo-palatine fossa and the posterior wall of the maxillary sinus was anteriorly displaced. Endoscopic transnasal maxillectomy type 2 was performed according to Turri-Zanoni et al.¹¹, and a pre-lacrimal approach was considered inadequate to treat this particular case as it did not grant appropriate control over the pathology. In case of a lesion invading the posterior maxillary sinus, MRI is mandatory to evaluate involvement of the pterygoid muscles and nervous structures that are in close relationship with the fossa. In this case, the lesion had an expansive nature and did not erode the cranial base, but invaded the orbit. For these reasons, the authors decided to proceed with the combined technique trans-nasal and intra-oral approach, otherwise radical surgery was not considered possible (Figs. 3, 4).

Any residual sharp bony edge was smoothed by round burrs. An ipsilateral buccal fat pad flap was harvested in five cases to close the bony defect. The buccal fat pad flap was sutured to the residual edges of the maxilla with a multilayer suture technique. The size of the buccal fat pad flap was sufficient to achieve a complete and tension-free closure of the bony defect (Fig. 5).

In case of peri-nasal soft tissue dissection, the intervention contemplated the skeletonisation of the piriform and possibly the anterior nasal spine. It is advisable to use an alar cinch suture to obtain a surgical alar base correct repositioning¹⁰.

Postoperative antibiotic therapy with amoxicillin and clavulanic acid (3 x 875 mg + 125 mg/day for 7 days) was administered, soft diet and frequent chlorhexidine mouthwashes were suggested. Nasal pads were removed 72 hours after surgery and intraoral sutures were removed 15 days after surgery.

A CT scan was performed at 3 months after surgery to reassess the Lund-Mackay score, and a new SNOT20 questionnaire was administered at three months after surgery. In order to restore the natural clearance of the maxillary

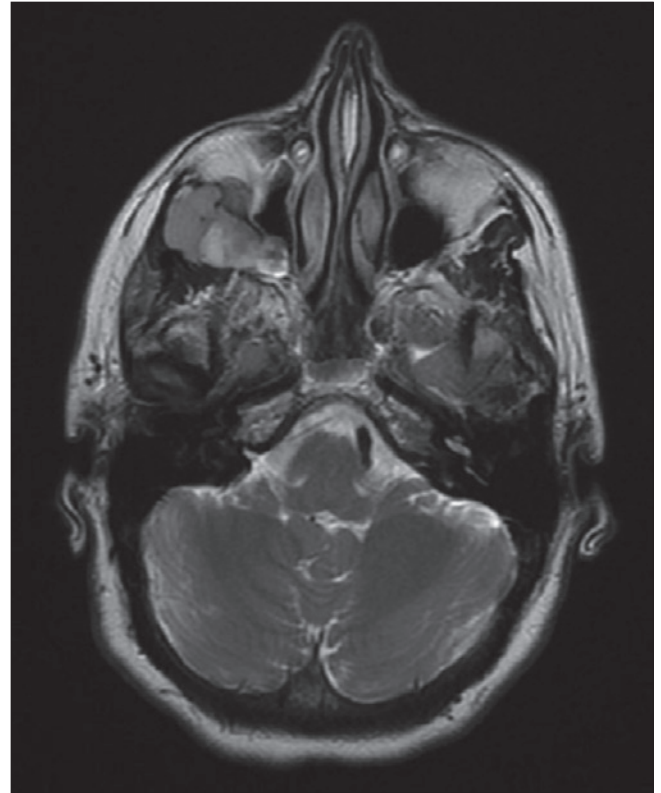


Fig. 3. Preoperative MRI.

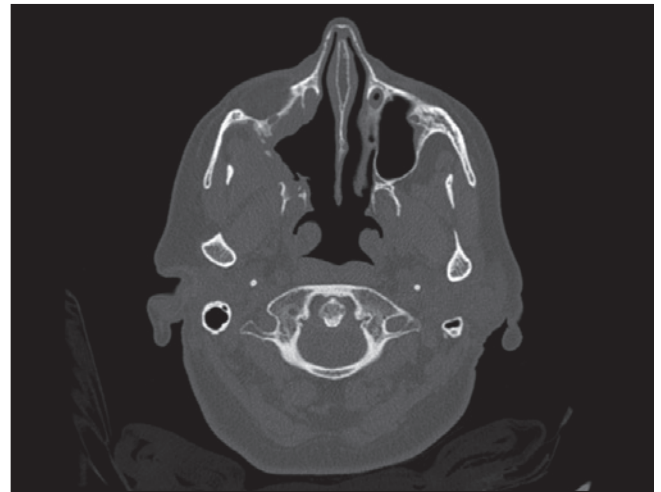


Fig. 4. Postoperative CT scan.

sinus and prevent rhino-sinusal problems the ostium of the maxillary sinus was enlarged as suggested by present day literature¹¹.

Postoperative Lund-MacKay scores were compared with preoperative scores and showed significant improvement. Comparison between preoperative and postoperative



Fig. 5. Buccal fat pad flap is mobilised and sutured to the maxillary bone to reconstruct the defect.

SNOT20 questionnaires showed a substantial reduction, with an improvement in quality of life (Table I).

Patients were followed monthly for 6 to 18 months, and no radiological complication occurred during postoperative follow-up. There were some postoperative complications such as malar oedema in all cases and malar haematoma in 6 cases. In one case the patient complained of infraorbital transient paraesthesia that spontaneously resolved at about 6 months after surgery.

Conclusions

A traditional surgical approach to odontogenic lesions is the trans-oral or trans-facial approach. Although the open approach allows a direct view of the lesions, it does not provide a clear vision of the medial and posterior sides of the lesion. Moreover, if the paranasal sinuses are not completely analysed during surgery it is possible that the lesion is not completely eradicated and therefore sinusitis could occur or relapse in a short time.

Table I. Patient data.

Patient	Gender	Age	Surgery	Final diagnosis	Location	Preoperative Lund-Macay	Postoperative Lund-Macay	Preoperative SNOT20	Postoperative SNOT20
AA	Male	48	Combined transnasal-intraoral, BFPF used	Odontogenic inflammatory cyst	Maxillary sinus, tooth 1.8	2	0	25	12
IA	Male	46	Combined transnasal-intraoral, BFPF used	Odontogenic cyst	Maxillary sinus, tooth 1.6	2	0	30	15
CA	Male	52	Combined transnasal-intraoral, Extraction 2.6-2.8	Odontogenic inflammatory cyst	Maxillary sinus, teeth 2.6-2.8	2	0	28	13
NE	Female	27	Combined transnasal-intraoral, Extraction 1.5, 1.6, mucosal scroll flap used	Odontogenic inflammatory cyst	Maxillary sinus, teeth 1.5, 1.6	2	0	32	14
RM	Female	50	Combined transnasal-intraoral, BFPF used	Odontogenic inflammatory cyst	Maxillary sinus, teeth 1.5-1.7	2	0	35	16
CZ	Male	50	Combined transnasal-intraoral, Extraction 1.7, Apicectomy 1.4	Odontogenic cyst	Maxillary sinus, teeth 1.6, 1.7	2	0	36	16
PG	Male	69	Extraction 3.6, Apicectomy 1.3, 1.4, 2.3, 2.4, mucosal scroll flap used	Giant radicular cyst	Maxillary sinus, nasal cavities, nasal septum, teeth 1.5-2.5	2	0	35	18
PM	Female	57	Combined transnasal-intraoral	Keratocyst	Maxillary sinus, infratemporal fossa	2	0	30	14
CM	Male	41	Combined transnasal-intraoral	Odontogenic inflammatory cyst	Maxillary sinus, teeth 1.6-1.7	2	0	27	13

A traditional surgical approach does not allow any type of adequate correction of nasal and paranasal sinus anatomy unless wide antrostomy is performed; however, wide antrostomy without an endoscopic approach is associated with an increased risk of postoperative complications.

Intraoral or external approaches require incisions through the oral mucosal or, in case of large lesions, directly through the skin with possible functional and/or aesthetic consequences.

On the other hand, an exclusive trans-nasal approach is characterised by some disadvantages such as the inability to remove all cyst remnants in some cases.

If a combined approach is necessary, the trans-nasal approach may decrease the extent of trans-oral dissection required to remove the entire lesion as most lesions can be removed transnasally, and small remnants may be removed transorally.

This technique has already been used for odontogenic neoplasms since it allows to perform extended resection of the neoplasm in the maxillary sinuses and consequently prevention of local recurrence¹².

Several reconstruction procedures have been described to correct secondary maxillary atrophy^{13,14} or fill the residual bony defect after odontogenic cyst removal^{15,16}, but this technique does not require secondary reconstruction procedures. Reconstruction, when necessary, is carried out using a buccal fat pad flap during the same session.

Cooperation between maxillo-facial and otolaryngologists is strongly recommended to obtain the most comprehensive treatment for the patient affected by cysts localised in the paranasal sinuses, orbit and skull-base¹⁷⁻¹⁹. The present experience is based on an effective collaboration between maxillofacial and ENT surgeons skilled in both endoscopy and oral surgery.

The combined endoscopic trans-oral and trans-nasal approach grants complete coverage of any pathological situation inside the paranasal sinuses and allows the surgeon to deal with it better, due to improved visualisation. The surgeon can manage the entire premaxillary region with complete control of the residual space inside the bone, and it is also possible to directly manage any eventual defect in the nasal floor or nasal septum involvement.

The combined trans-oral and trans-nasal endoscopic approach can reach complete control of the superior, posterior wall of the maxillary sinus. If associated with a megaantrostomy or endoscopic modified medial maxillectomy, it allows complete examination of the maxillary sinus and, if necessary, a path to the infratemporal fossa (Fig. 6).

In the present case series, there were no complications of traditional procedures such as oroantral fistulas or maxillary sinusitis. In the end, the treatment was less invasive

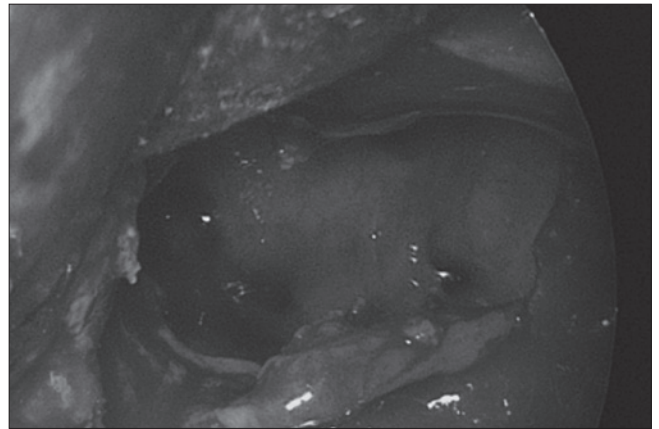


Fig. 6. Maxillary cyst eggshell.

with less morbidity. An endoscopic approach in the treatment of maxillary cysts may be helpful as both an exclusive and combined approach to obtain better magnification and a wider view of the pathology with minimally-invasive surgery. The number of patients is low and therefore our results are not statistically significant. Thus, further studies are necessary, even if the results of complete healing in all our patients, compared with a review of present literature, suggests that this treatment might be a reliable option.

Conflict of interest statement

None declared.

References

- Daley TD, Wysocki GP, Pringle GA. *Relative incidence of odontogenic tumors and oral and jaw cysts in a Canadian population*. Oral Surg Oral Med Oral Pathol 1994;77:276-80.
- Bilodeau EA, Collins BM. *Odontogenic cysts and neoplasms*. Surg Pathol Clin 2017;10:177-222.
- Deboni MCZ, Brozoski MA, Traina AA, et al. *Surgical management of dentigerous cyst and keratocystic odontogenic tumor in children: a conservative approach and 7-year follow-up*. J Appl Oral Sci 2012;20:282-5.
- Koca H, Esin A, Aycan K. *Outcome of dentigerous cysts treated with marsupialization*. J Clin Pediatr Dent 2009;34:165-8.
- Pogrel MA, Jordan RCK. *Marsupialization as a definitive treatment for the odontogenic keratocyst*. J Oral Maxillofac Surg 2004;62:651-6.
- Jain K, Goyal P. *Endoscopic surgical treatment of maxillary odontogenic cysts*. Int Forum Allergy Rhinol 2015;5:602-4.
- Procacci P, Trevisiol L, Nocini PF, et al. *A modified technique for endoscopic endonasal reduction of medial orbital wall fracture using an absorbable packing*. Oral Maxillofac Surg 2017;21:91-8.

- ⁸ Colletti G, Pipolo C, Lozza P, et al. *Orbital medial wall fractures: purely endoscopic endonasal repair with polyethylene implants*. Clin Otolaryngol 2016.
- ⁹ Cho DY, Hwang PH. *Results of endoscopic maxillary megantrostomy in recalcitrant maxillary sinusitis*. Am J Rhinol 2012;22:658-62.
- ¹⁰ Bertossi D, Albanese M, Malchiodi L, et al. *Surgical alar base management with a personal technique: the tightening alar base suture*. Arch Facial Plast Surg 2007;9:248-51.
- ¹¹ Turri-Zanoni M, Battaglia P, Karligkiotis A, et al. *Transnasal endoscopic partial maxillectomy: operative nuances and proposal for a comprehensive classification system based on 1378 cases*. Head Neck 2017;39:754-66.
- ¹² Jain K, Hsu J, Goyal P. *The utility of a combined endoscopic and transoral resection of maxillary ameloblastoma*. Int Forum Allergy Rhinol 2013;3:762-5.
- ¹³ Nocini PF, Trevisiol L, D'Agostino A, et al. *Quadruple zygomatic implants supported rehabilitation in failed maxillary bone reconstruction*. Oral Maxillofac Surg 2016;20:303-8.
- ¹⁴ Nocini PF, Bertossi D, Albanese M, et al. *Severe maxillary atrophy treatment with Le Fort I, allografts, and implant-supported prosthetic rehabilitation*. J Craniofac Surg 2011;22:2247-54.
- ¹⁵ Albanese M, Nocini PF, Fior A, et al. *Mandibular reconstruction using fresh frozen bone allograft after conservative enucleation of a mandibular odontogenic myxoma*. J Craniofac Surg 2012;23:831-5.
- ¹⁶ Albanese M, Procacci P, Sancassani G, et al. *Fresh-frozen human bone graft to repair defect after mandibular giant follicular cyst removal: a case report*. Cell Tissue Bank 2012;13:305-13.
- ¹⁷ Kunihiro T, Kawana H, Kodaka R, et al. *Keratocystic odontogenic tumor invading the maxillary sinus: a case report of collaborative surgery between an oral surgeon and an otorhinolaryngologist*. J UOEH 2014;36:251-6.
- ¹⁸ Selvi F, Enoz M, Yazgin I, et al. *Do asymptomatic foreign bodies in the maxillary sinus always need to be removed?* B-ENT 2008;4:243-7.
- ¹⁹ Lund VJ, Clarke PM, Swift AC, et al. *Nose and paranasal sinus tumours: United Kingdom National multidisciplinary guidelines*. J Laryngol Otol 2016;130:S111-8.

Received: August 19, 2017 - Accepted: February 23, 2018

Address for correspondence: Fabio Lonardi, Section of Dentistry and Maxillo-Facial Surgery, Department of Surgical Sciences, Paediatrics and Gynecology, University of Verona, piazzale Ludovico Antonio Scuro 10, 37100 Verona. E-mail: feblon@hotmail.it.