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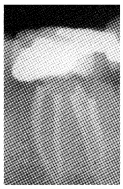

CASE REPORT

# Abscess of the orbit arising 48 h after root canal treatment of a maxillary first molar

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## Abstract

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**Aim** To discuss a rare, but severe complication arising following routine root canal treatment.

**Summary** An orbital abscess is reported that occurred following routine root canal treatment. A young, healthy female patient, with no history of chronic paranasal infection had undergone root canal treatment of the right maxillary first molar. On hospital admission, she presented with extensive periorbital swelling and discreet diplopia. Computed tomography imaging identified massive purulent sinusitis and subsequent involvement of the orbit via the inferior and medial orbital wall within 48 h after completion of root canal treatment. Immediate surgical drainage of the maxillary sinus and the orbit was established and a high dose of perioperative antibiotics (Amoxicillin/Clavulanic acid, Gentamycin, Metronidazole) were administered. Vision remained undisturbed and mobility of the globe recovered within 10 days.

**Key learning points**

- Rapid exacerbation of a periapical inflammation may occur following root canal treatment and may even involve the orbit.
- A typical speed of disease progression or ophthalmic symptoms should alert the clinician to at least consider unusual early orbital spread of odontogenic infection.
- When extra-alveolar spread and especially orbital spread is suspected, immediate referral to a maxillofacial or other specialized unit is mandatory.

**Keywords:** dental infections, endodontic treatment (complications), orbital infections, propionibacteria, root canal treatment.

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## Introduction

Although spreading of dental infections beyond the immediate proximity of the alveolar process is common and contributes substantially to the range of patients who are admitted to surgical maxillofacial units, early involvement of the orbit following infections of dental origin is an extremely rare event. In fact, a vast majority of orbital infections develop as a complication of infections in the paranasal sinuses (Bullock & Fleishman 1985, O'Ryan *et al.* 1988), secondary to periorbital trauma, in conjunction with an ascending thrombophlebitis or even as a complication of purulent otitis media (Jarrett & Gutman 1969, Krohel *et al.* 1980, 1982, Harris 1983, Hornblass *et al.* 1984, Jackson & Baker 1987).

Because of the dramatic clinical impact and the substantial sequelae of acute bacterial orbital infection, which includes blindness (Henry *et al.* 1992, Gold & Sager 1974) as well as thrombosis of the skull base venous sinuses and consecutive meningitis or intracerebral abscess (Hollin *et al.* 1967), the occurrence of this rare complication has been well documented. In the context of odontogenic infections, orbital abscesses have been reported to originate from exacerbated periapical lesions or secondary to dentoalveolar surgery (Kaban & McGill 1980, Allan *et al.* 1991, Henry *et al.* 1992, Pellegrino 1980).

Orbital infection as an early complication of endodontic treatment has not been described. This clinical article reports the uncommon complication of an orbital abscess, arising within 48 h of nonsurgical root canal treatment of a maxillary first molar in a healthy patient.

## Case report

A 29-year-old female patient was admitted to hospital because of progressive periorbital oedema and concomitant painful swelling of the right maxillary cheek. Three days previously, the patient had experienced an acute headache with the pain being focussed on the right maxillary molar region. The next day, she consulted a dentist who identified acute periapical periodontitis of the first maxillary right molar as the source of pain and infection. The radiograph taken at the time of the first consultation (Fig. 1) demonstrated a well-defined radiolucent area on the mesio-buccal root. Initial root canal treatment comprised apical trepanation, root canal preparation up to size 50 and root canal filling with

**Figure 1** X-ray (performed alio loco) prior to endodontic treatment. A well-defined radiolucency at the mesio-buccal root indicates periapical periodontitis at the right maxillary first molar.

 

**Figure 2** Clinical aspect of the patient on admission. Periorbital swelling prevented spontaneous opening of the eye. The upper lid sulcus and the lower lid skin creases had completely disappeared because of lid oedema and protrusion of the globe.

Endomethasone-N (Septodont, Saint-Maur des Fosès, France). The access cavity was temporarily sealed with a composite material.

Because of the persistence of pain, initial swelling of the cheek and the onset of mucous outflow from the right nostril, the patient was referred to an ENT specialist one day after the root canal treatment. Acute infection of the paranasal sinuses was recognized and anti-infectious therapy was initiated with Metronidazole. Overnight, periorbital swelling arose and, because of the progression of the symptoms, the patient was admitted to the University Hospital of Mainz.

On hospital admission (second day following root canal treatment), the patient had intense hemifacial pain, periorbital oedema and swelling of the right maxillary cheek (Fig. 2). Sensitivity of the maxillary first right molar was negative, all other teeth on the right maxilla had a positive pulp response. When looking upward, the patient experienced a discrete binocular diplopia. Laboratory control for C-reactive protein (CRP) was 267 mg $L^{-1}$ and leucocytes were 15.2 $nL^{-1}$. The panoramic radiograph showed extrusion of the root filling material beyond the apex in the disto-buccal root (Fig. 3). A computed tomography (CT)-scanning revealed maxillary sinus empyema and spread of the infection to the ethmoidal and frontal sinuses. Involvement of the orbit was confirmed from both

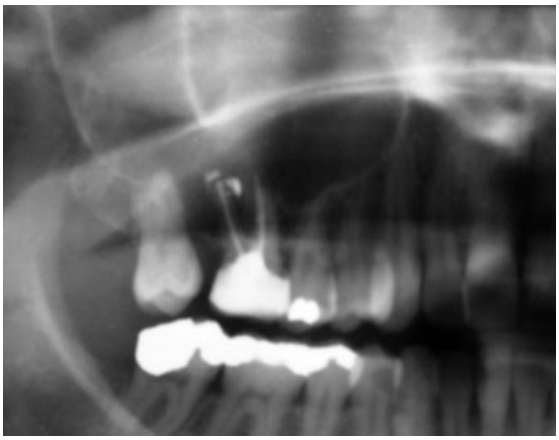

**Figure 3** Detail of a panoramic X-ray (performed alio loco) after root canal treatment showing extrusion of the root filling material beyond the apex at the disto-buccal root of the right upper first molar.

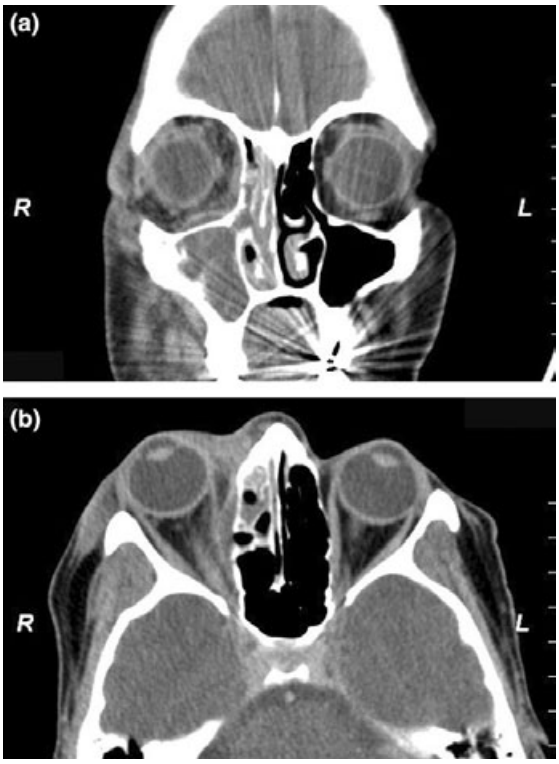


**Figure 4** Computed tomography-scan in frontal (a) and axial (b) view. Besides complete obturation of the maxillary sinus, the frontal view (a) demonstrates a convex elevation of the periorbital membrane because of the subperiostal abscess formation. In the axial view (b) a similar involvement of the orbit is seen at the medial orbital wall in close proximity to the partially obturated ethmoid cells. The medial rectus muscle is displaced laterally. In this section the significant protrusion of the globe becomes obvious.

the inferior orbital wall (Fig. 4a) and from the medial wall (Fig. 4b), significantly protruding the globe. The infection also passed through the lateral wall of the maxillary sinus in terms of a retromaxillary abscess formation.

The patient was immediately taken to the operating room and the abscesses were evacuated under general anaesthesia. Specifically, to drain the sinus empyema, the lateral wall of the maxillary sinus was fenestrated and a massive outflow of pus was achieved immediately (Fig. 5a). Silicon tubes were placed to drain the retromaxillary region and the maxillary sinus. The orbit was approached via an infraorbital incision. Extensive discharge of pus occurred when subperiostal access was accomplished to the medial and inferior orbital wall (Fig. 5b). Continuous drainage of the orbit was established by means of a 6 mm Medidrain® (Dispomedia, Hamburg, Germany). Postoperative antibiotics (Augmentan® $3 \times 2.2$ g [Glaxo SmithKline Beecham, Munich, Germany]; Gentamycin-Ratiopharm® $1 \times 120$ mg [Ratiopharm GmbH, Ulm, Germany]; Metronidazol-Fresenius® $3 \times 500$ mg [Fresenius Kabi Deutschland GmbH, Bad Homburg, Germany]) were administered.

The clinical signs of infection, especially the periorbital oedema and the subcutaneous infiltration of the cheek resolved considerably during the next few days. A significant decrease of the laboratory parameters CRP and leucocyte counts (Fig. 6) also occurred. The orbital drain was shortened on the third and fifth day and removed on the ninth day following surgical intervention. A slight increase of periorbital swelling and simultaneous increase in the leucocyte count to 9 $nL^{-1}$ resulted in a new infraorbital drain being placed,

 

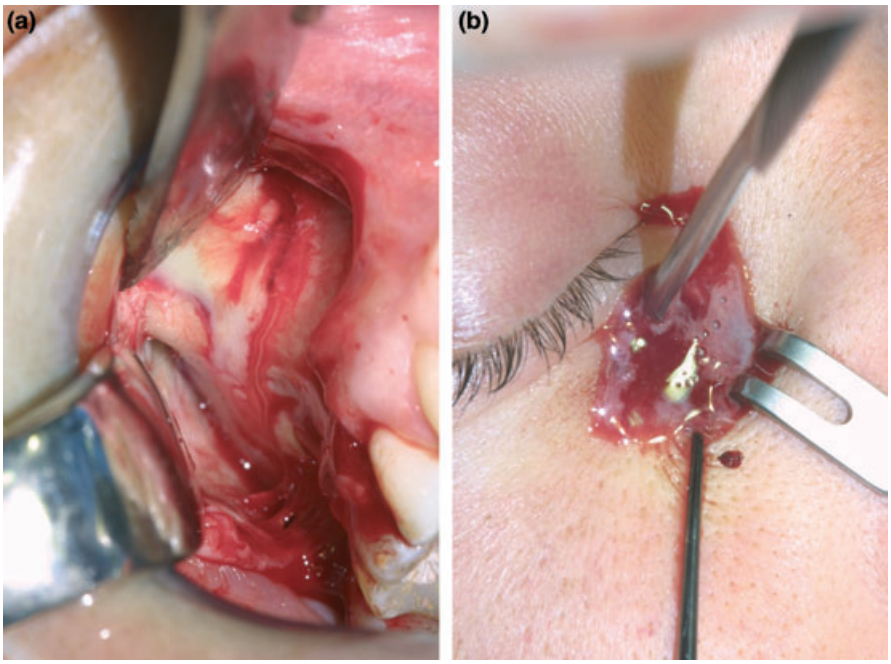


**Figure 5** Operative treatment. Transfacial fenestration of the maxillary sinus immediately resulted in a massive discharge of pus (a). Subperiostal access to the medial and inferior orbital wall succeed in spontaneous purulent outflow (b) interspersed with small gas bubbles.

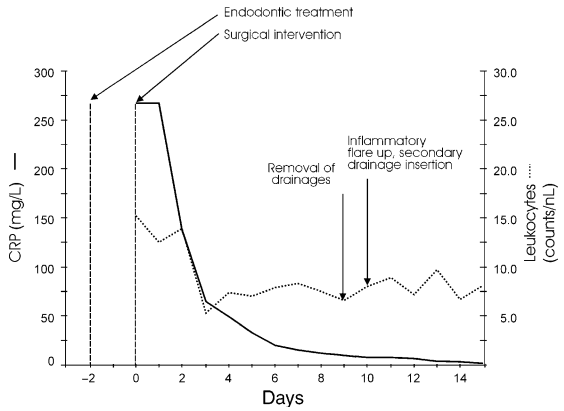


**Figure 6** The time table displays the infection parameters of C-reactive protein (CRP) and leucocyte counts as a function of time. Remarkably, the inflammatory flare reaction after the first removal of the orbital drainage was only marginally reflected in the leucocyte counts and not in the CRP values.

which was finally removed on day 15. On postoperative visits to the ophthalmologist, vision remained undisturbed during treatment and mobility of the globe had recovered completely by day 10. The retromaxillary drain was shortened on the seventh day and removed on the ninth day.

The microbiological analysis revealed propionibacteria as the main bacterial population in the putrid material of the orbit. Surprisingly, from the material gained from the maxillary sinus and from the retromaxillary region, only candida species and no bacteria could be cultivated. These results of the antibiogram suggested a monotherapy by Augmentan. This was administered orally.

No renewed signs of inflammation had occurred and the washing of the maxillary sinus retrieved clear fluid. The patient was discharged on the 16th postoperative day and scheduled for conservative root canal re-treatment with subsequent surgical maxillary sinus revision.

## Discussion

A severe case of orbital infection initiated or accelerated by routine root canal treatment is presented. The most outstanding aspect of this case is the extremely rapid exacerbation of a periapical inflammation (under root canal treatment) not only affecting the maxillary sinus and ethmoid cells, but also involving the frontal sinus and penetrating the inferior and medial orbital walls within 48 h in a young female with no history of chronic infection and especially without a history of chronic paranasal infection.

A potential explanation of this aggressive disease progression could include the deposits of root filling material inside the maxillary sinus. In fact, the cytotoxicity of Endomethasone when exposed to periapical tissues has been well documented and secondary inflammatory reactions even with external root resorption and osteonecrosis have been described (Harris 1971, Bernáth & Szabó 2003). Although such toxic tissue damages might principally promote the exacerbation of an apical lesion, the expected time frame of these toxic side effects would suggest a subacute or chronic course of disease rather than a peracute boost of infection. Endomethasone has been credited to possess a high bactericidal potential (Pumarola *et al.* 1992), which might even exert a protective influence. However, Endomethasone N (powder) contains zinc-oxide, hydrocortisone acetate, thymol iodide (which is added as a mild antiseptic agent), barium sulphate and magnesium stearate; yet, paraformaldehyde is not included as in the case of Endomethasone (powder).

The periapical extrusion of filling materials, as observed in the present case, has inconsistently been reported as a predictor of negative outcome in root canal treatment (Friedman *et al.* 2003, Farzaneh *et al.* 2004, Ørstavik *et al.* 2004). However, the periapical displacement of infected debris during chemo-mechanical canal preparation and especially due to over-instrumentation has been regarded as the relevant pathogenetic factor rather than the extrusion of filling materials *per se* (Friedman 2002, Siqueira 2003). Thus, it seems likely that the infection of the maxillary sinus resulted from the direct displacement of virulent microorganisms from the infected root canal into the sinus because of over-instrumentation. It is interesting, that the involvement of the anaerobic propionibacteria species has been reported in another case of odontogenic orbital infection (Henry *et al.* 1992). However, a rationale in terms of a functional pathogenetic role of this specific microorganism, which might explain this clinical observation, has not been identified.

It may appear counterintuitive that, although the whole maxillary sinus was filled with pus, no bacteria could be cultivated from the material retrieved at this site. However, it is not completely unusual, that aspirates drawn from abscesses in the head and neck area do not show any bacterial growth (Brook *et al.* 1991). Sterile cultures of purulent material have been reported in up to 25% of cases (Migirov & Kronenberg 2004).

Although uncommon in the primary diagnostic algorithms of odontogenic deep space infections, CT-imaging proved to be valuable in this specific case (Flood *et al.* 1982). The clinical aspect of the periorbital swelling was ambiguous and together with the nasal outflow could have been interpreted as a collateral oedema because of an ordinary acute odontogenic sinusitis. However, the CT-scan unequivocally identified orbital inflammatory involvement as the cause of the diplopia, advocating an immediate surgical intervention.

 

Whenever rare events are reported in the literature, the question arises as to how to adequately recognize such cases in an early state of the disease to provide an opportunity for a successful intervention. This is of crucial relevance, when routine procedures such as root canal treatment are involved, which are considered effective, safe and are performed commonly. In the present case, two diagnostic parameters were crucial when recognizing the course of the disease: the extremely rapid onset of maxillary sinusitis, within <24 h after root canal treatment, and the discrete diplopia upon admission. Both indicated that the patient required additional imaging by means of a CT to achieve a diagnosis, which finally revealed orbital involvement.

## Conclusion

An extremely rapid orbital abscess that occurred within 48 h following routine root canal treatment of a maxillary first molar in a young, otherwise healthy patient is reported. Most likely, over-instrumentation caused a microbial contamination of the maxillary sinus. Although exceptionally rare, this case should alert the clinician to at least consider unusual early orbital spread of odontogenic infection, when either atypical speed of disease progression or (even discrete) ophthalmic symptoms occur. If such an extra-alveolar spread of infection is suspected, immediate referral to a maxillofacial or other specialized unit is mandatory.

## Disclaimer

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