Krzysztof Osmola, Marian T. Nowaczyk, Doni M. Allecou

Extensive orbital damage as a result of maxillary sinus surgery – a case report and literature review

Rozległe uszkodzenie oczodołu w wyniku operacji zatoki szczękowej – opis przypadku, przegląd piśmiennictwa

Department of Maxillo-Facial Surgery
Karol Marcinkowski University of Medical Sciences, Poznań, Poland

Abstract

Classic and FESS (Functional Endoscopic Sinus Surgery) surgery of the sinuses are connected with the possibility of surgical complications involving the orbital structures and the eyeball. Most frequently these involve bleeding from the vessels of the orbit and the nasal cavity. A rare and certainly the most serious complication is blindness resulting from damage to the optic nerve. This paper presents a case of postoperative blindness as a result of maxillary sinus surgery complicated by damage to the orbital floor and its inadequate reconstruction.

Key words: blindness, maxillary sinus surgery, orbital floor reconstruction, orbital complications.

Streszczenie

Zarówno klasyczne jaki i endoskopowe (FESS) operacje zatok obocznych nosa wiążą się z możliwością powikłań oczodołowych. Najczęściej są to krwawienia z naczyń oczodołu lub jamy nosowej. Rzadkim, lecz z pewnością najcięższym powikłaniem jest ślepota w wyniku uszkodzenia nerwu wzrokowego. W publikacji przedstawiono przypadek uszkodzenia nerwu wzrokowego w przebiegu klasycznej operacji zatoki szczękowej z jatrogennym uszkodzeniem dna oczodołu i nieskuteczną próbą jego rekonstrukcji.

Słowa kluczowe: ślepota, chirurgia zatok szczękowych, rekonstrukcja dna oczodołu, powikłania oczodołowe.

Introduction

The maxillary sinus is the largest of all the nasal sinuses. Pathological sinuses are usually treated by maxillofacial surgeons or laryngologists. One of the most frequent therapeutic indications for surgical intervention in this area is a chronic inflammation of the paranasal sinuses. The most common laryngological procedures in the paranasal sinuses are connected with the ethmoid and frontal sinuses. The maxillary sinuses are treated by maxillofacial surgeons for odontogenic reasons (cysts, fistulas etc.).

The decision regarding operative treatment is based on a physical examination combined with a CT or X-ray imaging of the sinuses (orthopantomogram, Waters projection).

Surgical treatment of chronic sinusitis involves opening the sinus and removing the inflammatory lesions along with the changed sections of the mucosa. The unchanged mucosa is not removed, which allows for its faster regeneration. It is vital to recreate the correct drainage of the nasal cavity. The most frequently used intraoral access leads via the maxillary sinus wall from the incision of the mucoperiosteal layer in the oral vestibule.

The procedure may be performed under general or local anesthesia, which permits intraoperative evaluation of the drainage within the natural nasal ostium of the maxillary sinus.

The most frequent complications of sinus surgery are connected with the close anatomical relationship between the paranasal sinuses and the orbits. The complications may involve intraorbital tissue inflammation, bleeding, lacrimal drainage and ocular disturbances in the vision and motility of the eyeball [1, 2]. Other complications resulting from the procedure involve sensory disturbances of the suborbital region. This is usually caused by exposing the frontal wall of the sinus or its wide opening and damaging the arborization of the infraorbital nerve. The injury to the nerve takes place during the removal of the affected mucosa of the maxillary sinus from the orbital wall of the sinus, especially when its thickness is reduced as a result of chronic inflammation or the growth of an odontogenic cyst entering the space of the sinus. The next step of the procedure is to connect the sinus with the inferior turbinate, which may cause damage to nasal structures. The lateral nasal wall might be broken, or the nasal conchae or the septum might be damaged. Lacrimation may occur as a result of damage to the naso-lacrimal duct [3]. Another, rather infrequent, complication might be difficulty in removing the gauze packing from the

sinus, which might catch on the sharp edges connecting the sinuses with the nasal cavity.

Surgical procedures within maxillary sinuses, regardless of the type of procedure, do not pose any serious technical difficulties and most of the above mentioned complications can be successfully treated so that post-operative disability is avoided. Therefore, the aim of this article is to present a case of serious damage to the orbital structures which occurred during a routine maxillary sinus operation.

Case study

A forty-nine year old female suffering a loss of vision in her right eye, caused by a maxillary sinus operation, was admitted to the Department of Maxillofacial Surgery as an emergency, one day after the procedure had been carried out at another hospital. The surgery was to treat chronic inflammation of both maxillary sinuses. From the documentation delivered to the clinic it was evident that the operation was performed as indicated by the results of clinical examination and CT images (Figure 1.) The patient was operated under local anesthesia using the typical intraoral approach. During the operation it was found that there was a connection to the orbital cavity which caused enophtalmia towards the maxillary sinus. An attempt was made to reconstruct the orbital floor with bone fragments taken from the mandibule symphysis. The transplanted grafts were placed underneath the eyeball and supported with a Foley catheter balloon. The procedure was carried out intraorally. After the operation, partial loss of sight in the right eye was diagnosed. Several hours after the procedure, an ophthalmological consultation and an MR scan of the orbital cavity were performed.

On admission, the major and most alarming symptom was a lack of reaction by the right eye to light. This was accompanied by pupillary dilation and a limited movement for the eyeball with a simultaneous backward and downward displacement of the eyeball as well as the lack of a consensual pupillary reaction. There were also intraoral post-operative wounds in the superior recess (at the sinus) and the inferior recess (where the bone fragments were taken from), which were closed with single stitches. The Foley catheter had been introduced transnasally.

In the MR scans, a downward dislocation of the eyeball was visible as was its modelling via quite a well outlined shadow of clotted blood. The cut of the optic nerve was visible in the section beyond the eyeball, and partial damage to the inferior rectus muscle was also observed.

A revision of the sinus and the orbital cavity was undertaken immediately. Under general anesthesia, the intraoral stitches were removed and the maxillary sinus was opened; additionally, an incision on the infraorbital rim of the right orbit was performed. Following the dissection along the tissue layers, loose bone fragments were observed in the plane of the orbital floor. They were positioned at various angles and one of them did not have any contact with the remains of the orbital floor, neither from the nasal nor from the lateral side. (Figure 2) The eyeball was carefully supported by means of an orbital spatula and a piece of gauze was removed from behind the eyeball (a tampon) along with another bone fragment and a piece of material 8 x 4 mm in size – probably surgical wax or fibrin sponge. In the region of the orbital floor a cut infraorbital nerve was visible with its vessels. The Foley catheter balloon was filled up to c.a. 5 ml. The space of the sinus was completely filled with blood clots and blood. The foreign bodies and bone fragments were removed, then the cavity was rinsed. The sinus and the orbit were inspected. The orbital floor was reconstructed by means of a carefully fitted titanium mesh (SYNTHES) in order to obtain the correct position of the eyeball. The pulling test

Figure 1. CT preop.

Rycina 1. *KT przedoperacyjne.*

Figure 2. Free bone fragments.

Rycina 2. *Wolne fragmenty kości.*

showed no mechanical limitations to eyeball movement. The procedure was finished once hemostasis was checked, the sinus was drained and the wound was sutured.

In the post-operative period, a dysfunction related to closing the eyelids occurred. The patient can close her eyes; however, there is a dysfunction of the automatic, binocular action on the right side (Figure 4).

Discussion

The scope of the literature shows that the majority of intraorbital complications are connected with FESS (Functional Endoscopic Sinus Surgery). The most frequent complications include bleeding and eyeball motility disturbances. Blindness is a rare but major complication that may occur during sinus surgery. It is caused directly by damage to the optic nerve or, as a secondary complication, by retrobulbar haematoma which increases the intraorbital pressure affecting the supply of blood to and from the eyeball [4]. Whilst carrying out endoscopic procedures on the ethmoid and the sphenoid sinus, the most frequent complication is bleeding from the damaged sphenoid vessels. Coagulation at the bleeding site may damage the optic nerve and influence the vision of the opposite eyeball [5, 6]. Bilateral blindness described by Buss et al. resulted from bilateral endoscopic ethmoidectomy [7, 8]. Postoperative blindness was also reported after Le Fort I osteotomy as a result of pterygomaxillary separation [9]. Other complications which may occur as a result of functional endoscopic sinus surgery include disorders in eyeball motility caused by damage to the extraocular muscles. The most frequent is damage to the medial rectus muscle [10, 11]. Other complications such as an orbital apex syndrome, meningitis and CSF leakage were reported by other authors [12, 13].

Intraorbital complications resulting from surgery on maxillary sinuses occur much less frequently than those resulting from the extra- and intranasal ethmoidectomy procedure. As in FESS, maxillary sinus surgery also carries the risk of intraorbital and ocular disturbances connected with eyeball motility, vision, and the lacrimal duct system. But in maxillary sinus surgery the motility of the eyeball is more frequently disturbed by an injury to the inferior rectus muscle connected with a fracture of the orbital floor [14]. Considering the indications for maxillary sinus surgery SSS (Silent Sinus Syndrome) must also be taken into account because of the alteration in the normal orbital architecture due to maxillary sinus collapse with chronic sinus hypoventilation [15].

The case under discussion points to a possible occurrence of serious intraoperative complications during a standard maxillary sinus procedure. It is difficult to determine how such extensive damage to the superior area of the sinus and, consequently, to the orbital floor might have happened. An attempt to reconstruct the orbital floor was undertaken by the surgeons; however, it must have been inapt. Mistakes in the assessment of bone damage meant that the treatment was not effective. Bone material taken from the symphysis of the mandibule and the manner of its stabilization were inadequate. Bone fragments were incorrectly lifted by means of the Foley balloon and had no contact with the preserved edges, which made it impossible for this area to heal. The intra- and postoperative clinical evaluation and the analysis of the MRI

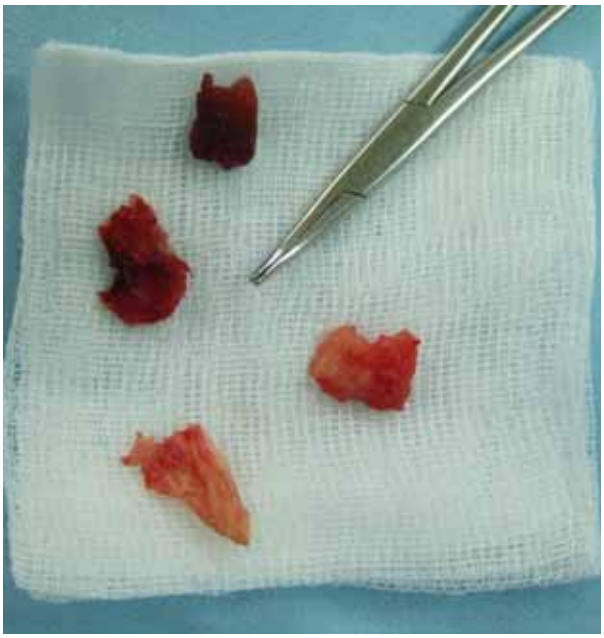

Figure 3. Bone fragments of orbital floor.

Rycina 3. *Fragmenty kości z dna oczodołu.*

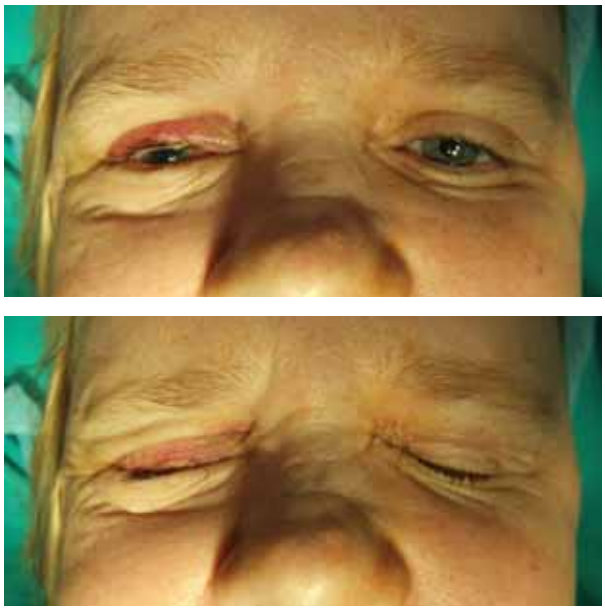

Figure 4. Eyes closing (after reoperation).

Rycina 4. *Zamykanie oczu (bezpośrednio po zabiegu naprawczym).*

scans were incorrect as the foreign body remained completely unnoticed.

Conclusion

Considering how such a sequence of severe damage could have occurred, one can assume that during the surgery a massive haemorrhage from the infraorbital vessels occurred and the attempts to stop the bleeding turned into a chaotic action which ultimately resulted in enormous damage to orbital cavity tissues. The risk of injury is also correlated with anatomical variations, the history of previous surgery, the extent and the gravity of the disease, as well as the skills of the surgeon.

Conflict of interest statement

The authors declare to have no conflict of interests concerning the data published in the article.

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Adres do korespondencji:
Klinika Chirurgii Szczękowo-Twarzowej UM
ul. Przybyszewskiego 49, 60-355 Poznań
tel.: 61 869 13 98, fax: 61 869 16 87
e-mail: k.osmola@onet.eu