DOI:10.21276/sjodr

Saudi Journal of Oral and Dental Research
Scholars Middle East Publishers
Dubai, United Arab Emirates
Website: http://scholarsmepub.com/

ISSN 2518-1300 (Print)
ISSN 2518-1297 (Online)

Case Report

A Hope for a Hopeless Tooth: A Case Report

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Abstract: Vertical root fracture(VRF) is one of the common reasons for extraction of endodontically treated teeth. Though many options of saving such teeth were available, they were not of much success. Therefore the objective of this article is to discuss one such case. A 50 year old male patient reported with Vertical root fracture and 15 mm of periodontal probing depth in the distal aspect of 14. Radiographic examination indicated vertical root fracture. Dual cure nanoionomer cement, Ketac N100 was used to seal the fracture followed by guided tissue regeneration therapy with amniotic membrane. The use of dual cure nanoionomer cement and amniotic membrane showed favourable results as the pocket probing depth reduced to 5mm and bone formation was appreciated radiographically at 1 year. It can be concluded that the combination of dual cure nanoionomer and amniotic membrane may be a suitable approach in the management of Vertical root fracture since it remarkably improved the prognosis of the tooth.

Keywords: amniotic membrane**,** guided tissue regeneration, nanocomposite, vertical root fracture.

INTRODUCTION

A vertical root fracture (VRF) is a longitudinally oriented fracture of the root [1]. The fracture originates from the root canal wall and continues to root surface [2]. Complete fracture is when it is present on both the sides and incomplete fracture is when it is on one side [1]. VRF is a considerable threat to the tooth's prognosis during and after root canal treatment [3]. The prevalence of VRF is 11-20% in extracted endodontically treated tooth [4-6]. VRF are classified based on position of the fracture in relation to alveolar crest

Class 1: Incomplete supraosseous fracture as one terminating coronal to the alveolar crest not creating a periodontal defect.

Class 2: Incomplete supraosseous fracture as one terminating at or slightly apical to the alveolar crest creating a shallow osseous lesion

Class3: Complete or incomplete intraosseous fracture resulting in loss of periodontal attachment [7].

Some of the predisposing factors of VRF are teeth with narrow mesiodistal dimensions, teeth having developmental depressions, endodontically treated teeth as they show more amount of plastic deformation than normal tooth due to the change in collagen crosslinking, thereby leading to VRF. Excessive removal of root dentin during canal preparation or post placement further weakens the tooth structure predisposing to fracture. Long term placement of calcium hydroxide as intra canal medicament brings changes in the organic matrix, which is due to disruption of link between the hydroxyapatite crystals and collagenous network in dentin [8]. Corrosion products of posts and pins also contribute for fractures. Spreader insertion during obturation causes wedging action [3] and also spreader load is detrimental in causing fractures. Spreader load

as small as 1.5 kg is known to cause fracture during lateral condensation in extracted tooth [9,10]. In vital tooth, heavy masticatory load or biting on hard substances or trauma may act as precursors for VRF [3].

VRF presents as mild pain or spontaneous pain on mastication. The tooth might be slightly mobile. Presence of deep narrow isolated periodontal pocket is a pathognomic sign. Single or multiple sinus tracts might be present. Periodontal type abscesses are also not uncommon, which result from chronic inflammation at the fracture line [3]. The clinical signs and symptoms vary depending on the position of the fracture, tooth type, time elapsed since fracture and periodontal status of the tooth [7]. Here, we present a case of VRF which has been treated with dual cure nanoionomer cement and amniotic membrane. This is the first time nanoionomer has been used subgingivally making this case one of its kind.

CASE HISTORY

A 50 yr old male patient visited the OPD of Department of Conservative Dentistry and Endodontics, with the chief complaint of pain in the upper back tooth region of jaw since 3 months. History of intermittent pus discharge since a month. He also gave a history of root canal treatment 2 years ago followed by placement of crown.

On examination, the involved maxillary 1st premolar (14) was previously root canal treated,14 was associated with a pocket probing depth of 15mm on distal aspect. The tooth was not mobile. Radiographically, canals were under obturated, distinct J- shaped bone defect was seen on distal aspect of 14. Thus helping in the diagnosis of VRF.

When the crown was removed and access was reopened crack line was observed on the distal aspect under microscope while performing biomechanical preparation thereby allowing us to diagnose it as VRF. This type of fracture comes under class 3 type where in it is either Complete or incomplete intraosseous fracture resulting in loss of periodontal attachment [7].

An option of extraction or Re Rct was given to the patient. As the patient was willing to save the tooth, a treatment plan of Re Root canal treatment with 14 was thought upon as the tooth was under obturated followed by an exploratory surgery. In order to minimize wedging forces and apical strain, single cone obturation technique was preferred to lateral condensation. Therefore the use of Hand files (2%) was avoided. Obtura and Thermafil were also avoided as they produce more coronal strain and thermal expansion of root dentin [3]. Hence, Hand protaper files have been used in this case.

Under local anesthesia, a full thickness mucoperiosteal triangular flap was reflected under operating microscope (Carl zeiss). Crevicular incision was given from canine to second premolar and a vertical incision on distal aspect of 2nd premolar. Upon reflection of the flap, the bony defect along the distal aspect of the root became quite evident. All chronic inflammatory tissue was thoroughly debrided with curettes to expose the bone defect. The fracture line was assessed with the help of a probe. (Fig 1:A) The fracture line was prepared using an ultrasonic tip (woodpecker) till a sausered shape appearance was felt. This was followed by placement of dual cure nanoionomer cement (Ketac N 100, 3M ESPE) in the prepared groove (Fig 1:B).

As there was large amount of bone loss, demineralised freeze dried bone allograft (DFDBA) (Tata memorial hospital tissue bank) was condensed into defect area followed by placing amniotic membrane (Tata memorial hospital tissue bank) as a guided tissue regenerative membrane to prevent epithelial cell migration apically. (Fig 1:C) Finally the flap was repositioned with the help of simple interrupted sutures and a periodontal dressing was placed. (Fig 1:D) Since the entire procedure had a questionable prognosis, the tooth was kept under observation before loading until any positive outcome is seen. The crown was placed after 1 year (Fig 1-E).

Postoperative check-ups were done at 6 month, 9 month & 1 year (Fig 2) and the radiographs demonstrate distinct bonefill at the end of 1 year and also a substantial decrease in pocket probing depth to 5mm. Since the tooth was asymptomatic & the prognosis was increased substantially, it can be hypothesized that the sealing of VRF & usage of amniotic membrane as a GTR was beneficial in this case.

Fig-1: A: Mucoperiosteal flap raised and VRF visualized; B) Application of nanoionomer to seal the defect; C) Placement of amniotic membrane; D) Suturing; E) Placement of crown

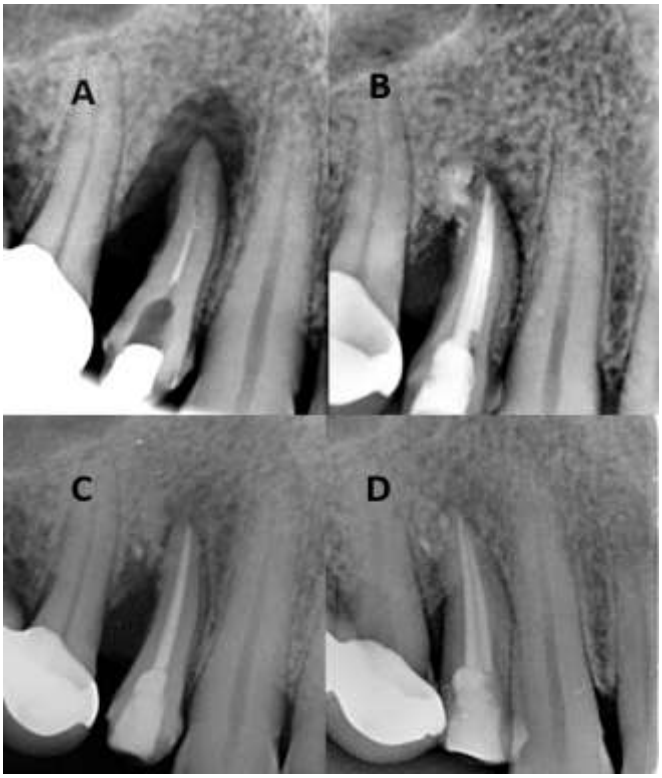

Fig-2: A) Preoperative radiograph; B) Postoperative radiograph at 6 months; C) Postoperative radiograph at 9 months; D) Postoperative radiograph at 1 year

DISCUSSION

The diagnosis of VRF is very difficult as it presents as different entities in different cases. Radiographic features of VRF vary widely. VRF might present as dislodgement of retro filling material or vertical bone loss or separation of root fragments. Presence of 'radiographic halo' is a pathognomic feature. The ''halo'' appearance is described as either ''combined periapical and perilateral radiolucency along the side of the root, or angular radiolucency from the crestal bone terminating along the root side''[3]. In an endodontically treated molar, furcation radiolucency may be seen. Bony dehiscence and fenestrations are also found in cases of vertical root fractures.

It is rare for all these findings to be present in a single case of vertical root fracture. Therefore, each of these clinical findings should be carefully observed and correlated with the radiographic findings, to get conclusive evidence for vertical root fracture. Recent advances such as CBCT and OCT can also be used in the diagnosis of VRF

Generally when a VRF diagnosis is made, a quick decision to extract the tooth or root is made. The reasoning for the quick extraction is that the inflammation in the supporting tissues would lead to periodontal breakdown followed by the development of a deep osseous defect facing the root fracture. Many techniques have been tried to save these teeth. Some of them are extracting the fractured tooth atraumatically, bonding the fragments, and then replanting the tooth either directly or with a 180 degree rotation [11]. It is followed by placement of bone graft material and GTR therapy. CO2 and Nd.YAG laser [12], 4-META/MMA-TBB resin, [7] glass ionomer cement or dual cure adhesive resin cement have been used to fuse fractured tooth roots.

Compared to conventionally setting GIC, RMGICs have easier handling properties. Over composites, GIC is advantageous as it can be used without etching, as it is detrimental to cementum and PDL. The material shows low cytotoxicity, pronounced antibacterial activity and also favourable tissue response [13] GIC have both soft tissue and bone compatibility which is evident after follow up of the case for 9 months.

In the current case management, Dual cure nanoionomer was used because it provides Monobloc effect [13]. Bonding mechanism is attributed to micro mechanical interlocking provided by the surface roughness, most likely combined with chemical interaction through its acrylic/itaconic acid copolymers. It was used as it also creates high initial gloss & achieve smooth surface but also causes less porosities and surface cracks which helps in periodontal reattachment. Filler particle size is small which in turn increases the strength of the cement. Nanoionomer is known to have high fluoride release and it may contribute to bone mineralization.

Amniotic membrane is a novelty in the field of dentistry. The advantages of using this as a guided tissue regenerative membrane in this case is that it is of natural origin, demonstrates self-adhering property, enhances vascularization & wound healing. The placental allografts possess antibacterial and antimicrobial properties being tissues with immunoprivilege and are thus quite different from cadaveric allograft, xenograft, and alloplast barrier membranes. They reduce inflammation and provide a matrix highly rich in protein and thereby facilitate migration of cells at the area of defect [15]. Considering the above facts, it can be believed that amniotic membrane did play a favourable role in facilitating bone fill in this case.

CONCLUSION

Thus it can be concluded that the combination of nanoionomer and amniotic membrane may be a suitable approach in the management of VRF since it remarkably improved the prognosis of the tooth. However, further research with a larger sample size is indicated for more conclusive results.

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