

REVIEW ARTICLE

ROOT PERFORATIONS: BRIEF REVIEW

Inderpreet Singh¹, Amit A. Jain², Simerpreet Kaur Bagga³, Vikas Setia⁴

¹Dept of Conservative and Endodontics, Dasmesh Institute of Research and Dental Sciences, Faridkot, Punjab,

²Senior Lecturer, Dept of Pedodontics, A C P M Dental College, Dhule- 424001, Maharashtra, India,

³B.D.S., ⁴Reader, Department of Pedodontics, Adesh Dental College, Bathinda, Punjab, India

ABSTRACT:

This review relates specifically to the diagnosis and the impact of various factors on the prognosis of root perforations. Successful treatment depends mainly on proper diagnosis and immediate sealing of the perforation to eliminate risk of infection. A classification of root perforations is presented in the review to assist the clinician in making a proper choice of treatment protocol. A delay in repairing perforations does influence the prognosis of root perforations.

Key words: Curved canals, Endodontic treatment, Root perforation.

Corresponding author: Dr. Inderpreet Singh, Dept of Conservative and Endodontics, Dasmesh Institute of Research and Dental Sciences, Faridkot- 151203, Punjab, India, E mail: inderpreet.singh.dr@gmail.com

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INTRODUCTION:

Root perforation may complicate the endodontic treatment, for example, during efforts to negotiate calcified and curved canals.

Root perforation is an artificial communication between the root canal system to the supporting tissues of teeth or to the oral cavity.¹ Often, the cause is iatrogenic as a result of misaligned use of rotary burs during endodontic access preparation and search for root canal orifices.²⁻⁴

Non-iatrogenic causes, including root resorption and caries.⁵⁻⁸ Accidental root perforations, which may have serious implications, occur in approximately 8-10% of endodontically treated teeth.⁹⁻¹³ Yet, if discovered early and properly managed, prolonged survival of the tooth is possible.

DISCUSSION:

Prognosis:

A number of factors including time from the perforation to detection, size, and shape of the perforation as well as its location impact the potentials to control infection at the perforation site.

Time:

Time is a most critical factor determining outcome of treatment. Beavers et al.¹⁴ observed consistent periodontal healing following treatment of experimentally produced root perforations in a monkey model. Lantz & Persson¹⁵⁻¹⁷ produced root

perforations in dogs that were treated either immediately or after some delay. The most favorable healing response was evidenced when perforations were sealed immediately. Proper treatment of the perforation may not always be possible, due to lack of time, lack of experience of the operator, and proper equipment.

Size:

Large-sized perforations may not respond to repair as well as smaller ones.¹⁸ Himel et al.¹⁹ evaluated the effect of three materials on healing of perforations of the pulp chamber floor of mandibular molars in dogs, and found that the larger teeth with proportionally smaller perforations showed a better healing response. Small perforations clearly are easier to repair and therefore provide potential for predictable healing.

Location:

The most important parameter affecting treatment prognosis is the location along the root surface. Furthermore, apical migration of the epithelium to the perforation site can be expected, creating a periodontal defect.^{3, 15-17, 20-24} Once the periodontal pocket is formed, persistent inflammation of the perforation site is most likely maintained by continuous ingress of irritants from the pocket.²⁰⁻²¹ Perforations of the furcation areas of multi-rooted teeth are similarly critical.^{3, 7, 21, 25-26} At times; they are especially troublesome as the inflammatory process

may cause rapid and extensive destruction of the periodontal tissues. Hartwell & England²⁴ had a high clinical success rate following repair of furcation perforations in monkeys using freeze-dried bone. Perforations, coronal to the crestal bone, are easy to access and seal, and teeth may be restored without periodontal involvement.

CLASSIFICATION OF PERFORATION:

Based on the factors impacting the outcome of treatment considered above, the following classification of root perforations, proposed by Fuss & Trope¹ may assist the clinician to select a treatment strategy:

Fresh perforation – treated immediately or shortly after occurrence under aseptic conditions, Good Prognosis.

Old perforation – previously not treated with likely bacterial infection, Questionable Prognosis.

Small perforation -- (smaller than #20 endodontic instrument) – mechanical damage to tissue is minimal with easy sealing opportunity, Good Prognosis.

Large perforation – done during post preparation, with significant tissue damage and obvious difficulty in providing an adequate seal, salivary contamination, or coronal leakage along temporary restoration,

QUESTIONABLE PROGNOSIS

Coronal perforation – coronal to the level of crestal bone and epithelial attachment with minimal damage to the supporting tissues and easy access, Good Prognosis

Crestal perforation – at the level of the epithelial attachment into the crestal bone, Questionable Prognosis.

Apical perforation – apical to the crestal bone and the epithelial attachment, Good Prognosis. In multi-rooted teeth where the furcation is perforated, the prognosis differs according to the factors described for single-rooted teeth.

Determining Perforations:

Accurate detection of root perforations and determination of location are crucial to the treatment outcome, certain signs, and tools must be recognized in making the diagnosis. Sudden bleeding and pain during instrumentation of root canals or post preparations in teeth are warning signals of a potential root perforation. To enhance radiographic detection, it has been proposed to place a highly radiopaque calcium-hydroxide paste, by inclusion of barium sulfate, in the root canal.²⁷

Electronic apex locators (EALs) can accurately determine the location of root perforations, making them significantly more reliable than radiographs.²⁸ A dental operating microscope is another helpful tool²⁹⁻³⁰ effective in detecting root perforations during orthograde root canal therapy and in surgical endodontic treatments.

Treatment:

The crown-root alignment should always be evaluated and bony emences noticed. Often, palpation is useful to detect the direction of the root relative to the crown. The use of magnification is advantageous to observe canal orifices and the coronal alignment of the root canal.

Modern flexible nickel titanium instruments along with copious irrigation and lubrication were proposed for curved canals to prevent apical perforations.³¹⁻³² Utmost care should always be exercised during post preparations so that root canals are not overextended. Generally speaking, a safe preparation is best attained with the surgical microscope immediately after completion of a root canal filling. Fresh perforations that occur during either operative or endodontic procedures are followed by hemorrhage.

The first step then is to control the hemorrhage by pressure or irrigation.³³ Subsequently, the perforation should be adequately sealed. The efficacy of a sealing material depends primarily on sealability and biocompatibility and thus ability to support osteogenesis and cementogenesis.

Infected apical perforations may be medicated with an antibacterial intracanal dressing before obturation. It has been suggested that large apical perforations should be treated similar to teeth with immature apices, i.e. with long-term calcium hydroxide treatment to achieve a hard tissue barrier. MTA has recently been proposed for repair of root perforations.³⁴

Rud et al.³⁵ suggested that even if a small bridge of crestal bone remains, it should be preserved by all means. Intentional replantation may be considered when orthograde and surgical treatments are not possible, undesirable, or have already failed.³⁶⁻³⁷

Before surgical intervention, the following parameters should be considered: the amount of remaining bone, extent of osseous destruction, duration of the defect, periodontal disease status, soft tissue attachment level, patient's oral hygiene, and surgeon's expertise in tissue management.

CONCLUSION:

Thus root perforation should be considered a serious problem, which is caused by an artificial communication between the root canal system to the supporting tissues of teeth or to the oral cavity. Yet, if discovered early and properly managed, prolonged survival of the tooth is possible. This review thus relates specifically to the diagnosis and the impact of various factors on the prognosis of root perforations.

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