

Abordagem externa dos mucocelos frontais: Uma técnica esquecida?

External approach to frontal sinus mucocele: A forgotten technique?

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RESUMO

Os mucocelos do seio frontal são uma lesão benigna de crescimento lento que pode levar a erosão óssea local. Atualmente, o tratamento cirúrgico por via endoscópica é o mais usado, no entanto existem ainda casos em que há indicação para uma abordagem externa. Neste trabalho, procuramos avaliar as indicações para o uso de uma abordagem externa no tratamento dos mucocelos frontais. Para tal, revimos os doentes tratados através desta abordagem no hospital de Braga entre 2012 e 2019.

Dez doentes foram tratados através de uma abordagem cirúrgica externa. Todos apresentavam um mucocele com localização lateral, 90% tinham erosão da tábua externa do seio frontal e 70% apresentavam também erosão da tábua interna do seio frontal sem extensão intracraniana. Durante o período de *follow-up* (6-87 meses), não foi encontrado nenhum caso de recidiva. Nem todos os casos podem ser tratados de forma puramente endoscópica, pelo que a abordagem externa por vezes deve ser considerada.

Palavras-chave: mucocele do seio frontal; abordagem externa.

ABSTRACT

Frontal sinus mucoceles are benign, slow growing lesions capable of local bone erosion. Currently, endoscopic sinus surgery is the mainstay for its treatment, however there are still indications for an external surgical approach. Here, we focus on the indications for an external surgical approach for frontal sinus mucocele treatment. To do so, we review the patients with frontal sinus mucocele treated by this approach in Hospital de Braga from 2012 to 2019.

A total of 10 patients were treated with an external approach. All patients had a mucocele with lateral location, 90% had erosion of the external frontal sinus wall and 70% had also erosion of the posterior frontal sinus wall without intracranial extension. During follow up, no recurrence was identified so far (6-87 months). Not all patients can be treated endoscopically exclusively. In selected cases, an external approach should be considered.

Keywords: frontal sinus mucocele; external approach.

INTRODUCTION

Paranasal sinus mucoceles are pseudo cystic lesions filled with mucus enveloped by a layer of pseudostratified epithelium^(1,3). These lesions have slow growth, but can expand destroying neighbor bony structures^(1,2). Paranasal sinus mucoceles are usually unilateral, being the frontal sinus the most affected one and representing more than half of cases⁽¹⁾. Frequently their origin is idiopathic, but can also result from an infection, nasal polyposis, trauma, previous surgery or neoplasm⁽²⁾. Mucocele affect both genders equally and occur mainly during adult life (40-60 years old)⁽²⁾.

Radiology is essential for both diagnosis and surgery planning. Computer tomography (CT) scan is the first choice, showing a well-defined cystic lesion that is homogeneous and isodense to brain parenchyma. Also, it can show local bone erosion⁽⁴⁾. Magnetic resonance imaging (MRI) is particularly important to distinguish from neoplasm and to determine its relationship to soft tissues, like brain or orbit⁽⁴⁾.

The treatment of paranasal sinus mucoceles is surgical. Since the first report about an endoscopic approach by Kennedy et al⁽⁵⁾, this technique has become the main

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choice to frontal sinus mucocele treatment, has it presents low morbidity^(1,3,6). Particularly, the techniques described by Draf⁽⁷⁾, became the gold standard to the endoscopic approach of the frontal sinus. Although nowadays, the endoscopic management of frontal sinus mucoceles is preferred⁽⁸⁾, not all cases can be treated exclusively by this technique. There are some indications for an external approach to frontal sinus: lateral localization of mucocele, frontal recess neo-osteogenesis, and disease recurrence^(3,6,9,10).

Anterior frontal sinus wall dehiscence is no longer considered an absolute indication for an open approach, but in cases of severe disfiguration or esthetic concerns, this could be the best way to treat and reconstruct.

In this study, we focus on the indications of the external approach to frontal sinus mucoceles.

MATERIALS AND METHODS

This paper presents a retrospective study about patients with frontal sinus mucocele treated with an external approach in Hospital de Braga, from January 2012 to December 2019. External surgical approach was chosen in cases of mucocele with lateral location and presence of neo-osteogenesis. The following data were collected: age, gender, relevant medical history, presenting clinical signs, imaging features of the mucocele, surgical procedure and follow-up.

RESULTS

This study includes 10 patients (9 male and 1 female) with frontal sinus mucocele treated with an external (7 patients) or combined surgical approach (3 patients). The mean age at the time of surgery was 51.3 years old (range 28-77 years).

Patient history

We observed that in this population, 80% (8 patients) had a risk factor for mucocele. Of these, the main risk factor identified was previous craniofacial trauma in 50% of the cases (4 patients), 25% (2 patients) had chronic rhinosinusitis and 25% (2 patients) had a previous surgery. The patients with previous trauma developed mucocele in average 30.8 years after (range 20-41 years). Of the 2 patients who had a previous surgery, one had a nasal endoscopic surgery 28 years before, and one had a frontal craniotomy 15 years before.

Clinical presentation

The most common presenting symptom was forehead swelling that was found in 50% of the cases (5 patients), followed by periorbital edema that was present in 30% (3 patients). Other presenting symptoms were proptosis in 10% (1 patient), and in other 10% (1 patient) it presented has central nervous system infection due to subdural empyema as a consequence of a frontal mucopyocele.

Imaging findings

Patients were subjected to imaging analysis by CT scans and MRI. In all cases, mucocele location was lateral to the lamina papyracea. Regarding the erosion of the local bony structures, 90% of the patients had erosion of the anterior wall and 70% of the posterior wall of the frontal sinus without intracranial extension. 50% had erosion of the superior wall of the orbit and 30% of the lamina papyracea. 10% had neo-osteogenesis of the frontal recess. CT scans and MRI of a patient with a lateral frontal mucocele with erosion of both anterior and posterior frontal sinus walls as well as the superior wall of the orbit are depicted in Figure 1 and 2, respectively.

FIGURE 1

Computed tomography of the paranasal sinuses on sagittal (A) and coronal (B-D) views, with soft tissue (A,B,D) and bone algorithm (C). An expansile lesion on the left frontal sinus can be depicted, with regular margins and isodense to the grey matter, that projects downward to the orbital cavity, deviating the superior ocular muscular complex and the optic nerve (A,B). On bone algorithm (C) associated frontal bone demineralization is shown. There are also signs of maxillary and ethmoidal chronic sinusitis, with left predominance, and encephaloclastic bilateral frontal lobe lesions, due to a previous head trauma. Antero-medially (D), its relation with the ipsilateral frontal recess can also be depicted.

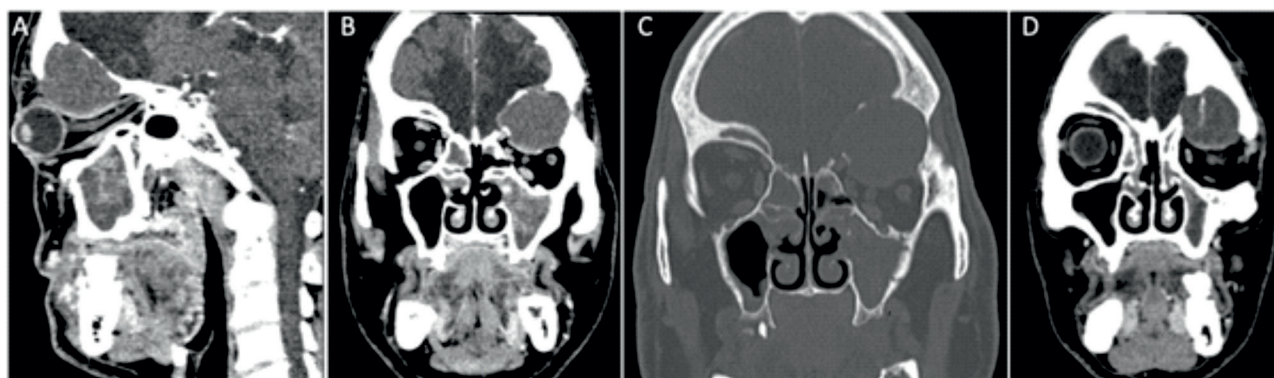
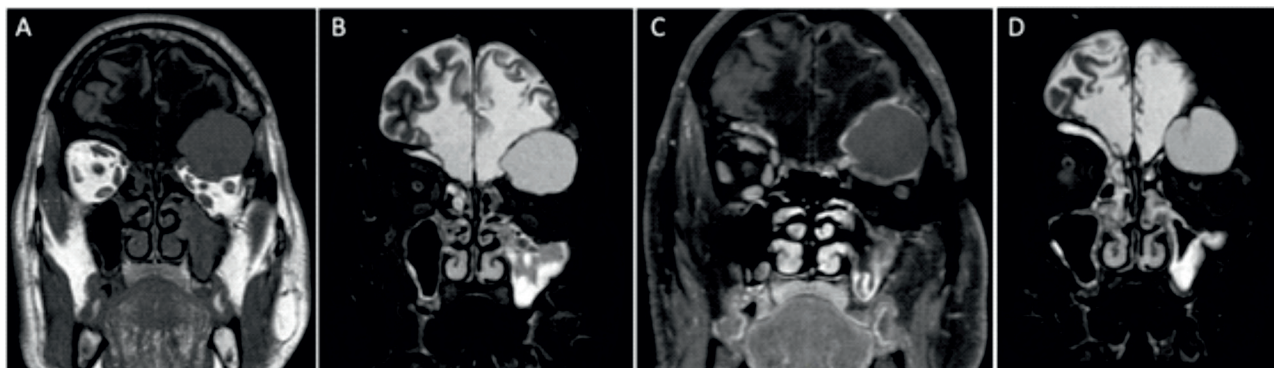


FIGURE 2

Magnetic resonance imaging of the same patient as in figure 1. Fast spin-echo T1-weighted (A), short tau inversion recovery (STIR) (B,D) and fast spin-eco T1-weighted post-gadolinium (C) sequences on coronal view confirm the expansile lesion on the left frontal sinus, that is slightly hyperintense to the grey matter on T1, markedly hyperintense on T2, and peripherally enhances after gadolinium administration. This is the typical appearance of a mucocele.

**Surgical approach and intra operative findings**

Besides the external approach, in 3 patients an endoscopic sinus surgery was performed at the same time. The aim of the endoscopic approach was to improve frontal sinus drainage. For the external approach, the skin incision was performed by either supraciliary incision (50% of the cases) or coronal incision (40% of the patients). In one patient with a fistula, an elliptical skin incision surrounding the fistula aperture was performed to access frontal sinus. In patients with anterior frontal sinus wall dehiscence (9 cases), the access to the frontal sinus was performed by drilling the frontal bone around the

erosion. The mucocele was then removed through this opening. In the other patient, since it did not present an anterior frontal sinus wall dehiscence, an osteoplastic bone flap was performed (Figure 3).

Seven of the patients had erosion of the posterior wall of the frontal sinus, without meningocele. Following mucocele excision, dura mater was reinforced in 3 of them (2 with collagen matrix (TissuDura®) only, 1 with TissuDura® and fascia lata). In one patient, a laceration of the dura mater occurred during mucocele excision, resulting in a cerebrospinal fluid fistula. It was corrected in the same procedure with TissuDura® (Figure 4) and

FIGURE 3

Surgical preparation with supraciliary delineation (A). Following supraciliary incision, a periosteum flap was retracted (B). Frontal bone was exposed, showing the previous location of trephination (arrowhead), bone flap margins were drawn (C). After bone flap collection, mucocele wall was exposed (D). Following mucocele excision, frontal sinus was obliterated with fat (E). Previously collected bone graft was fixed with osteosynthesis plate (F).

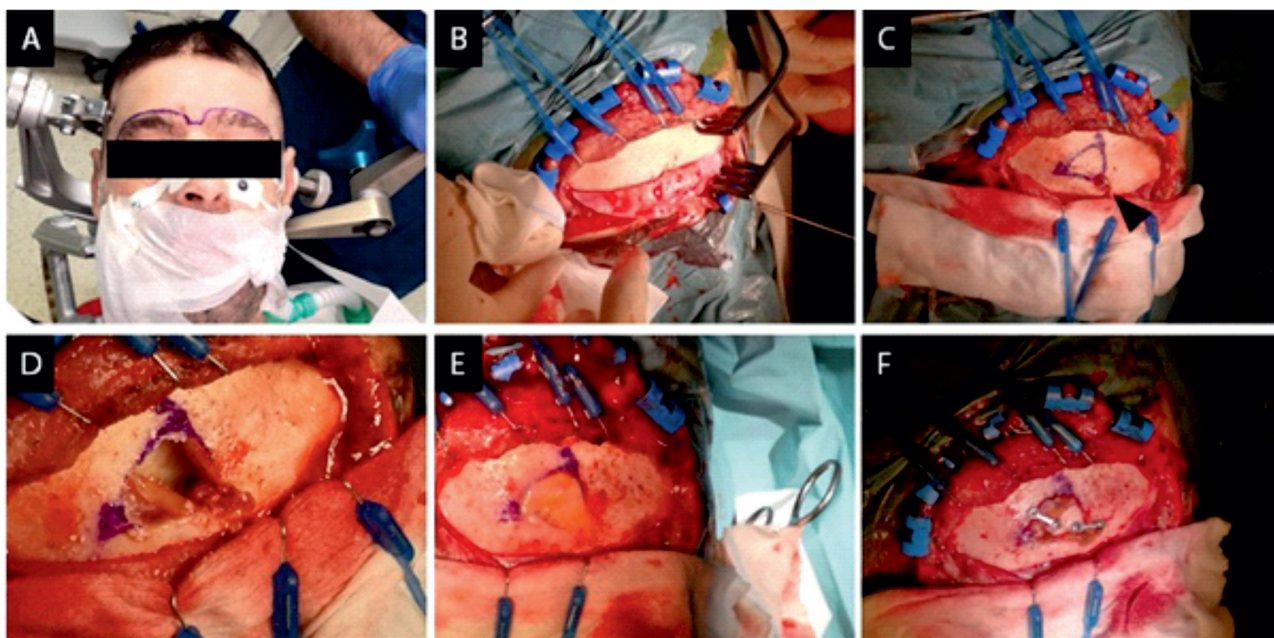
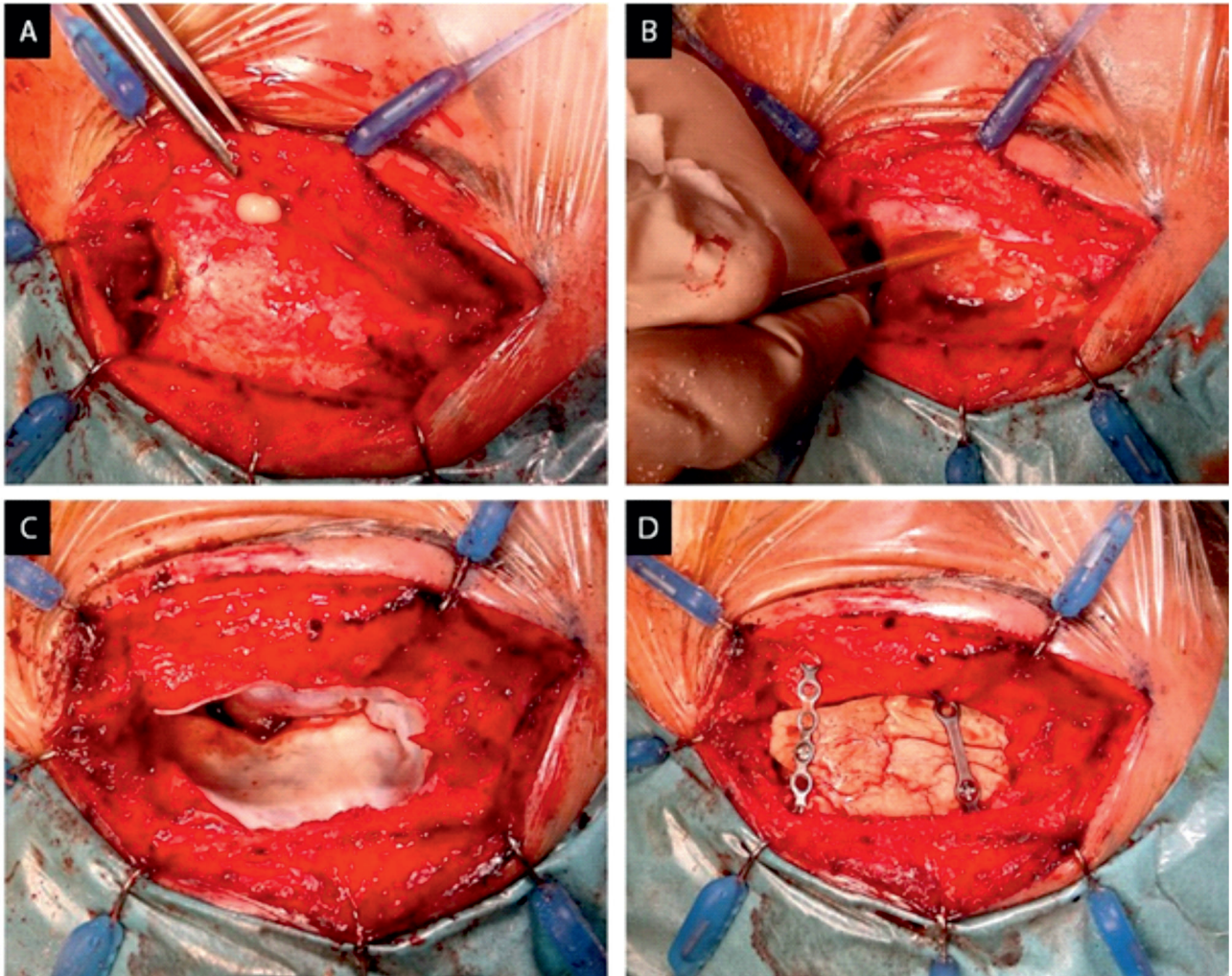


FIGURE 4

Surgical pictures showing anterior frontal sinus wall erosion with muco-pus present (A). Mucocele was exposed after frontal bone drilling around the erosion (B). During mucocele excision, the dura mater was injured resulting in cerebrospinal fluid leakage. The defect was corrected with collagen matrix (TissuDura®). The anterior frontal sinus wall was reconstructed with gentamicin cement (D).



a superior orbital wall defect was reconstructed with gentamicin cement. The other procedures occurred without any surgical complication.

Although, CT reports showed that only 1 patient presented frontal sinus neo-osteogenesis, we observed intra-operatively that other 6 patients also presented significant neo-osteogenesis. In these cases we performed: sinus obliteration (4 cases) with fat (1 patient, Figure 3), fascia lata (1 patient), hemostatic gelatin sponge (spongostan®) with fibrin sealant (tissel®, 1 patient) and spongostan® with bone wax (1 patient); sinus cranialization (3 cases) in patients with small frontal sinus and posterior wall dehiscence. In the remaining 3 cases, a combined approach was performed with reestablishment of frontal sinus drainage.

90% of the patients presented anterior frontal sinus wall erosion, but in only 67% this defect was corrected. In patients with a small defect, no correction was

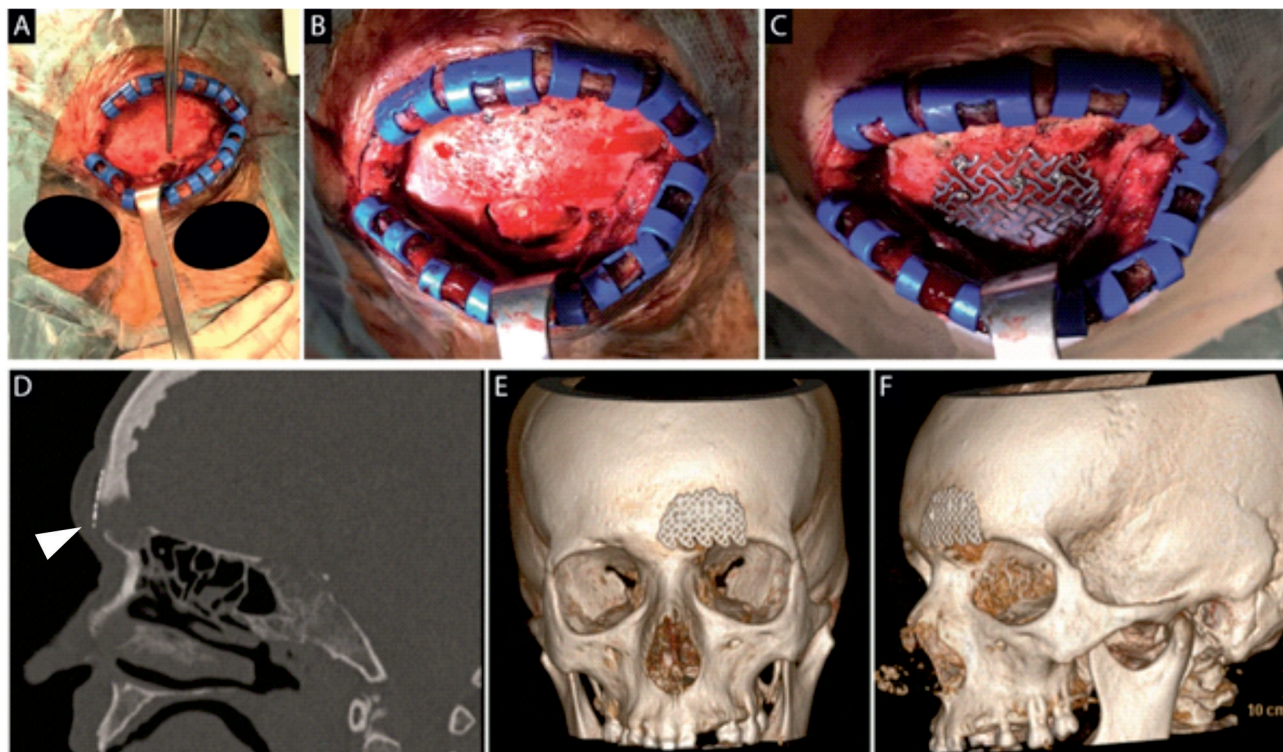
performed. In the others, different materials were used to do so: titanium plate (3 cases), gentamicin cement (2 cases), osteoplastic frontal bone graft fixed with an osteosynthesis plate (1 case, Figure 3). A surgical craniotomy for frontal sinus mucocele excision with anterior sinus wall reconstruction with titanium plate is depicted in Figure 5. A post-operative CT scan is also shown.

Follow-up

At the time of this report, the follow-up period of this patients ranges from 6 to 87 months. No relapse or other post operative sequels like forehead anesthesia or dysesthesia were found.

FIGURE 5

Surgical pictures showing anterior frontal sinus wall erosion (A). Mucocele exposure after frontal bone drilling around the erosion (B). The anterior frontal sinus wall was reconstructed with titanium plate (C).— Computed tomography obtained after surgery on sagittal (D) and tridimensional reconstructed images (E, F) shows signs of left frontal cranioplasty with titanium plate (arrowhead) and successful mucocele resection.

**DISCUSSION**

Since it was first reported in 1989⁽⁵⁾, the endoscopic approach has become the gold standard for frontal sinus mucocele treatment^(8,10). Although the endoscopic techniques to assess frontal sinus have improved, not all cases can be treated by this approach exclusively. Most authors suggest that an external approach may be preferred if the mucocele has a lateral location, frontal recess neo-osteogenesis and if previous endoscopic approaches failed^(6,9,11). Besides this classical criteria, other mucocele characteristics have been proposed to favor an external approach: a mucocele close to the frontal ostium either on lateral-medial or antero-posterior axes. Such evidence highlights the importance of a patent frontal ostium in the success of an endoscopic approach⁽³⁾. Here, we report 10 cases of frontal sinus mucocele treated by an external approach. All presented a mucocele with lateral position and 90% had erosion of the anterior wall of the frontal sinus. One patient also had frontal recess neo-osteogenesis.

The number of reports about endoscopic management of complex frontal sinus pathology has been increasing, namely treatment of mucoceles with orbital^(12,13) or intracranial extension⁽¹⁴⁾. In fact, it has been proposed recently that lateral position, posterior frontal sinus wall dehiscence, orbital or intra-cranial expansion alone

should not be used as criteria to perform an external approach. Growing evidence has shown that endoscopic marsupialization is effective in the treatment of such cases^(3,15). Furthermore, successful treatment of frontal sinus mucoceles with anterior wall erosion without any reconstruction has also been reported⁽³⁾.

The existence of “frontal peak” sign on CT-scan (an acute angle between the bony edge of erosion and the dura) has been associated with dura laceration and cerebrospinal fluid leakage following endoscopic decompression. In such cases, an open approach should be considered⁽¹⁵⁾.

In our series, the anterior wall of the frontal sinus was reconstructed whenever a big defect was found (67% of the cases). Different materials were used accordingly with the size defect and surgeon option.

Of all cases with frontal sinus posterior wall or orbital superior wall dehiscence, only in one patient the superior orbital wall was reconstructed with gentamicin cement following a CSF leak correction.

In our report, none of the cases had any previous surgical attempt to treat the mucocele. Although, recent reports on management of complex mucoceles, can light us that some of our cases could be managed endoscopically; at the time of surgery several factors have been taken into account: surgeon experience, surgical material and neuronavigation system availability. So, it was thought

that a solely endoscopic approach would not be able to effectively treat these cases.

The most common surgical complications in the external approach are dural injury with cerebrospinal fluid leakage, orbital or intracranial injury and bleeding with hematoma. Some patients may also develop paresthesia and anesthesia of the forehead⁽¹¹⁾. We report only one surgical complication (a CSF leak), that was corrected immediately and did not show any long-term complication. This event results in 10% complication rate that is well above of the reported in the literature (0,7% in endoscopic approach and 2,9% in the external approach⁽⁸⁾), however, the number of cases in our series is too low to value such finding.

Mucocele relapse can occur several years after surgery. Relapse following external approach can be as high as 10%⁽¹⁶⁾. We did not report any case of recurrence, however in most patients the follow up period is still too short.

CONCLUSION

In the past 30 years, the endoscopic sinus surgery became the mainstay for the treatment of sinus mucocele. Although, the indications for frontal sinus mucocele treatment by endoscopic surgery have been expanded, still, not all cases can be solved by this technique exclusively. Here, we compile a series of cases where an external approach was also necessary, particularly in cases of mucoceles with lateral location or frontal recess neo-osteogenesis.

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Conflict of interests

The authors declare that they do not have any conflict of interest related to this manuscript.

Data confidentiality

This study is in accordance with the ethics standards of the Hospital where the study was carried out.

Compliance with ethical standards

The authors declare that the procedures followed are in accordance with the ethical standards and the Helsinki Declaration of the World Medical Association.

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Scientific data

There are no public data related to this work.

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