A Rare Case of Orbital Cellulitis Followed by Therapeutic(Orthodontic) Extraction

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Abstract We report a rare case of orbital cellulitis occurring secondary to a dental infection followed by therapeutic (orthodontic) extraction. A 16 year old female patient presented to the dental office with a left orbital proptosis for the past 4 days. PNS view, CT scan revealed an abscess in relation to medial, lateral superior inferior walls of the orbit associated with naso ethmoidal and left maxillary sinus. Through nasal endoscopy, middle meatus antrostomy and ethmoidectomy was performed for the drainage of pus from the orbit, ethmoid and maxillary sinus under general anesthesia. Immediately regression of orbital swelling was noticed. Eyeball movements improved. Epiphora reduced and proptosis declined. With the advent of higher antibiotics, orbital infection rarely occurs secondary to dental causes except in a very few cases. Complete elimination of pus from orbital cavity, para nasal air sinuses and appropriate antibiotic coverage at the earliest forms the mainstay of treatment. The nasal endoscopic approach with orbital decompression is the most acceptable atraumatic, cosmetic and functional procedure.

Keywords Orbital cellulitis · Therapeutic extraction · Nasal endoscope

Introduction

The development of orbital cellulitis following a dental extraction has been recognized clinically in a number of studies. Orbital cellulitis can lead to dental abscess, trauma of orbit, peri-ocular surgery, panophthalmitis, septicaemia and immunosuppression but in the majority of the cases, they represent complications of maxillary sinusitis [1].

Although dental infection has been recognized as a source of orbital cellulitis since the time of Hippocrates, [2] attention to this association in the recent ophthalmic literature has been sparse. Orbital infections can have consequences ranging from a temporary loss of visual acuity to the severe life threatening subdural empyema or blindness. Sinus surgery has evolved today from the erstwhile external approaches, to endoscopic endonasal approaches.

The decreased morbidity and improved cosmesis, along with the preservation of the functional mucociliary system associated with the latter, have caused them to replace external approaches in most cases. Being odontogenic in origin, the infection must be tackled by removal of the involved teeth to allow complete eradication and prevention of recurrence.

Case Report

A 16 year old female patient was planned for orthodontic treatment. Premolar extraction was done on upper left side. On 4th day after extraction patient reported to the dental office with pain, swelling, redness, watering of the eye with protrusion of the eye ball and a complaint of blurred vision. Patient developed fever on the second day along with nasal decongestion. On examination circum orbital edema on left eye, proptosis, ophthalmoplegia, conjunctival chemosis, hyperemia of the conjunctiva, blepharitis, restricted eye

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ball movements (diplopia), lid edema and erythema (Figs. 1 and 2).

Immediately patient was admitted in the hospital. Parenteral antibiotics – inj. Cephapirazone + Inj. Salbactim, Inj. Metrogyl and parenteral fluids for the fluid replacement were given. Anti inflammatory like one stat inj. Hydrocortisone 100 mg was given.

A contrast enhanced CT (Figs. 3, 4, and 5) of orbit and maxilla was taken. A well demarcated radio opacity was seen on all sides of the orbital walls, naso ethmoidal complex area, left whole maxillary sinus, posterior accumulation of the pus and edema pushing the eye ball anteriorly.

Ophthalmologist consultation was taken and there was no vision loss. Patient was planned for the drainage of the pus under general anesthesia. Routine blood investigations were done. Elevated neutrophil count, total WBC count was observed. Pus samples were sent for culture sensitivity and showed the presence of following organisms:-

- *Staphylococcus aureus*
- *Beta hemolytic streptococci*

Fig. 1 Left peri orbital edema

Fig. 2 Post Extraction Site

Fig. 3 CT showing left ethmoid and Proptosis orbital opacity

Fig. 4 CT showing opacity in all

Fig. 5 CT showing opacity in left

With the help of ENT surgeon, nasal endoscopic surgery (Fig. 6), middle meatus antrostomy and ethmoidectomy (Fig. 7) was done for drainage of pus from maxillary sinus, ethmoidal sinus and also from the orbital cavity.

Fig. 6 Nasal endoscopic surgery Orbital walls orbit and immediate decompression of Eye ball

Fig. 7 Ethmoidectomy

Immediately regression of orbital swelling was noticed. Eye lid movements were improved. Epiphora reduced and proptosis declined. On the second day patient was discharged. Routine follow ups were done. Patient was able to function normally (Figs. 8, 9). Periodic post operative checkups were done and after 4 years, CT showed normal paranasal sinus and orbital cavity (Figs. 10, 11, and 12)

Pathophysiology

Orbital cellulitis occurs in the following 3 situations: (1) extension of an infection from the periorbital structures, most commonly from the paranasal sinuses, but also from the face, the globe, and the lacrimal sac; (2) direct inoculation of the orbit from trauma or surgery; and (3) hematogenous spread from bacteremia.

The medial orbital wall is thin and perforated by numerous blood vessels and nerves. The combination of thin bone, foramina for neurovascular passage, and

Fig. 8 Immediate post operative

Fig. 9 4 years after surgery

Fig. 10 CT shows clear para nasal sinus walls and orbit walls, 4 years after the surgery

naturally occurring defects in the bone allows easy communication of infectious material between the ethmoidal air cells and the subperiosteal space in the medial aspect of

Fig. 11 CT shows clear para nasal sinus walls and orbit walls, 4 years after the surgery

Fig. 12 CT shows clear para nasal sinus walls and orbit walls, 4 years after the surgery

the orbit. The most common location of a subperiosteal abscess is along the medial orbital wall. The periosteum is loosely adherent to the bone of the medial orbital wall, which allows abscess material to easily move laterally, superiorly, and inferiorly within the subperiosteal space.

In addition, the lateral extensions of the sheaths of the extraocular muscles, the intermuscular septa, extend from one rectus muscle to the next and from the insertions of the muscles to their origins at the annulus of Zinn posteriorly. Posteriorly in the orbit, the fascia between the rectus muscles is thin and often incomplete allowing easy extension between the extraconal and intraconal orbital spaces.

Venous drainage from the middle third of the face, including the paranasal sinuses, is mainly through the orbital veins, which are without valves, allowing the passage of infection both anterograde and retrograde. Infectious material may be introduced into the orbit directly from accidental or surgical trauma. Ethmoid sinusitis is the most common cause of orbital cellulitis in all age groups and aerobic non-spore-forming bacteria are the organisms most frequently responsible.

Discussion

Odontogenic causes of orbital inflammation are rare. Gans et al. [3] in a series of 190 patients with orbital inflammation only 2% had an odontogenic source as the cause of the orbital inflammation. The predisposing factor for the orbital cellulitis was acute sinusitis which was confirmed by many authors. Fearon et al. [4] suggested that complicating sinusitis is commoner in the younger age group because vascular development is greater, with softer and more diploic bone that allows infection to spread with greater ease.

Classical anatomical studies published in the 1930s, by Dingman [5–10] and others, analyzed the facial compartments in the head and neck wherein infections may gain entrance to the orbit via by several pathways. Purulent material from an apical periodontal abscess travel in the path of least resistance. The buccal cortical plate of the alveolar process overlying the maxillary teeth is very thin; thus, most abscesses penetrate buccally. Orbital involvement may then ensure, either by direct spread through local tissue planes or by ascending facial thrombophlebitis. The

Ascension of facial thrombophlebitis to the orbit is facilitated by the absence of valves in the ophthalmic veins, resulting in an extensive two-way communication between the facial and orbital venous networks.

The most extensive communication between the facial and ophthalmic veins occurs at the inner canthal region above the medial palpebral ligament. An abscess of the first maxillary premolar or canine tooth is in close proximity to this region and should be handled with great care. Because of the intimate anatomic relationship between the paranasal sinuses and the orbit, paranasal sinusitis is the most common cause of orbital cellulitis.

Occasionally the apices of these teeth are in direct contact with the mucous membrane of the sinus. During extraction of an abscessed tooth, the floor of the sinus may be fractured, resulting in inoculation of the antrum with purulent material. In 1927, Hempstead [11] reviewed 385 cases of maxillary sinusitis. In 22.5% of these cases, the infection was attributed to extraction of abscessed molars. In 16% of the cases, a fistula extended through the alveolar

process into the maxillary antrum. The time interval between extraction of the tooth and onset of orbital symptoms ranged from 3 to 4 hours.

Chandler Classification of Orbital Cellulitis [12]

Stage I—Preseptal cellulitis

Inflammatory oedema of the eyelids

Stage II—Orbital cellulitis

Proptosis, chemosis, reduced eye movements, and possible visual loss.

Stage III—Subperiosteal abscess

Proptosis and visual loss

Stage IV—Orbital abscess

Complete ophthalmoplegia, visual loss, and marked proptosis

Stage V—Cavernous sinus thrombosis

Bilateral signs. May lead to loss of vision and meningism

Conclusion

The surgical drainage can be through external approach or through the nasal endoscopic approach. But the endoscopic approach has replaced the external method because of

- decreased morbidity,
- improved cosmesis,
- the preservation of the functional mucociliary system
- decreased chances of Telecanthus
- avoidance of paresthesia of sensory nerves.

The clinician should be aware whether a patient with orbital cellulitis may respond to initial antimicrobial therapy or to surgical drainage. If drainage is attempted prematurely, a localized infection may be disseminated throughout the orbital tissues. Conversely, if left undrained, a true orbital abscess that has not responded to medical therapy may result in loss of vision, cavernous sinus thrombosis, meningitis, subdural empyema, or brain

abscess [15]. If the clinical situation is ambiguous and a decision is made to delay surgery, the ophthalmological findings must be followed meticulously. Beta-scan ultrasonography and computerized axial tomography of the orbit may aid in the detection of an abscess [13, 14]; however, careful observation of the eye should take precedence in influencing the decision to attempt surgical drainage.

The high incidence of dental extraction makes it important to recognize the possibility of infection that may spread to the orbit, and the potential consequences of such an infection must not be underestimated.

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