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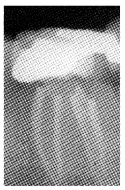

CASE REPORT

An unusual case of root perforation caused by surgical trephination

E. Kosti, I. Molyvdas & T. Lambrianidis

Department of Endodontology, Dental School, Aristotle University of Thessaloniki, Thessaloniki, Greece

Abstract

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Aim To present the diagnosis and management of an unusual case of root perforation caused by surgical trephination.

Summary A root perforation caused by surgical trephination on a maxillary lateral incisor with diagnosis of symptomatic chronic periradicular periodontitis was managed with standard root canal preparation and filling with thermoplasticized gutta-percha. Recall radiographs up to 1 year revealed healing of the periapical lesion.

Key learning points

- During surgical trephination, there is risk of damaging anatomical structures surrounding the tooth as well as the tooth itself.
- Root perforation caused by trephination was successfully managed by standard canal preparation and filling with thermoplasticized gutta-percha.

Keywords: root perforation, trephination.

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Introduction

Iatrogenic root perforation is an artificial communication between the root canal system and the periodontal tissues. It usually occurs during nonsurgical endodontic treatment with hand or rotary endodontic instruments used for root canal access preparation and root canal instrumentation. Erroneous evaluation of the root canal morphology and crown–root angulation can also lead to root perforation during the preparation of the root canal space for the placement of a post or a pin (Lambrianidis 2001). More rarely, root perforation could occur whilst performing periapical surgery (Trope & Tronstad 1985), surgical extraction of an adjacent impacted tooth (Lambrianidis 2001), placement of an implant (or mini-implant) (Rubenstein & Taylor 1997), application of miniplates for microdimensioned osteosynthesis (Kocaelli *et al.* 2006) and placement of transalveolar

Correspondence: Kosti Eleni, 17 Agias Sofias Str, 54623 Thessaloniki, Greece (Tel.: +30 2310 235816; fax: +30 2310 275071; e-mail: elkosti@dent.auth.gr).

screws for control of the occlusion after surgical management of mandible fractures (Fabbroni *et al.* 2004).

Trephination is recommended as a method of alleviating severe pain caused by tissue exudates accumulated under the alveolar cortical plate, when no intraoral or extraoral swelling is present (Rossman *et al.* 2006). An incision is made or a flap is raised and the cortical plate is perforated towards the periapical area with either a rotary instrument or an endodontic file; alternatively, the medullary bone is directly approached by means of an engine-driven perforator without an incision (Rosenberg 2002, Henry & Fraser 2003a).

Literature supporting trephination is limited. It has not been a popular procedure, and its benefit as a supplemental treatment to relieve pain has been questioned (Houck *et al.* 2000, Rosenberg 2002). The trephination site is suggested to be at or near the root apex (Henry & Fraser 2003, Rossman *et al.* 2006). Thus, there is always concern regarding the risk of damaging anatomical structures around the tooth as well as the tooth itself during the procedure. This article presents a case of root perforation caused by a trephination procedure.

Case report

A 22-year-old male patient was referred for root canal treatment of the maxillary left lateral incisor. The past medical history of the patient was noncontributory. The patient reported that 2 weeks previously, he experienced severe pain and an intraoral swelling associated with the maxillary left lateral incisor. He visited a local dentist, who, as the patient recalls, after drilling, performed a surgical intervention to alleviate his pain immediately. After the anaesthesia wore off, there was no pain. The patient then visited his regular dentist to continue with the treatment and subsequently was referred for specialist care. Intraoral clinical examination revealed sensitivity to percussion and palpation associated with the maxillary left lateral incisor and the presence of an inadequate unsealed access cavity.

The preoperative radiograph revealed a well-defined defect in the apical third of the root and a lateral periradicular radiolucent lesion (Fig. 1). Based on the dental history, it was hypothesized that the defect was caused by the surgical procedure performed by the local dentist. After contacting the dentist who first treated the patient, the defect was diagnosed as a perforation in the root from the bur used for trephination.

The access cavity was enlarged and the perforation was confirmed with the use of an apex locator. The site of the perforation was bypassed and the length of the root canal was estimated radiographically with a size 40 (0.02 taper) K-file (Antaeos; Vereinigte Dentalwerke & Co., Munich, Germany) (Fig. 2). Instrumentation was performed using K-files in a step-back technique with a size 60 (0.02 taper) apical enlargement and a coronal flare by means of Gates Glidden drill sizes 4 and 5 (Antaeos; Vereinigte Dentalwerke & Co.) in a contra-angle 1 : 1 handpiece (W&H; Bürmoos GmbH, Landesgericht Salzburg, Austria). The canal was irrigated between successive instruments with 1% NaOCl and 0.12% chlorhexidine solution (Paroex; Butler, Chicago, IL, USA). Irrigation was performed using 5-mL disposable plastic syringes with 27-gauge needle tips (Endo EZ; Ultradent Products Inc., South Jordan, UT, USA) placed passively into the canal, as far as 3 mm from the apical foramen without binding. After drying the root canal with paper points (Roeko Dental Products, Langenau, Germany) $Ca(OH)_2$ paste [a mixture of chemically pure $Ca(OH)_2$ and saline] was placed in the canal with a size 40 lentulo paste carrier (Antaeos; Vereinigte Dentalwerke & Co.) and the access cavity was sealed temporarily (Cavit; Espe, Seefeld, Germany). No medication was prescribed. After 15 days, the patient was free of any symptoms. The intracanal medicament was removed by means of instrumentation and copious irrigation and canal filling was performed using vertical compaction of thermoplasticized gutta-percha (Obtura; Obtura/Spartan, Fenton,

Figure 1 Preoperative radiograph.

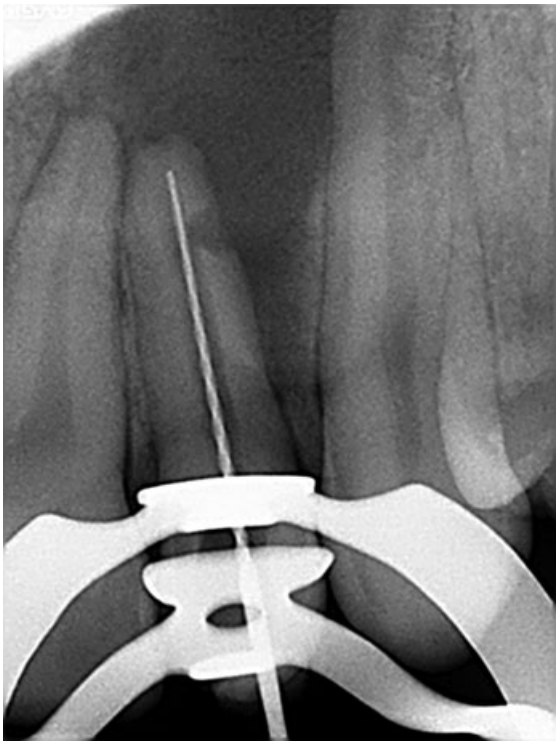

Figure 2 Radiographic working length measurement.

Figure 3 Immediate postoperative radiograph.

MO, USA and System B Heat Source; Sybron Endo, Orange, CA, USA). Roth 811 (Roth International, Chicago, IL, USA) was used as a sealer. The postoperative radiograph showed satisfactory filling of both the main root canal space and the perforation site (Fig. 3). Clinical and radiographic evaluation at the recall appointments after 15 days, 3 months and 12 months (Figs 4, 5 and 6 respectively) revealed uneventful healing.

Discussion

In asymptomatic patients with periradicular lesions, trephination performed prophylactically was reported to prevent pain after instrumentation (Peters 1980, Elliot & Holcomb 1988). In more recent studies, in patients with acute periapical periodontitis (Moos *et al.* 1996) or symptomatic chronic periradicular periodontitis (Moos *et al.* 1996, Houck *et al.* 2000, Nist *et al.* 2001), root canal instrumentation alone relieved pain, whereas in cases where root canal instrumentation was combined with trephination not only did it not reduce pain, percussion pain and swelling but it led to pain of severe intensity. In patients with symptomatic chronic periapical periodontitis, trephination was not effective in reducing pain or the number of analgesics required (Houck *et al.* 2000, Nist *et al.* 2001).

In the case presented, erroneous judgement of the site of trephination resulted in iatrogenically induced root perforation in the apical third of the root. The prognosis of perforations in this area is considered to be good once root canal treatment is performed, because of their location away from the crestal bone and the epithelial attachment and thus the reduced risk of contamination (Tsesis & Fuss 2006). Management of perforations in the apical third could be either conservative or surgical, performed immediately in cases of extensive or inaccessible perforations or at a later stage after unsuccessful conservative treatment (Lambrianidis 2001).

Figure 4 Fifteen-day recall radiograph.

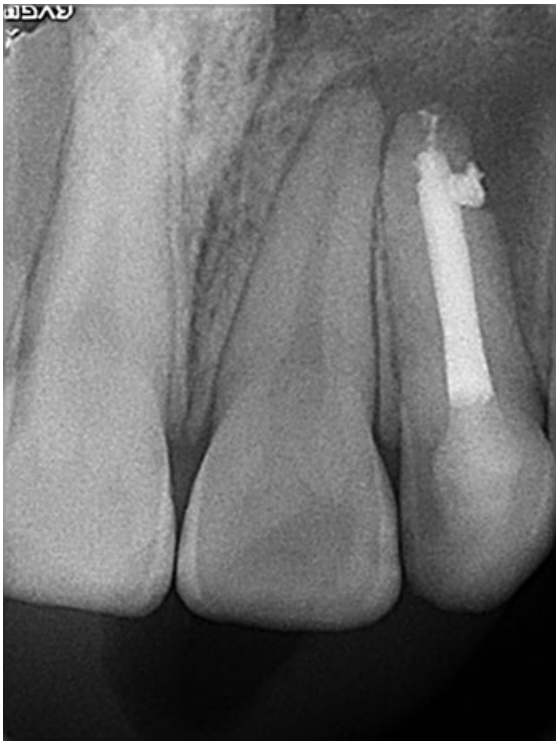

Figure 5 Three-month recall radiograph.

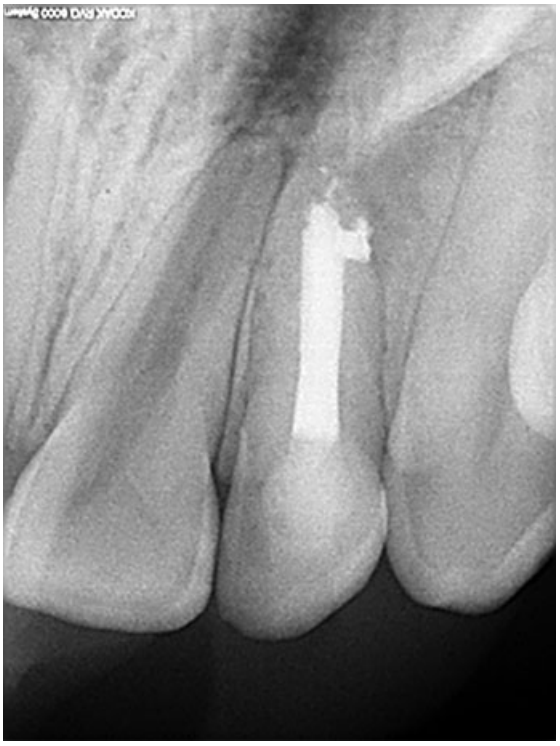

Figure 6 Twelve-month recall radiograph.

In the conservative approach, the perforation is treated as an additional root canal exit with the routine endodontic treatment procedures and is filled with root canal filling material. Because there is lack of a physical barrier to prohibit extrusion of the material, the sealing of the perforation site could be challenging. In cases where the shape and size of the perforation is such that overfilling is considered inevitable, it is suggested to either stimulate hard tissue growth with the aid of $Ca(OH)_2$ or MTA or use a matrix to prevent extrusion (Bargholtz 2005). A plethora of materials has been proposed to seal the perforation site (Lambrianidis 2001, Regan *et al*. 2005, Tsesis & Fuss 2006) with varying degrees of success and most of them with limited evidence-based documentation.

The alternative surgical management includes surgical exposure and sealing of the perforation, apicoectomy or when none of the other options can apply, intentional reimplantation and sealing of the perforation during the extra-alveolar time (Kafantaris & Lambrianidis 1999, Tsesis & Fuss 2006). Loupes and operating microscopes could be useful in improving visibility during either surgical or nonsurgical management of the perforation. Healing of the damaged periodontal tissues, from the perforation itself as well as from the surgical access opening, may be aided with root surface conditioning, guided tissue regeneration procedures or application of enamel proteins (Regan *et al.* 2005).

Short recall times, up to 1 year, do not sufficiently depict the healing process. Yet, based on the radiographic appearance, the evaluation of potential enlargement of the existing periapical radiolucency or the development of a new disease is possible. In certain cases, healing of an existing radiolucency has been observed after only 2–4 months (Ørstavik 1996, Kerosuo & Ørstavik 1997). Subtraction radiography (Mikrogeorgis *et al.* 2004, Carvalho *et al.* 2007) as well as the use of ultrasound and colour power Doppler flowmetry, as a monitoring tool in the healing of endodontic periapical lesions (Rajendran

& Sundaresan 2007), could provide observation of the periapical status and indications of healing at an earlier stage.

The 1-year recall is considered to be a reasonable stage to evaluate the outcome of the treatment, because by this time the vast majority of the cases with periapical disease that will eventually heal show signs of healing, whereas most cases that will eventually fail present radiographic signs of osteolysis (Murphy *et al.*1991, Ørstavik 1996). Signs of radiolucency reduction observed at two successive recall radiographs could be considered an indication that complete healing will eventually take place (Bystrom *et al.* 1987); thus, in the case presented, a successful outcome can be anticipated.

Conclusion

Root perforation caused during surgical trephination was successfully managed with standard canal preparation and filling with thermoplasticized gutta-percha.

Disclaimer

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