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"ADVANCEMENTS IN APEXIFICATION: COLLAGEN PLUG FOR OPEN APEX REPAIR" – A CASE REPORT

Endodontics

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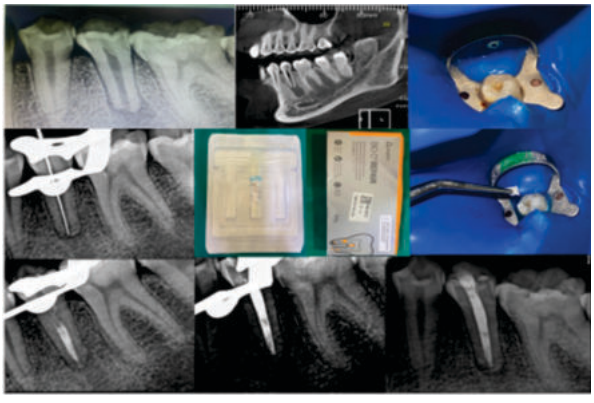
ABSTRACT

Teeth with open apices, such as in immature teeth or those with apical root resorption are clinical cases with difficult immediate resolution. With the use of bioceramic materials in dentistry, it was possible to optimize the treatment time of these cases by immediate placement of apical plug and the root canal filling. However, some negative effects can occur if material is extruded beyond the apex. To avoid this, it has been recommended to use of an apical plug prior to placement of bioceramic material. The aim of this article was to elaborate a case report of open apex with collagen plug using bioceramic material.

KEYWORDS



INTRODUCTION

The anatomy of apical third of the tooth changes with the age. The process of root development and apex closure can take up to three years following tooth eruption. However, there are several situations in which disruption to the permanent teeth development result in open apex.[1]

The etiology of an open apex are severe apical resorption from orthodontics, periapical pathosis or trauma, dens in dentin dysplasia, and pulpal necrosis resulting from caries or trauma.[2]

A necrotic pulp in an immature root creates several obstacles to effective treatment.

1. The use of endodontic files in the usual root canal protocol is inadequate to disinfect the diseased root canal space.
2. Because there is no barrier to stop filling the root canal becomes challenging
3. Roots are thin and more prone to breaking, even if the difficulties mentioned previously are resolved.[3]

The treatment modalities for an open apex are as follows; if it is vital pulp i,e, reversible pulpitis then the treatment has to be apexogenesis which includes indirect pulp capping, direct pulp capping or pulpotomy. If it is necrosed pulp,which indicates irreversible pulpitis then the treatment includes apexification or regeneration of pulp[2]

The formation of an apical barrier enables to disinfect teeth in three dimensions and to properly adapt obturating materials, which results in an effective endodontic procedure. Materials utilized in these situations should be bioactive, antibacterial, strong, and able to support the dentin of the root. They should also form a fluid-tight seal.

Previously, the apexification procedure was carried out with calcium hydroxide; however, the formation of a calcific barrier requires five to twenty months. This course of therapy presents a number of challenges, including difficulty managing patient follow-up, an increased risk of tooth breakage with prolonged intracanal calcium hydroxide dressing use, and a delay in treatment completion.

Recently, there has been an emphasis on using novel materials, such as MTA, Bio Dentine, bio-C repair etc. for apexification.

According to Holland et al., treatment outcomes for endodontics are less likely when the MTA is overextruded into the periapical tissue.[5] Therefore, It has been suggested to use an apical matrix such as collagen membrane before the apical barrier is positioned in order to prevent these issues.

There are a few limitations to collagen membrane, including its high cost and handling challenges. Collagen sponge is a useful substitute that is economical and effective and is often suggested for its favourable biological characteristics, aiding in hemostasis at a surgical alveolus.[6]

Therefore, this report presents two open apex teeth treated with collagen sponge apical stop and Bio C repair apical barrier prior to root canal filling.

Case Report:

A 25 year old female patient has reported to the hospital with a chief complaint of pain in lower left back tooth region since 3 months. On radiographic examination there was periapical radiolucency and open apex was noticed. Following assessment, root canal therapy has been indicated. After administration of local anaesthesia, under rubber dam (Hygienic, Coltene Whaledent Inc., USA) isolation access opening i.r.t 35 has been done. working length determination was done and biomechanical preparation done with hand k files till 80 No.K file, Root canal was dried with paper points (DiadentPvt Ltd) and calcium hydroxide (ApexCal, IvoclarVivadent) dressing was placed for 1 week In the first appointment. After 1 week, on the second appointment, calcium hydroxide dressing was removed by irrigating the canal with

saline and canal was dried with paper points then Collagen plug was placed 1-2 mm beyond the apex followed by placement of apical barrier using Bio C repair material. A moist cotton pellet was introduced inside the pulp chamber to hydrate the material. Temporary restoration was done to seal the cavity. After 24 hours the patient was recalled and temporary restoration is removed. The pulp chamber was cleaned with saline to remove any remaining cotton fibers. Followed by Obturating the canal using backfill. Post endodontic restoration was done with composite.

DISCUSSION

Treating non-vital teeth with a large or open apical foramen is associated with a number of clinical problems. Debridement is challenging since the canal's apical diameter is frequently greater than its coronal diameter. Furthermore, the obturation is nearly impossible in all dimensions due to the absence of an apical stop. Lastly, surgical therapy is typically not a practical option due to the thin walls of the root canal's susceptibility to fracture. Apexification before root canal filling should be considered to prevent these issues.[7]

During apexification extrusion of the material beyond apex can take place. Therefore, the use of an apical barrier with a biocompatible material, before Bio C repair placement is an interesting treatment strategy for avoiding extrusion of the material.[6]

In this present case report, collagen sponge has been placed 1-2 mm beyond the apex as apical barrier, then apexification of 4-5mm was done with Bio C repair material, followed by filling the canal with Guta percha.

The collagen plug used in this case is absorbed in 10 to 12 days. The pore size of the plug allow to absorb fluid and blood at the defect site. Due to collagen fibers coloplug have intrinsic hemostatic properties for the control of bleeding .[8] This will act as a barrier and help in proper adaptation of the Bio C repair material.

Bio-C Repair is a new silicate-based hydraulic cement that is presented in a ready-for-use format. According to the manufacturer, it exhibits excellent consistency that is easy to be applied, acts as a barrier against microorganisms, stimulates tissue healing, and does not contribute to discoloration. It is not provided in powder-and-liquid form; instead, it is offered as a single product stored in a syringe, thereby eliminating the need to manipulate the material. The material's composition includes calcium silicate, calcium oxide, zirconium oxide, iron oxide, silicon dioxide and a dispersing agent. Several studies have shown that the addition of zirconium oxide to calcium silicate material increases compressive strength promotes greater antimicrobial activity and induces cell proliferation.[9]

According to a study done by Francisco Javier Rodríguez-Lozano et al, were they have evaluated the cytocompatibility and bioactivity of bioactive cement, Bio-C Repair. These results suggest that Bio-C Repair is biologically appropriate materials to be used in root canal system.[10]

The treatment plan for teeth with open apices is determined by the specific circumstances of each case as well as the operator's experience and expertise with the different materials. If a series of visits is needed, the patient's availability for follow-up appointments should also be taken into account.[11]

CONCLUSION

Bio C repair is a newer putty consistency material, which has similar properties like MTA, because of its ease of use, consistency, less microleakage and high strength it can be a better option for managing open apices.

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