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CASE REPORT

Foreign body of endodontic origin in the maxillary sinus

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Abstract Foreign bodies found in the maxillary sinus include tooth roots, burs, dental impression material, root-filling materials, dental implants, and needles. The purpose of this paper was to present an unusual case of a large foreign body of endodontic origin (root-filling material) removed from the maxillary sinus. A 45-year-old generally healthy male patient reported to the Department of Conservative Dentistry with Endodontics of the Medical University of Silesia, because of orbital and buccal pain on the right side of his face and headaches in the preceding 6 months. Those symptoms were associated with the end of endodontic treatment of teeth 14 and 16. Periapical X-rays, including of teeth 14 and 16, showed the presence of root canal filling with extrusion of endodontic obturation material beyond the apices of tooth 14. In the case of tooth 16, a completely filled palatal canal and incompletely filled buccal canals were found. There was also an irregular dimness at the upper edge of the X-ray image. Panoramic radiography and computed tomography demonstrated a foreign body in the right sinus. Sinus exploration was performed via a surgical procedure conducted using topical anesthesia. The root apices of tooth 14 were resected, and foreign substance was removed. The practitioner did not correctly recognize a complication that occurred during endodontic treatment, which resulted in extrusion of endodontic material beyond the root apices of tooth 14. This case emphasizes the potential impact that an involved maxillary sinus may have on endodontic therapy. Detailed diagnostic identification based on the medical interview, physical and histopathological examinations, and diagnostic imaging allowed rapid surgical intervention and

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prevented local and general complications. It is important to realize that the range of the periapical X-ray projection is not always sufficient.

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Introduction

Foreign bodies found in the maxillary sinus include tooth roots, burs, dental impression material, root-filling materials, dental implants, and needles.¹ In most cases, these materials gain entry via oroantral communication. Extruded material that remains in place forms an oroantral fistula. In some less-common cases, materials gain access to the sinuses via a tooth socket, via the pulp chamber of a tooth, or during an operation near the antrum.^{1,2} A complication following the root canal therapy occurs as the result of overinstrumentation and extrusion of endodontic obturation materials.^{3–5} Although some objects remain asymptomatic, others result in chronic sinusitis because of invasion by highly virulent bacteria from the oral cavity into the sinus,¹ as systemic and local conditions of patients differ in each case.⁶ Orbital pain and headaches have been found to result from pain caused by local compression of obturation material in many cases.² It is possible for small foreign materials to spontaneously be expelled, but in most cases, they require removal.⁶ Sometimes the foreign body can move some distance in the space of the maxillary sinus from the place of origin, and the smallest pieces may be transported by the cilia of the epithelium lining the maxillary sinus, contained in the mucus fluid against the forces of gravity, up to the nasal wall of the sinus, and out into the nose via the ostium. Small foreign bodies may be silently inhaled, especially during sleep. If inhaled in this way, there is a real danger of occurrence of pneumonia or lung abscesses.⁷

The purpose of this paper was to present an unusual case of a large foreign body of endodontic origin (root-filling material) removed from the maxillary sinus.

Case report

A 45-year-old generally healthy male patient reported to the Department of Conservative Dentistry with Endodontics, Medical University of Silesia, because of orbital and buccal pain on the right side of the face and headaches in the preceding 6 months. The symptoms were associated with the end of endodontic treatment of teeth 14 and 16. Periapical X-rays, including of teeth 14 and 16, showed the presence of root-canal filling with extrusion of endodontic obturation material beyond the apices of tooth 14. In the case of tooth 16 a completely filled palatal canal and incompletely filled buccal canals were found. There was also an irregular dimness at the upper edge of the X-ray image, which suggested an artefact that appeared during the X-ray preparation (Fig. 1). Panoramic radiography revealed an irregular, radiodense foreign body in the right maxillary sinus. A foreign body with irregular borders was observed to have spread to the maxillary sinus wall away from the apical region of the involved tooth 14 (Fig. 2).

Computed tomography (CT) in the frontal plane and three-dimensional reconstruction CT in the lateral plane demonstrated a foreign body in the right sinus (two pieces; Figs. 3 and 4). Subsequently, the patient was adequately informed about the results of the examination, potential complications, and the need for additional surgical treatment. Maxillary sinus exploration was performed via a surgical procedure conducted using topical anesthesia in the Department of Dental Surgery, Medical University of Silesia. The root apices of tooth 14 (filled using paste without gutta-percha points) were resected, and the foreign substance was removed through fenestration (1.0 cm × 1.0 cm) at the frontal wall of the sinus and similarly in the area of the maxillary sinus (Figs. 5–7). In order to obtain an accurate clinical diagnosis of the state of the sinus maxillaris, a sample of mucosa was taken for histopathological examination, which later showed sinusitis chronica. The sinus was irrigated with a saline solution. The wound was then cleaned, and the flap was sutured into its original position (Fig. 8). A postoperative panoramic radiograph was taken



Figure 1 X-ray projection, including teeth 14 and 16.



Figure 2 Panoramic radiograph revealing a radiodense, irregular foreign body in the right maxillary sinus.

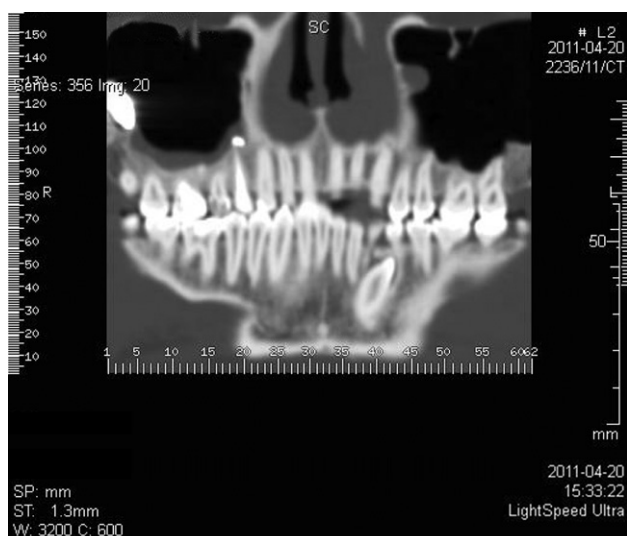


Figure 3 Computed tomography of the frontal plane demonstrating the foreign body (two pieces).

(Fig. 9). Anti-inflammatory and pain medication was given to the patient (ketoprofen table, 100 mg), and antibiotics were prescribed for the next 7 days (ciprofloxacin tablet, 500 mg, every 12 hours). The extirpated foreign material (the largest piece weighed 0.62 g, with dimensions of 15.5 mm × 7 mm × 7 mm, and a volume a 290 mm³) was chemically fixed and preserved in epoxy resin (AH Plus; Dentsply International Inc., York, PA, USA; Fig. 10). Recovery was observed with no clinical symptoms and, after 6 weeks, the recurrence of orbital pain and headaches was totally eliminated. In the future, clinical observation and endodontic retreatment of tooth 16 are planned.



Figure 4 Three-dimensional reconstruction computed tomography in the lateral plane demonstrating the foreign body (two pieces).



Figure 5 The status after exposure of the radical region of tooth 14.



Figure 6 The status after resection of the radices of tooth 14.

Discussion

The most commonly found foreign bodies are displaced fractured roots of teeth and in some instances, whole displaced teeth. Other foreign bodies include dental burs and implants.^{2,5} The bone of the maxillary sinus floor can be



Figure 7 The foreign body clearly visible in the maxillary sinus through the surgical approach.



Figure 8 Postoperative status.

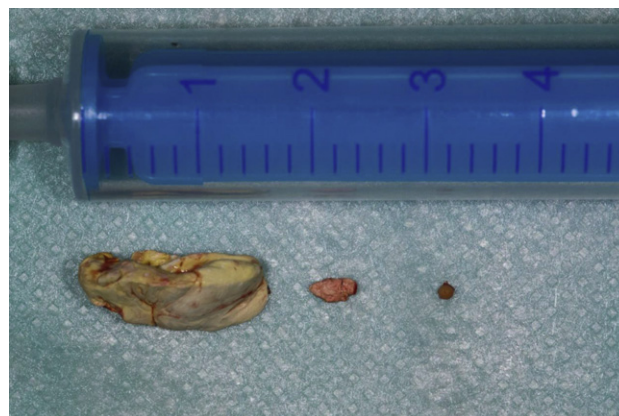


Figure 10 Foreign body after removal from the sinus.

very thin, and in some individuals, the roots of the premolars and posterior teeth project through this bone. In such a case, the root tips on tooth 14 are then covered only by the Schneiderian membrane of the respiratory epithelium which lines the maxillary sinus.⁸ Great care must be taken during dental treatment and particularly endodontic procedures not to accidentally introduce a foreign body into the antrum. Perhaps if a “step-back” technique in preparing the root canal and placement of an initial principal point followed by further additional points using lateral condensation had been utilized, then the root-filling material would not have been displaced through the apex.⁵ Roots with open or wide apices can become potentially dangerous, when vertical condensation of root-filling material is used, especially when using the injection-type of thermoplastic gutta-percha³ or the paste-filling method with a Lentulo needle. However, minimal use of sealer-extrusion should result in a symptom-free prognosis, with a weak inflammatory tissue reaction after obturation. Accidental overextension of root-canal sealer into the sinus might be the main etiological factor for aspergillosis of the maxillary sinus in otherwise healthy patients. Root-canal materials, including zinc oxide, are considered to be a growth factor for aspergillus.³

During root-canal filling, the volume of the sealer used should be very carefully considered. *In vitro* studies indicated that the initial mean volume of the internal space of the first maxillary premolars averaged 55.58 mm^3 , and after endodontic preparation, it may increase to an average of



Figure 9 Postoperative panoramic radiograph.

125.45 mm^3 .⁹ This means that in the described case, in which the paste-filling method was used, the volume of the foreign body extracted from the sinus maxillaris was approximately 231.16% of the average volume of the inner space after endodontic treatment of tooth 14. When the gutta-percha lateral condensation method is used, the sealant should constitute 1–10% of the volume of the root canals; however, in this case a volume 23–230-times greater than needed was used.

It is generally accepted that prompt surgical intervention to remove a foreign body is recommended to prevent possible sequelae of acute/chronic sinusitis or mucosal cyst formation. A sinus approach is classically achieved by open surgery via a Caldwell-Luc sinusotomy that, apart from foreign-body removal, aims at sinus clearance and drainage, especially in the presence of serious mucosal disease.² An alternative procedure to open surgery is functional endoscopic sinus surgery, which has gained in popularity in the past few decades. An endoscopic sinus approach is a reliable procedure that provides excellent visibility and allows for removal of small foreign bodies with a limited incision and reduced risk of infraorbital nerve damage. In addition, this procedure can be performed under local anesthesia.¹⁰ In the described case, due to the possible large size of the foreign body, a decision to apply an open surgical method approach was made.

In the reported case, the practitioner did not correctly recognize the complication that occurred during endodontic treatment that resulted in extrusion of endodontic sealer material beyond the roots apices of tooth 14. The practitioner was not sufficiently careful during the final obturation and did not control the amount of input material. This case emphasizes the potential impacts that an involved maxillary sinus may have on endodontic therapy. The patient should also be sufficiently informed of potential complications including sinus invasion and the need for additional treatment. Detailed diagnostic identification based on the medical interview, physical and histopathological examinations, and diagnostic imaging (X-ray and CT) allowed us to carry out a rapid surgical intervention and prevented local complications such as sinusitis and aspergillosis and general complications. It is also important to realize that the range of a periapical X-ray projection is not always sufficient.

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