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Root Perforations: A Review

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Review Article

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Abstract: The aim of this review is to discuss the etiology, classification, diagnosis, management strategies of root perforations. Root perforation acts as a source of infection as there is communication of tooth with the surrounding tissues thereby reducing the chance of a successful treatment. The etiology and diagnosis of root perforations are described. The article also focuses on the non-surgical and surgical management of root perforations. The article also emphasizes on the non-surgical and surgical management of root perforations and describes how accurate diagnosis is necessary for appropriate management.
Keywords: perforation, exudate, root resorption, cone beam computed tomography.

INTRODUCTION

An artificial communication that arises between the root canal space and periodontium is termed as perforation[1]. Most of the causes are iatrogenic which occurs during the search of canal orifices and access preparation followed by excessive dentin that is removed during post placement. Root resorption and caries are the common causes for non-iatrogenic perforation. Non-iatrogenic perforation results from root resorption and caries while the mostly occurring iatrogenic root perforations results during access preparation, location of canal orifices or preparation of post space [2,3].

IATROGENIC PERFORATION

Perforations of the coronal third

These often result while locating and opening canals. Calcifications of the pulp chamber and the orifices, misidentification of canals, significant crown-root angulations and excessive removal of coronal dentine can easily result in perforations in the coronal or furcation regions.

Perforations of the middle third

Due to excessive and aggressive instrumentation of canals away from the centre of the root, strip perforations of middle third occur. Furcational strip perforation can occur if the instrumentation is too heavy on the inside curvature of curved molar roots.

Perforations of the apical third

Blockages and Ledges formed due to inadequate cleaning and shaping can cause instruments to deviate resulting in perforation and breakage. Placing the stiff instruments in curved canals straighten them resulting in zip perforations. Endodontic files when passes aggressively through apical constriction can cause apical perforation.

Post-space preparation

Careless post space preparation can cause perforation. Traditional approaches of achieving good length and width for the post poses risk of both apical and strip perforation. Post if placed in adjacent dentine can cause catastrophic consequences.

NON-IATROGENIC PERFORATION

Pathological perforations

These occur due to root resorption or caries. Though the process is uncommon and often self-limiting, it can progress into a perforation. External inflammatory root resorption can occur following damage to the cementum and periodontal ligament cells on the root surface. There are different types of external resorption, but all have the potential to continue until the resorptive defect communicates with the root canal. Extensive carious lesions can also lead to perforations. An untreated carious lesion may either perforate the pulp chamber floor or extend along the root, resulting in perforation of the root[1].

DIAGNOSIS

Profuse bleeding following injury indicates iatrogenic perforations. This can often be seen directly

when a perforation occurs in the coronal portion of the tooth, but sometimes, when a strip or apical perforation occurs further within the canal, a paper point inserted into the canal reveals the bleeding. In absence of local sudden unexpected pain during treatment may also indicate a perforation. Apex locators are very useful in detecting perforations. By placing the file onto the perforation this will give a zero reading, indicating a communication with the periodontal ligament. Dental Operating microscopes are becoming increasing popular in identifying perforations. The bright operating light and magnification make it excellent for visualizing the position and extent of the perforation. Radiographs can be used at the time of perforation, but do have their limitations: they are only a two-dimensional representation and so it may be difficult to accurately assess the site and extent of the perforation. Taking a second film and shifting the radiographic beam angulation to the mesial or distal aspect can partly overcome this. Untreated perforations may be revealed by the presence of serous exudate or sinus from the site of perforation, sensitivity to percussion, localised periodontal pocketing and chronic inflammation of the gingiva when the inflammation has penetrated the alveolar bone.

Cone beam computed tomography is increasingly important in the assessment of perforations. There is evidence that resorptive lesions and post perforations can be accurately identified and assessed using CBCT. These 3-dimensional scans are, however, associated with increased exposure to ionising radiation and as such, referral for CBCT must only be considered if it could change the clinical outcome. The presence of pre-existing Gutta percha, posts and core restorative materials will create artefacts and both the referred patient and the practitioner must be aware that this may compromise the diagnostic yield.

MANAGEMENT

Successful perforation management is achieved by sealing the perforation immediately or as early as possible, type of material used, location of perforation, and by adequate sealing the perforation. There are two types of management of perforation, by non-surgical approach or surgical approach.

Non-surgical management

Non-surgical management of perforation includes orthograde approach, management of crestal root perforation, intentional replantation, and iatrogenic perforation.

Orthograde approach

Fresh perforations that occur during endodontic and operative procedure are followed by hemorrage. Hemorrage can be controlled first by applying digital pressure.

Bleeding can be controlled using hemostatic agents. Other hemostatic materials used to control bleeding are collagen, calcium sulfate, freeze-dried bone, ethymsylate, bone wax. Adrenaline cotton pack. Calcium hydroxide material is used for perforation management.

Non-absorbable barrier materials are mineral trioxide aggregate (MTA), super EBA, resin cement, composite bonded restoratives, and calcium phosphate cement[5].

Management of Crestal Root Perforation

Sealing should be done with any biocompatible material with short setting time and good sealability properties. For single-rooted teeth, orthodontic extrusion is recommended to bring the perforation to a coronal position so that it can be sealed externally without surgical intervention.

.For crestal root perforations, biodentine is considered to be the best material. The use of stem cells with treated dentin matrix in the management of perforation enhances bone formation.

Intentional replantation it is considered when orthograde and surgical treatment are not possible. It is indicated when perforation is too large for repair and inaccessible without excessive bone removal.

Atraumatic extraction and reimplantation should be done without damaging the surrounding tissues. After removal, tooth should be held in forceps and bathed gently in a balanced salt solution. Replantation should be done as quickly as possible.

Complications are inflammatory root resorption and ankylosis. Iatrogenic perforation the more apical the perforation, the prognosis will be more favorable. Perforations occurring in the coronal one-third of the root below the crestal bone have a poor prognosis.

Surgical management

Surgical approach is done in cases of large perforation, perforation as a result of resorption, and failure of healing after non-surgical repair. Parameters considered before surgical management are the amount of bone remaining, extent of osseous destruction, duration of defect, periodontal disease status, attachment level of soft tissue, oral hygiene, and surgeons expertise in tissue management. Guided tissue regeneration is attempted to manage perforation.

Buccal full-thickness flap is raised for visibility of perforation site. Perforation is then sealed with MTA; then, sutures are placed on the flap. After healing, surgical wound sutures are removed, and then, the post can be cemented.

Multidisciplinary treatment approach

In multidisciplinary approach, sequential procedures include conventional endodontic retreatment, an initial orthograde sealing of perforation, guided tissue regeneration, and resealing of perforation with ketac-endo and intermediate restorative material.

Microscope in management of perforation

Microscope enhances the visibility of perforation in a magnified field. It helps in locating even smaller perforation site so that it can be treated earlier preventing from future infection [4].

CONCLUSION

Clinician should have a thorough knowledge of the anatomy of tooth to prevent the chances of perforation. With the advent of newer materials and techniques for sealing, the clinical management and prognosis have been improved [4].

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