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Revascularization of Anterior Teeth: A Case Report

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Abstract: ***Introduction: Anterior teeth in young children are the most prone for trauma, because of their position in the arch and moreover the carefree attitude of children. A tooth fracture at this age, i.e before complete root formation , leads to a non vital tooth that in turn leads to cessation of root formation resulting in wide open apex leading to formation of blunderbuss canal. The treatment of these teeth poses a challenge and the proposed treatment modalities are apexogenesis with calcium hydroxide, apexification with MTA and calcium hydroxide and periapical surgeries. A case report where all these modalities were used to traet the fracture of anterior teeth in a young patient is discussed here. It was concluded that Revascularization is an effective method of inducing maturogenesis in nonvital, immature teeth. However, more clinical trails are needed to establish the final outcome***

Keywords: Revascularization, Regenerative Endodontics, Apexification

1. Introduction

Anterior teeth in young children are the most prone for trauma, because of their position in the arch and moreover the carefree attitude of children.A tooth fracture at this age ,i.e before complete root formation , leads to a non vital tooth that in turn leads to cessation of root formation resulting in wide open apex leading to formation of blunderbuss canal. The treatment of these teeth poses a challenge and the proposed treatment modalities are apexogenesis with calcium hydroxide, apexification with MTA and calcium hydroxide and periapical surgeries. Now, the recent advances in the treatment of these teeth areoriented not only towards the replacement techniques but also towards the regenerative techniques[1].

One of the terms used for these regenerative techniques directed at repair of the fractured teeth, is known as Regenerative Endodontics. Regenerative endodontics deals with the healing of impaired dental tissues, including dentin , pulp, cementum and periodontal tissues[2].

The following case report represents the treatment of immature fractured anterior teeth using both the treatment modalities, i.e. regeneration via revascularization, as well as replacement using calcium hydroxide and MTA and in turn comparing the healing achieved by both the techniques.

2. Case report

An 11 year old child reported to the department of paediatric and preventive dentistry with a chief complaint of broken upper front teeth. Past dental history revealed that the child had sustained traumatic injury to the upper front teeth 2 yearsback and patient visited a local dentist in his area seeking treatment for it. The dentist in turn did access opening for maxillary right central incisor (11), and left lateral incisor (22). On clinical examination, it was revealed that the maxillary left and right central incisors were fractured horizontally and an angular fracture of the left lateral incisor. The left central incisor exhibited intrinsic discoloration.Intraoral periapical radiographic examination revealed incomplete root with open apex i.r.t 11,21,22 and periapicalradiolucency. A written consent was obtained from patient's parents before starting the treatment.

Based on the clinical and radiological findings a treatment plan was laid down that included attempting, calcium hydroxideapexification for 21, MTA apexification and revascularization for 11 and revascularization with coronal sealing with MTA plug for 22.

Treatment was carried according to the above mentioned plan. Triple antibiotic paste i.e. a combination of ciprofloxacin, metronidazole and minocyclinmixed with saline,was inserted into the canals of 22 and subsequent revascularization was carried out, followed by a tight coronal seal using MTA plug. Follow up was done at 1 month, 3 months and 1 year respectively. Last follow up revealed closure of apex in all the three teeth . Thus, leading to the conclusion that Revascularization can be as successfully employed as MTA and calcium hydroxide in regular practice while achieving continued root formation leading to apical closure.

Figure 1: Preoperative view showing fractured 11, 21, 22 and Intrinsic discoloration of 21.

(a) Pre operative (b) 3 months Follow up

Figure 2: Periapicalradiographs showing : (a) open apices i.r.t 11,21,22. (b) continued root formation leading to apical closure observed in 11,21,22.

3. Discussion

The present case compared the clinical and radiographic treatment outcome of revascularization against MTA and dycal used for repair of the teeth with an open apices.

Pulpal necrosis of an immature tooth due to trauma can affect the further growth of the roots leading to thin fragile canal walls and open apices. Treatment of such teeth involves mechanical instrumentation and placement of repair medicament. However. There is a risk of fracture of the thin lateral walls. Therefore, minimal mechanical instrumentation is required for disinfection of such teeth[3].

The modalities that have been adopted for repair of such teeth in the past involves long term calcium hydroxide and/ or MTA in an attempt to induce apexification. But, this might lead to reduced root strength, thin dentinal walls and no further root development[4]. The current shift in dentistry is directed more towards the regeneration of tissues. Regenerative endodontics, as it is called, involves creating a platform for the maturation of nonvital immature teeth[3]. Revascularization; which is a treatment based on the regenerative principle, can be achieved successfully if a suitable matrix is provided in a disinfected root canal for tissue in-growth and a coronal bacterial tight seal. Triple antibiotic paste , which is a combination of metronidazole, ciprofloxacin and minocycline was used for disinfection in this case. Tight coronal seal was achieved by using MTA plug directly over the blood clot. MTA is reported to be resistant to bacterial leakage, is biocompatible and can also set in a moist environment. It also provides signaling molecules for the maturation of stem cells. This justifies the use of MTA[5].

One of the mechanisms proposed for the regeneration of apical tissues postulates that the rest cells of Mallasezor remnants of the Hertwig's Epithelial root sheath, which are relatively resistant to the periapical infections, remains in the apex in a vital state. These cells lead to stimulation of the stem cells of apical papilla, periodontal ligament and the multipotent cells of dental pulp that differentiate into bone and dentin forming cells, thus leading to normal root maturation[6].

Another mechanism states that, over instrumentation beyond the apex will induce bleeding that leads to transplant of mesenchymal cells from the bone into the lumen of the canal.These cells have an extensive proliferating capacity that will ultimately lead to formation of new tissue [7].

The blood clot itself is a rich source of growth factors such as tissue growth factor, platelet derived growth factor, vascular endothelial growth factor stimulate differentiation, growth and maturation of fibroblasts, odontoblasts and cementoblasts from the immature, undifferentiated mesenchymal cells of the newly formed tissue matrix[8]. If the attempted revascularization procedure fails, the conventional methods of apexification involving calcium hydroxide and MTA can be employed.

4. Conclusion

Revascularization is an effective method of inducing maturogenesis in nonvital, immature teeth. However, more clinical trails are needed to establish the final outcome.

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