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Case Report

An insight on management of odontogenic orbital infections: report of two cases

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Abstract – Odontogenic infections are common and very often spread to potential spaces of head and neck. The spread of such infection to adjacent maxillary sinuses or distant sites such as the orbits are a rare occurrence and may develop periorbital and orbital cellulitis. Unfortunately once orbital cellulitis and subsequently orbital abscess develops it can give rise to serious complications such as complete blindness or even more serious and life-threatening situations as cavernous sinus thrombosis, intracranial abscess or even death. Two cases are presented to demonstrate the differences between the two conditions and the necessary management in either case. This article provides an insight into the clinical behaviour of orbital infections of odontogenic origin with contemporary diagnostic and treatment modalities that will help in reducing morbidity and mortality associated with these conditions.

Introduction

An abscess around the periapical region of teeth is the most widely recognized type of odontogenic infection which starts by contamination of the root canal with microorganisms that cross apical foramen and invade periapical tissues. Root apices of maxillary teeth being anatomically proximal to adjacent muscles, connective tissue and sinus; are commonly associated with the pathophysiology of odontogenic infections. Purulent infections at periapex of upper jaw teeth owing to decay or trauma and contaminated sockets after tooth removal can be the sources of odontogenic infection.

In most cases, the infection is localized, but in some instances, purulent material passes through the soft tissue and fascial planes and spreads into distant regions [1,2]. Very rarely the distant spread of odontogenic infection may involve the orbit, having a variable clinical presentation that ranges from more confined preseptal cellulitis to more severe and potentially aggressive involvement in form of orbital cellulitis and orbital abscess. Orbital cellulitis through the remote propagation of odontogenic infection accounts for 2–5% of all orbital cellulitis [3,4]. In the absence of adequate knowledge, diagnosis and treatment of these unusual orbital infections is often delayed and may result in potentially life-threatening situations like cavernous sinus thrombosis, brain abscess and possibly death [5,6]. Chandler *et al.* [7] discussed in detail the clinical, pathological and treatment strategy of each orbital inflammatory condition. Periorbital and orbital cellulitis are two such conditions that are considered analogous, however, they are distinct in their clinical course and management. The author presents two cases of orbital infection of odontogenic origin, intending to demonstrate the differences between the two conditions and provide an insight on the clinical, radiological manifestations and the necessary management of odontogenic periorbital cellulitis and odontogenic orbital cellulitis.

Case report

Case 1–Odontogenic periorbital cellulitis

A 41-year-old female visited the hospital complaining of left mid-facial pain, drooping of the left upper eyelid and swelling around the left eye region since 2 days. The patient revealed that the swelling around the eye developed after severe toothache in the left upper jaw for which she took analgesics which provided temporary relief. A physical examination revealed erythematous edema around the left periorbital region and drooping of the left upper eyelid (Fig. 1A). Slightly blurred vision with watering of eyes was present but there was no proptosis and diplopia. The visual

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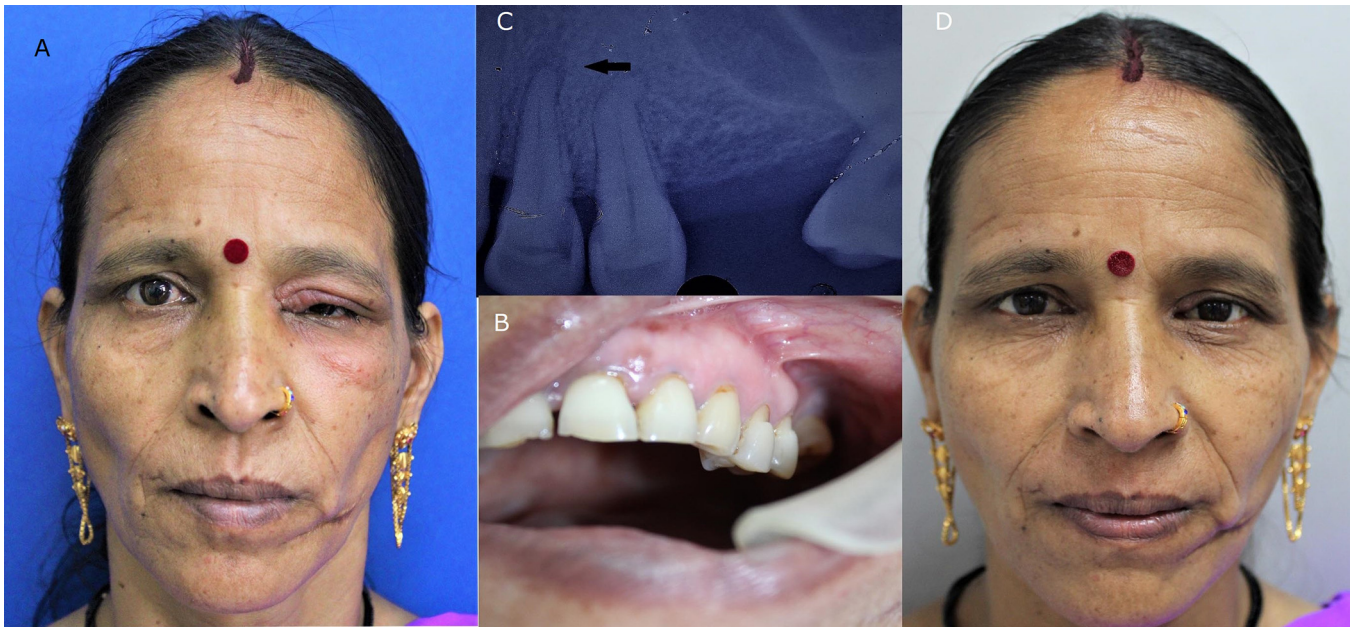

Fig. 1. Periorbital cellulitis of left eye (A), Periapical abscess associated with left premolars (B), IOPA showing carious 1st premolar associated with periapical radiolucency (C), complete recovery following extraction of carious teeth (D).

acuity, visual field and extraocular movements were intact. The intraoral examination revealed a carious left maxillary first premolar which was tender on percussion associated with a draining sinus (Fig. 1B). A radiograph revealed a periapical radiolucency associated with the left maxillary first premolar (Fig. 1C).

Extraction of the carious tooth was done under local anesthesia. Oral antibiotics amoxicillin-clavulanic acid combination and metronidazole were prescribed and the patient was recalled for follow up after three days. The swelling subsided rapidly on the third day. The patient presented with almost total recovery by the seventh day (Fig. 1D).

Case 2–Odontogenic orbital cellulitis

A 60 year old female reported with a swelling on the right side of the face involving the right eye. History revealed that the onset of swelling started spontaneously following toothache and rapidly involved the right side of the face. On physical examination, the patient looked very ill, irritable and febrile. The swelling surrounding the right eye was tender to palpation (Fig. 2A).

The ophthalmic assessment was done. The right eye had mild proptosis, right conjunctiva was erythematous and chemosed associated with lid edema; with moderate restriction of the eyeball movement. Light reflexes were intact. MRI revealed ill-defined radiopacities involving the intraconal compartment and diffuse fatty strands in the intraconal and extraconal compartment with resultant proptosis of the right eye globe and facial soft tissue swelling around the right orbit (Fig. 2B).

The patient was admitted and routine blood investigation including blood sugar, complete blood count, serum electrolytes and creatinine were performed. The patient was a recently diagnosed case of hypertension and was under medication. Blood sugar was normal while neutrophil counts were increased. Intravenous cefotaxime and metronidazole administered empirically along with tobramycin and atropine topical eye drop application. Lateral and medial canthotomy was done for decompression of orbit. The patient underwent ENT evaluation and incision and drainage of the temporal and infratemporal space was done and purulent discharge was sent for culture and sensitivity. Intravenous administration of Piperacillin-Tazobactam was started based on culture and sensitivity report. After a week, regression of orbital and facial swelling was noticed. Eyelid movements improved, epiphora reduced and proptosis declined. During the second week, the patient was able to function normally.

Swelling had resulted in trismus and made the intraoral examination difficult due to the restricted opening of the mouth. The radiograph revealed carious molars in the right maxilla (Fig. 3A). The patient was given oral prophylaxis and jaw physiotherapy was instituted to improve mouth opening. In the third-week the patient was normotensive and had an improved mouth opening (Fig. 3B and C). Carious molars were extracted from the right maxilla under local anaesthesia, and drainage was established intraorally (Fig. 4A and B). The patient was kept under observation; all signs and symptoms subsided at the time of discharge. Total recovery commenced within a month. The patient had normal vision, unrestricted eye-movements and adequate mouth opening on follow up after one month (Fig. 5A and B).

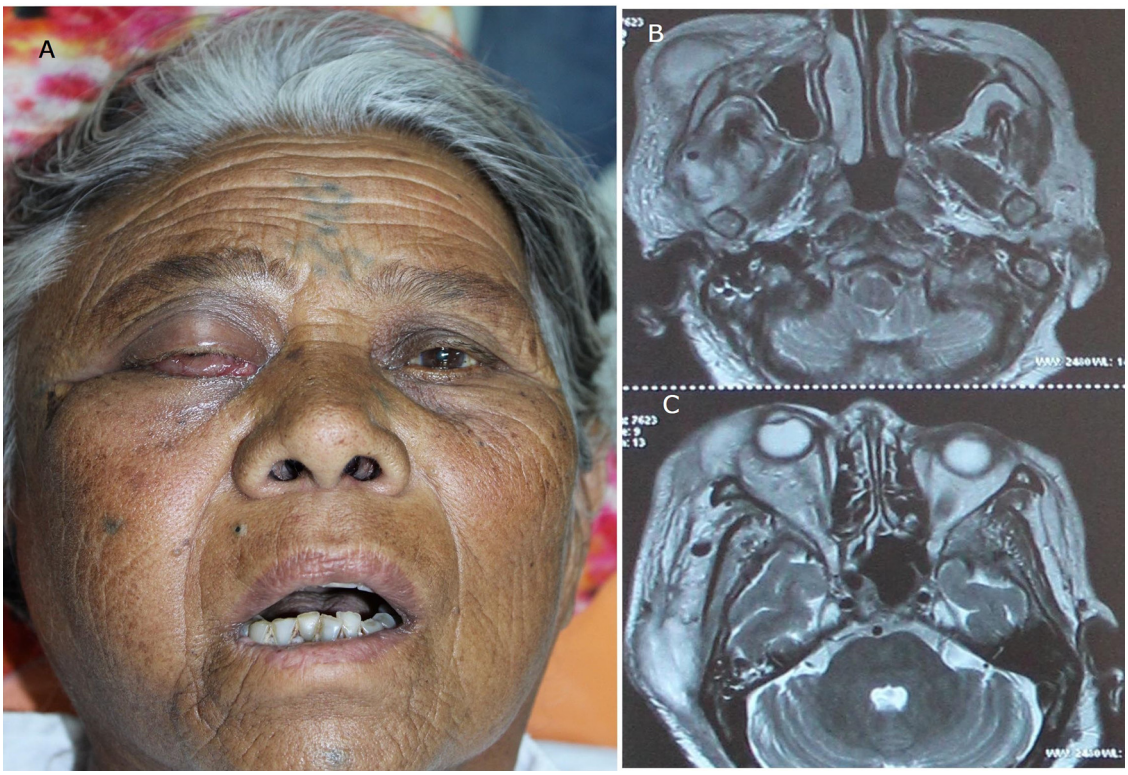

Fig. 2. Facial swelling on right side with right orbital cellulits (A), MRI showing swelling & proptosis of the right eye globe and ill-defined radiopacities and diffuse fatty strands in the intraconal and extraconal compartment (B).

Discussion

Bony orbits are surrounded by air-filled sinuses having a very thin bony partition that makes the orbital contents vulnerable to the contagious spread of various infections. The absence of lymphatic drainage and valve less venous drainage of orbital and periorbital tissue allows the extension of infection into the orbit and deeper structures [8]. The course of the infection depends on the virulence of the bacteria, host resistance factors and regional anatomy. Odontogenic infection can spread to orbital and periorbital regions via a variety of pathways. Direct spread of odontogenic infection into the maxillary sinuses can reach the orbit, indirectly infections from anterior maxilla can be conducted to orbit via canine fossa with facial vein thrombophlebitis. Similarly backward spread into the pterygopalatine and infra-temporal region may approach the orbit via inferior orbital fissure [8,9]. In the patient presented in case 1 with periorbital cellulitis, odontogenic infection close to the root summit of the maxillary teeth likely entered through the buccal cortices to the respective maxillary sinus and ascended upwards to involve the orbit. While in the patient presented in case 2 with orbital cellulitis the infection spread to the orbit through the infratemporal region. The imaging study in both the cases was intriguing for such a course and predictable with the historical backdrop of toothache.

Microorganisms identified in most reports for causing odontogenic orbital infections are predominantly staphylococcus aureus and streptococcus species [10–12]. Community-acquired methicillin-resistant staphyloccocus is emerging as a causative organism in recent studies [13,14]. Other frequently associated microorganisms reported are coagulase-negative staphylococcus, klebsiella pneumoniae, aspergillus, moraxella catarrhalis and acinetobacter [15,16]. Haemophilus influenza was a common cause of orbital infections in children before the advent of haemophilus influenza type B (HIB) vaccine [17–19].

Although the difference between periorbital and orbital cellulitis is typically apparent, it may be difficult initially to differentiate between both. Periorbital cellulitis is less frightful owing to confinement anterior to the orbital septum and manifests mainly as diffuse erythematous periorbital edema with mild to moderate pain of the affected eyelids; while the visual acuity, pupillary reaction and eye motility remain normal. In contrast, orbital cellulitis is more aggressive depending upon the amount of involvement of the posterior orbit. Patients typically have painful limitations of extraocular movements, decreased visual acuity and proptosis [17,20]. However chemosed conjunctiva can be seen in both the conditions [21,22]. Hence, despite clinical diagnosis of these conditions radiographic investigations are essential for prompt detection of their nature and severity and also to determine the appropriate treatment modality. Computerized axial tomography (CT) is considered a gold standard for imaging of the orbit in orbital infections. CT gives information about the anatomic components, contents of the orbit and inflammatory changes

Fig. 3. OPG showing carious molars in right posterior maxilla (A), Regression of facial and orbital symptoms after second week (B) and improvement of mouth opening (C).

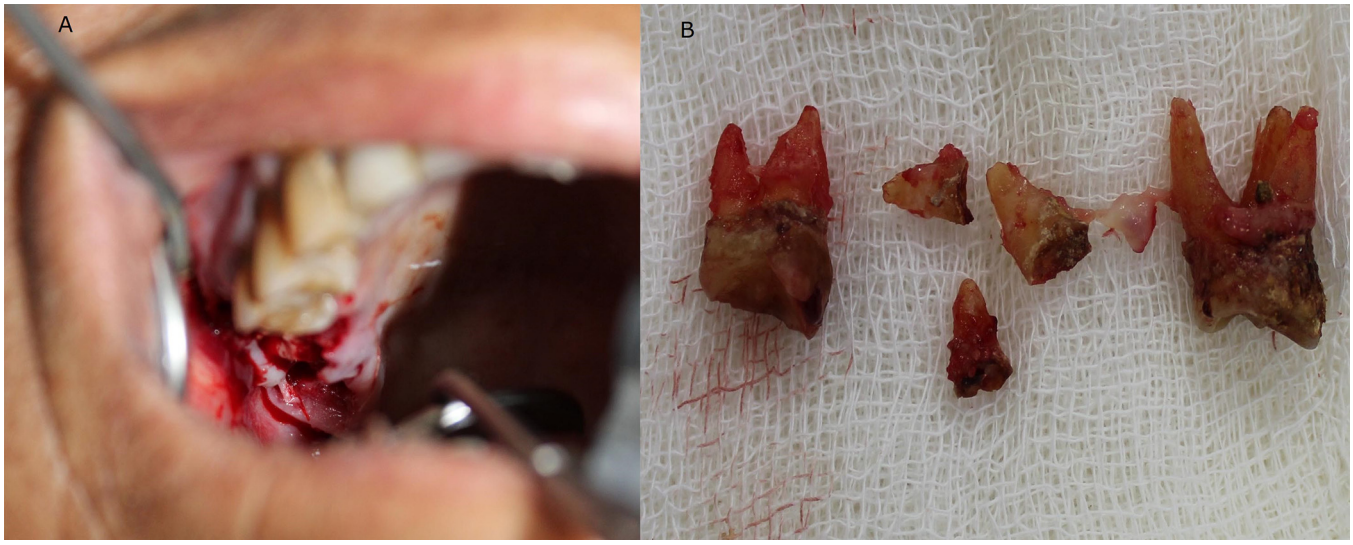

Fig. 4. Drainage established intra-orally through buccal vestibule (A), Extraction of carious teeth from posterior maxilla (B).

Fig. 5. Complete recovery after 1 month with no residual effect (A), Mouth opening in normal limit with complete healing at extraction site (B).

associated with infection. Common CT findings in orbital cellulitis that are lacking in periorbital cellulitis are inflammation of extraocular muscles, fat stranding and anterior displacement of the globe, although this may be subtle [23,24]. Magnetic resonance imaging (MRI) of the orbits provides a superior resolution of orbital soft tissues with no radiation exposure as compared to CT [25].

Rapid assessment and initiation of the treatment are essential to minimize permanent disability and possible life-threatening complications. Hence, regardless of the severity of orbital inflammation a comprehensive ENT, ophthalmic and dental assessment must be conducted initially for all patients. The meticulous ophthalmic examination must include a physical examination of involved orbit along with an assessment of visual acuity, pupillary reflexes, intraocular pressure and ophthalmoscopy. Excessive swelling of eyelids often precludes proper examination of the eye, hence radiological evaluation becomes necessary for proper assessment of orbit and surrounding structures to establish a diagnosis and determining the setting of care [26].

Patients with mild to moderate periorbital cellulitis usually do not require surgical intervention. Thus, they can be treated effectively with conservative therapy by eliminating the source of odontogenic infection and prescribing broad-spectrum antibiotics in the outpatient department. Careful drainage and debridement of the eyelid abscess can be performed by making a little entry over the most fluctuant area of swelling. However, these patients must be kept under regular follow-up due to the potential of developing significant complications. Hospital admission will be necessary for extensive periorbital and orbital cellulitis cases as aggressive medical therapy along with surgical intervention and perpetual monitoring of the clinical course of the condition is required [25]. Regardless of the severity, the medical management focuses primarily on parentral administration of broad-spectrum antibiotics covering anaerobes empirically and later based on culture and sensitivity. Commonly administered empiric antibiotics based on microbiology knowledge and available literature is a combination of cefotaxime and metronidazole or clindamycin. Piperacillin — tazobactam, ticarcillin — clavulanate and ceftriaxone are also potential antibiotic combinations. Vancomycin along with appropriate fluoroquinolone can be used in patients allergic to penicillin [27]. Addressing and eliminating any source of odontogenic infection is paramount.

Prompt surgical interventions in emergency setup under general anesthesia may significantly reduce ocular and cranial complications in patients who do not respond to medical therapy. Surgical measures aim towards the release of pressure from ocular adnexa by establishing drainage of orbital compartments and adjoining sinuses by evacuation of purulent content through appropriate methods [25,28]. Inadequate surgical debridement may progress into intracranial sepsis and unfortunate consequences. If treated efficiently, the prognosis of orbital cellulitis with or without abscess is good and patients can be out of the hospital care within a few days. Recurrence of the disorder and residual deformity require frequent follow-up of all surgically treated patients, to avoid early complications. Delayed complications include reduced visual acuity, persistent diplopia, enophthalmos, excessive-wound scarring and keloid formation on the skin over drainage site [25].

Conclusion

Odontogenic orbital infections are rare yet potentially life-threatening occurrences. Clinicians must investigate all aspects of orbital infection. Odontogenic source of infection though rare is very important to be taken into consideration, as many a times the patient does not have any significant dental history or visible dental ailment. Timely identification of differentiating clinical and radiological features, major risk factors and commonly responsible microbial species are crucial in the management of acute periorbital and orbital cellulitis. Follow-up of treated patients depends on the severity, associated complications and intervention adopted and is directed by relevant medical disciplines involved in patient care including oculoplastic surgeons, otolaryngologists, maxillofacial surgeons, neurosurgeons and experts in infectious diseases.

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