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A literature review on root perforation repair materials in dentistry

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Abstract
Root canal treatment is one of the commonest problem dentist encounters in day to day practice. There are so many reasons for the tooth to be under go root canal treatment, like caries, fracture of the tooth or teeth due to fall or from any other reason, hygiene not maintained properly. The most common problem encounter while doing the root canal treatment of the patient is, root perforation of the same tooth undergoing root canal treatment. Root perforation can be defined as a opening of the root to the outer oral tissue, that might have occurred accidently during the process of root canal treatment therapy, or might be due to some unknown pathological causes, which ultimately leads to the complications in the same patient due to the passage of microorganisms to the surrounding soft and hard tissue. Root perforation commonly caused by operative procedural accident or due to some pathological conditions such as, severe dental caries, internal root resorption or external root resorption. Some associating factors that can lead to the root canal perforation are presence of pulp stones, calcification of the canals, malpositioning of the tooth, some extra coronal restoration or presence of any intra canal posts.
There are different materials which can be used in the repair of root perforation, which includes, indium foil, super – 2 ethoxybenzoic acid, some bio ceramic materials like mineral tri oxide aggregate biodentine. all the materials which can be used in the repair of root canal perforation, should possess some basic requirements like, the material which is supposed to be used in the repair of root perforation should be bacteriostatic in nature, should bear the property of radio opacity.

Keywords: Root canal treatment, root canal perforation, mineral tri oxide aggregate, calcium hydroxide, root resorption

Introduction
Root canal perforation is characterized by formation of a communication in between the root canal system and external tooth surface. This issue of root perforation can be caused by any of the pathological process like dental caries or root resorption, whether the internal root resorption or the external root resorption, or it can also be due to some operatory procedure done unintentionally. The occurrence of pathological root perforation can be found in routine endodontic practice, while the iatrogenic root perforation might occur during the step of access cavity preparation. Procedural errors can occur at any time in the routine root canal treatment procedure and might lead the treatment to the failure side [1-6].
Root perforation has been found to be the second greatest cause of failure which accounts for 9.62% of all the unsuccessful cases. Literature have also stated that perforations which has done while doing the routine endo practice accounts approximately 2 – 12% of all the cases [6]. these root canal perforations act as eternal open channel which helps in the bacterial entry either from the root canal area or from the peri radicular area, which leads to the inflammatory response, that might result in formation of fistula if not treated on time and ultimately leads to failure of the endodontic procedure [3-7].

Diagnostic
There are various diagnostic methods, which can be used in the diagnosis of root canal perforation. Clinically diagnosing the root canal perforation is a challenging method, however newer generation apex locators can help in diagnosing the root canal perforation. Along with it

peri apical radiography is the imaging method which is very frequently used in the routine endodontic procedure. Peri apical radiography is used in the diagnosis of the endodontic procedure, helps in endodontic diagnosis, treatment plan, and follow up for the same. When a radiolucent line which is visible at the communication between the canal walls and the periodontal space, simply indicates for the root perforation [2-8].

For the instant review, one should go for RVG, which is now a days most commonly used in the daily clinical practice. RVG helps in providing the image instantly with all the fine details, details like curvature of the root, morphology of the root, number of canals present in the root, if there is any perforation a radiolucent line appears at the unction between the root canal and outer surface. Another finding that can be helpful in diagnosing the root canal perforation is, one should place a file in the root canal and then take a rvg, if there is any perforation in the canal, the file extruded from the perforated space [5-7].

Another most recent technique which is totally helpful in diagnosing the root canal perforation is usage of CBCT. This technique is known as cone beam computed tomography, which helps in detecting the root anatomy, morphology in three dimensional view. So, any perforation if occur in the root canal while doing the endodontic procedure can be visible in the three dimensional view with the help of cone beam computed tomography. CBCT helps in locating the actual site of the perforation with actual dimension of the perforation. This will help in sealing the perforated site, so to avoid the occurrence of secondary infection which ultimately leads to the failure of the endodontic procedure. Once the diagnosis for the root perforation is confirmed, after root canal treatment is bit difficult in the same case. As now this tooth is prone ot get infected, if the root perforation has not been done accurately and perfectly [11-15].

Materials which can be used to seal the perforation

MTA, mineral trioxide aggregate, it was first introduced in the field of endodontic in the year of 1990, as a newer material which is having an ability to seal the communication between the root canal space and the outer environment. This material was tested extensively in all the terms and this material shows best results to seal the root perforations. Lee *et al* in the year of 1993, they did a study in which they used MTA as a root perforation seal material in comparison with other materials. And they revealed that MTA shows the lowest marginal leakage, they also supported the use of MTA as a root canal perforation seal material [9-12].

Torabinejad *et al*. did a study and revealed that when MTA is used as a root canal end filling material it shows very good results and shows least marginal leakage. MTA also shows very nest sealing property when compared to any other material. MTA shows good sealing properties in terms of sealing lateral perforations of the root canal, it also shows better sealing properties as and when used in root end filling material, along with this, it also have the ability to improve the process of mineralization, this material shows better and promising results when it is used as a pulp capping material, when it used in pulpotomy, when it is used in apexification, this material also show good results in the procedure of revascularization [12-15].

Calcium hydroxide

This material was suggested in the field of dentistry by Bernhard W. Hermann in the year of 1920, this material was found to be one of the oldest materials to be used in dentistry. Initially it was totally used in the treatment of pulp. When so ever the root canal perforation is seen while doing the routine endodontic procedure, the first dressing to be given in the canal is the dressing with calcium hydroxide. As calcium hydroxide shows good and promising results in terms of anti-bacterial action. This also helps in reduction of microorganisms in the canal that are capable of producing infection. Its placement should be very well condensed in the root canal to avoid any sort of empty spaces with in it, when filling the root perforation [14-17].

Bio ceramics

This is one of the newer materials with the similar composition of MTA with easy and better handling properties. This bio ceramic cement is mainly composed of dicalcium silicate and tricalcium silicate. This material forms a structure which is colloidal in state and after hydration this material gets itself settled in to a very hard consistency and shows very less marginal leakage. Different bio ceramics material is bio dentine, bio aggregate, endo sequence and calcium enriched mixture. These materials shows good and promising results in terms of sealing capacity as well as in terms of handling and mixing [14-19].

Other materials which can be used as a root perforation repair material are indium foil, now says it is not using in routine endo practice. Amalgam can be used as a root canal filling material and it shows superior sealing properties. Plaster of paris can also be used as a root canal filling material, it is totally bio compatible and has a rate of resorption equal to rate of new bone formation. Gutta parcha is one of the most common material which is extensively used in routine endodontic practice and can be used as a root perforation filling material, as it shows less inflammation when compared to zinc amalgam. Glass ionomer cement can also be used as a filling material, as it shows properties of restricting the secondary caries, as GIC is capable of fluoride releasing. When it is used as a root canal filling repair material it shows good results when compared to cavit or amalgam, so GIC is having better sealing properties. Other materials which can be used as root filling materials are Portland cement zinc phosphate cement, composite, dentine chips, hydroxyapatite, super epoxy benzoic acid [11-19].

Conclusion

There are so many materials present in the market, which can be used in the repair of root perforation. One should have a thorough knowledge regarding all the materials which can be used in the repair of the root perforation.

Conflict of Interest

Not available

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Not available

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