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DOI: 10.2478/rjr-2020-0020

Romanian Journal of Rhinology, Volume 10, No. 39, July - September 2020

CASE REPORT

Chronic sinusitis and frontal sinocutaneous fistula: late complications after pterional craniotomy

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ABSTRACT

We sought to determine the clinical significance of delayed complications after different neurosurgical procedures, such as chronic sinusitis and frontocutaneus fistula. These can be managed by endoscopic closure or by external approach, depending on the cause and extent of sinusitis. We report a case of a 65-year-old woman who was presented to our ENT Department with a frontocutaneus fistula and was surgically managed.

KEYWORDS: frontocutaneus fistula, pterional craniotomy, frontal outflow tract, functional endoscopic sinus surgery, frontal recess, ostiomeatal complex.

INTRODUCTION

Frontotemporal craniotomy, also known as "pterional craniotomy" (PC), provides an optimal microscopic exposure and a wide open working space for manipulation of the intracranial structures. It has been widely used in the field of neurosurgery including for pituitary surgical approach[1].

If the frontal sinus is approached unappropiately during pterional craniotomy, the lining mucosa is injured, determining the blockage of the frontal recess, and, secondarily, it can generate chronic sinusitis. This leads to pressure osteonecrosis of the walls of the frontal sinus, which results in osteitis and subsequently osteomyelitis of the frontal sinus wall. A subperiosteal abscess then forms, resulting in the fistula formation[2].

The management depends on the clinical presentation and the results of investigation. The standard workup includes a computed tomography of the nose and paranasal sinuses. The treatment includes antibiotics and surgery. Surgery in the past consisted in an external approach of the frontal sinus and of the superior part of the frontal recess. With the recent advances, they have been approached endoscopically with computerized stereotactic localization system. However, the approach must be adapted to the extent and site of the pathology[3].

In the present case, we used an external approach to identify the laterally placed fistulous tract, along with the eradication of the disease from the right frontal sinus and excision of the fistulous tract.

CASE REPORT

A 65-year-old patient with a previously operated pituitary tumor, under pterional craniotomy aproach (2005), known with multiple side-pathologies (Type II Diabetes, Hypertension, Congestive Heart Failure), presents with purulent discharge from a right sinocutaneus fistula through the forehead skin (Figure 1) and right-sided frontal headache. The patient had a history of right chronic mucopurulent rhinorrea, repeated episodes of nasal obstruction, dull pain, right-sided frontal pressure. These symptoms had a recurrent manifestation during the last 15 years, but aggravated in the last 2 years.

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Received for publication: June 10, 2020 / **Accepted:** June 22, 2020

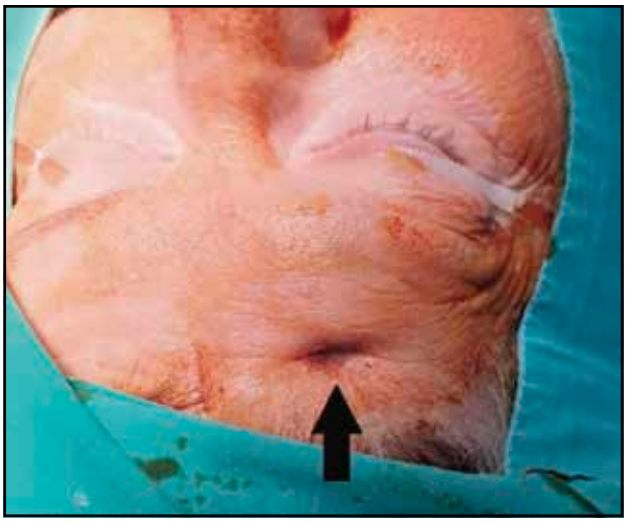

Figure 1. Right sinocutaneus fistula through the forehead skin (black arrow).

Clinical examination revealed edema of the right frontal region and pus draining fistula orifice (1x2 cm) at the upper third of the right frontal region (the area of the previously made bone flap for pterional craniotomy), surrounded by an associated bony defect. The right eye palpebral fissure was narrowed due to the local edema and eyelid swelling.

On palpation, there was local pain, with tenderness and rise of temperature over the above-mentioned area.

Examination of the nose revealed a deviated nasal septum to the right side with nasal turbinates hypertrophy, congested nasal mucosa. Mucopurulent discharge was present in the right middle meatus.

There were no pathological changes in the ear and throat aria.

Ophthalmology examination revealed right preseptal cellulitis, diagnosis based on clinical examination and imagistic findings. The pacient presented with unilateral eyelid swelling, edema and periorbital erythema. The CT scan showed right periorbital soft tissue swelling.

Complete blood count and biochemical parameters revealed an inflammatory syndrome (leucocytosis with neutrophilia and increased C-reactive protein).

The cranio-facial CT scan showed well-defined defects in both posterior and anterior table of the frontotemporal area, as a result of the pterional craniotomy surgery underwent in 2005, opacification involving the right maxillary and frontal sinuses and the right anterior ethmoid air cells, with aspects of thickening of the frontal sinus mucosa and right periorbital soft tissue swelling. The right frontal sinus had a bony dehiscence of the posterior table, juxta-cortical osteolytic lesion along the anterior table of the right frontal bone, and a possible periosteal reaction (Figure 2).

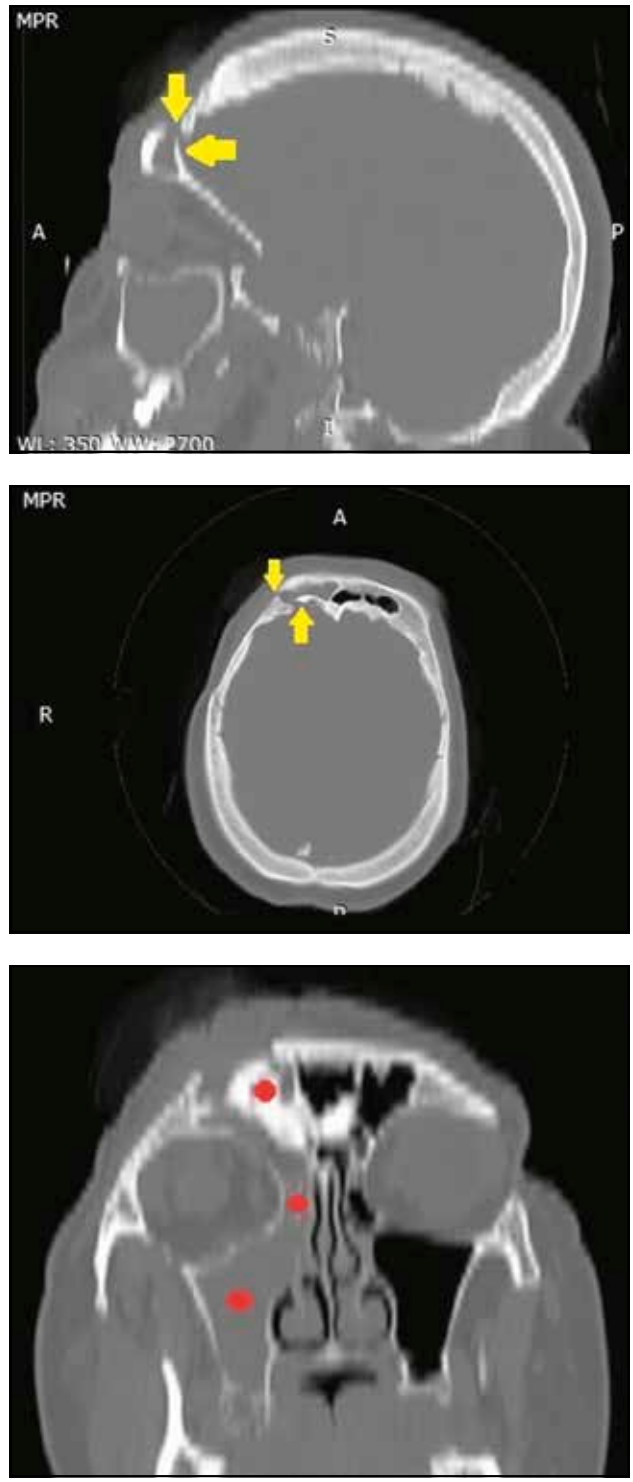

Figure 2. Cranio-facial CT scans showing the right frontal sinus wall defects (yellow arrows). Right frontal sinus, ethmoidal and maxillary sinus soft tissue densities (red circles).

Neurosurgery clinical examination excluded any types of neurosurgical causes that could have led to infection and dehiscence of the frontal bone, despite the unappropriate approach of the frontal sinus during the supported craniotomy (2005). It also recom-

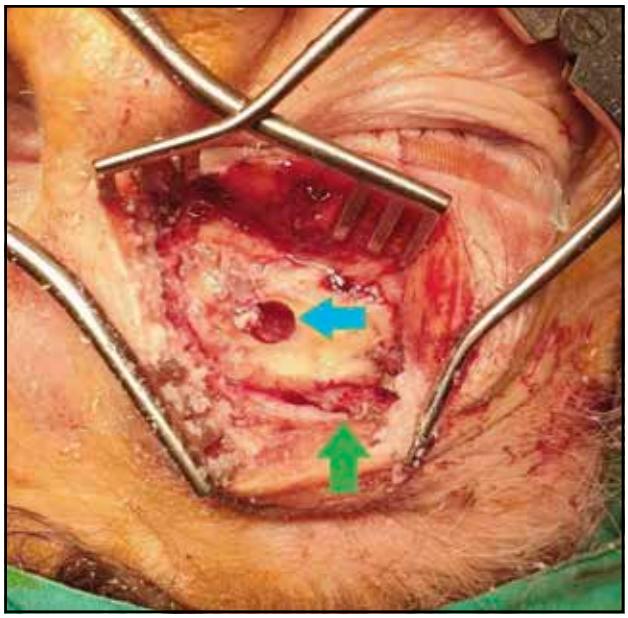

Figure 3. Fistula tract (green arrow), the right frontal sinus trephination (blue arrow).

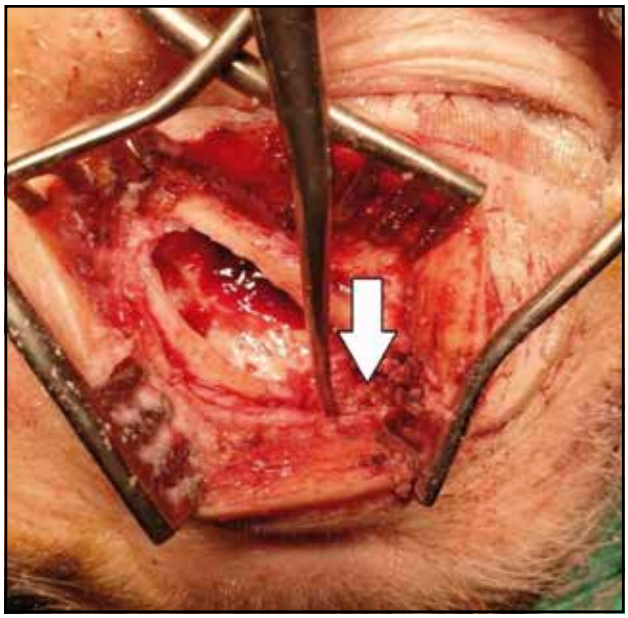

Figure 4. The curette introduced into the fistulous tract (white arrow).

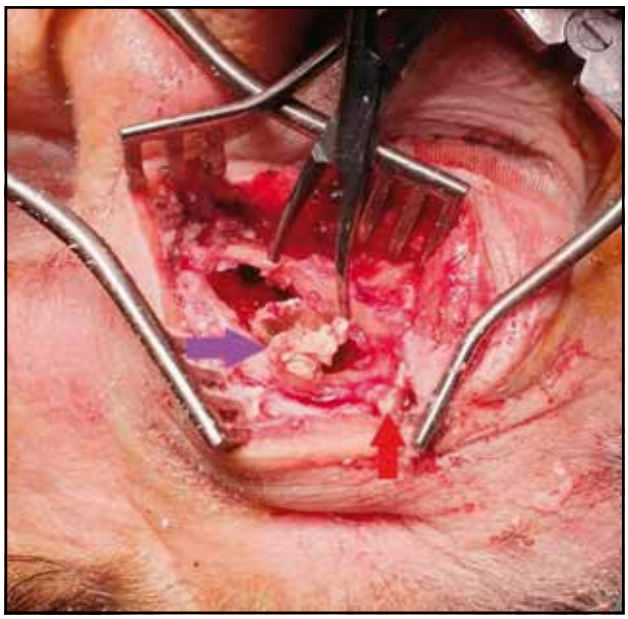

Figure 5. Osteolytic areas (red arrow), frontal recess obstructed by thick mucopurulent secretions (purple arrow).

mended to firstly treat the sinus infection, because it represented the main cause of the persistence of the purulent drainaige through the frontal fistula orifice.

So, the management is controversial among neurosurgeons and otorhinolaryngologists. Both specialties agree that, if the frontal sinus is penetrated but the mucosa is not injured, no treatment is required. The management options and operative techniques can vary significantly if any injury of the frontal sinus mucosa occurs. Some neurosurgeons prefer total mucosal exenteration, irrigation, packing with antibiotic-soaked gelfoam, and placement of a pericranial graft over the entrance to the frontal sinus[4].

The pacient preoperatively received intravenous antibiotics, NSAID, anti-edematous and analgesic medication. The pacient did not respond to antibiotics, and the pus aspirated from the fistula orifice was negative on culture. The purulent discharge persisted under medical treatment, and further surgical approach of management was considered.

We proceeded with fronto-ethmoido-maxillary drainage by combined external (Ogston-Luc procedure) and endoscopic approach (antrostomy, anterior ethmoidectomy and frontal recess disection).

An incision was made along the inner third of the superior orbital margin and carried laterally to the outer third of the eyebrow. The periosteum was elevated. The right frontal sinus was entered by drilling its anterior table (Figure 3) exposing the thick mucopurulent secretions, which were cleared. The frontal sinus lining was intact along the posterior table, with no evidence of exposed dura (the opening in the right frontal sinus was previously probably sealed with bone wax). The sinus thickened mucosa appeared unhealthy. It was curetted and sent to the histopathological examination.

A fistula tract was discovered on the anterior wall the frontal sinus (Figure 3), which was filled with granulation tissue and surrounded by osteolithic areas (Figure 4), which were removed and sent to histopathological examination. Fusiform excisions were made around the fistula site.

The upper half of the frontal recess was obstructed by thick mucopurulent secretions (Figure

Figure 6. Dissection of the right frontal recess.

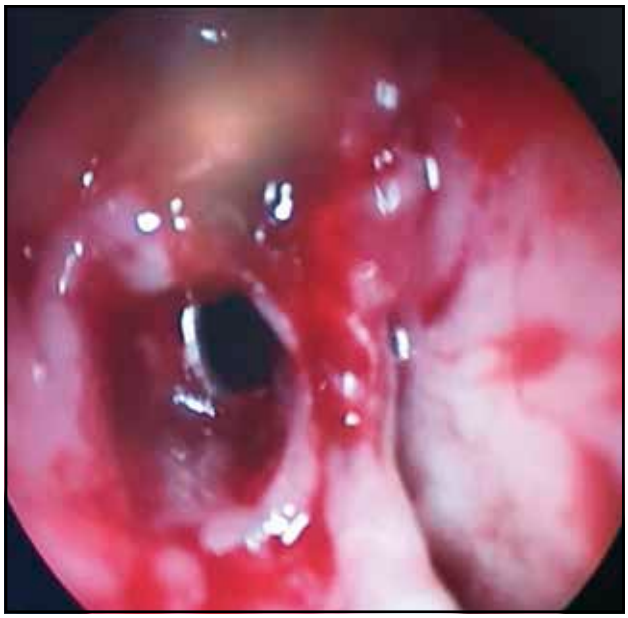

Figure 7. Endoscopic view of the patent frontal recess.

5), with cholesteatomatous aspect, which were also cleared (Figure 6). Lavage of the sinus with mild antibacterial solutions was performed.

At the completion of the external frontal sinusotomy, the maxillo-ethmoidal sinusal drainage was performed under endoscopic approach. The intraoperative findings included a mass of granulation tissue at the level of the anterior ethmoid cells and maxillary ostium. The excision of the necrotic tissues was finished. The inferior half of the frontal recess was enlarged for a better sinus drainage (so there was no need to place an additional catheter) (Figure 7). Merocel® type tampon was applied at the end of the procedure, and left in place for 24 hours. After this time, the dressing was removed, and debris was aspirated from the nasal cavity. The external incision was sutured in layers. Histopathologic examination of the sinus mucosa and the tissue extracted from the fistulous tract showed abundant granulation tissue, as well as chronic inflammatory cells.

As a post-operatory final result, we succeeded to obtain an efficient ventilation of the ostiomeatal complex.

Other cases in literature were managed by obliterating the frontal sinus with autologous fat, hydroxyapatite cement, muscle, bone, bioactive glass, etc[5-7]. However, the obliteration of the frontal sinus requires meticulous removal of the frontal sinus mucosa and permanent occlusion of the frontal recess[8]

Some authors recommend temporary external stenting of the fistula tract for better irrigation of the sinus. The accepted initial management is to close the fistula primarily and place pacients on 6 to 8 weeks of antibiotic treatment. The most important goal is to restore a long term patency of the frontal sinus outflow tract[9].

Figure 8. Postoperative aspect of the frontal region and the fistula orifice.

In the post-operative interval, the pacient received antibiotics. A topic nasal decongestant was used to help in the cleaning and aspiration of the nasal fossae. Subsequently, the patient had chemosis, edema of the right upper eyelid and restrictive ophthalmopathy of the right eye. Ciprofloxacin eye drops was recommended to be administrated every 2 hours. The patient was discharged after the edema had receded (Figure 8).

Good outcomes in terms of cosmetic satisfaction and functional results were achieved at the 3-month follow-up.

DISCUSSIONS AND LITERATURE REVIEW

In a frontal sinus wall injury, including the periosteum and mucosa, re-epithelialization occurs by the migration of the epithelium from the borders of the defect. This leads to interruption of the normal mucociliary drainage pattern by simple loss of functional epithelium. A prerequisite for a successful re-epithelialization is a vascularized and functional matrix which fills the defect. But mucosal re-epithelialization, ventilation and drainage can only be achieved if the frontal recess remains patent[10].

Pterional craniotomy sometimes leads to purposeful or inadvertent extension of the craniotomy into the frontal sinus or orbit, or both. In the study performed by Rita S. Patel, of the total 82 craniotomies reviewed, 94% had been performed via the pterional approach. 30% of these cases revealed some evidence of penetration into the orbit or frontal sinus (orbit 56.2%; frontal sinus 53.4%; both 54.4%). Of the 7 patients with frontal sinus injury, 3 had mucosal exenteration and packing with antibiotic-coated gelfoam. No late complications were identified (follow-up period: 18–29 months)[4].

Nevertheless, a study made by Yoshioka on 8 patients (who had previously undergone neurosurgical treatment – pterional craniotomy) showed that the interval between the surgery and the onset of sinus infection ranged from 12 to 35 years (mean period: 23 years). Seven of them had forehead skin fistula with purulent discharge. The frontal sinus infection was bilateral in six cases and unilateral in two cases. The same study presented a 66-year-old pacient who was treated with a left frontotemporal craniotomy. 20 years later, she was reffered to the hospital with symptoms of purulent discharge from a forehead fistula. The CT scan demonstrated a left frontal sinus infection with obstruction of the fronto-nasal recess. During the surgery, there was noticed granulation tissue in the left frontal sinus outflow tract, which was difficult to remove because of its narrow recess. The forehead skin deffect was closed directly. Postoperative CT scan showed that the frontal sinus outflow tract obstruction had been eliminated[11].

CONCLUSIONS

Frontal sinus and orbital penetration are common, but rarely cause significant complications in patients with pterional craniotomy[4].

Despite intraoperatory injury of the lining mucosa of the frontal sinus, infections and late complications are rare if the ventilation and drainage of the ostiomeatal complex are preserved and can only be achieved if the frontal recess remains patent. Functional endoscopic sinus surgery is the standard for managing frontal sinusitis today, when conservative management has failed. However, the frontocutaneous fistula can only be managed if the underlying pathology has been well treated[8].

The key of the successful management of this disease is to ensure patency of the fronto-nasal recess, with fistula excision and multilayer closure[9].

Conflict of interest: The authors declare that there is no conflict of interest.

Contribution of authors: All authors have equally contributed to this work.

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