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Management Of Vertical Root Fractures – A Review
Vertical Root Fractures- A Review

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ABSTRACT: Vertical root fractures are the main reason for tooth loss in endodontically treated tooth. These fractures have a various etiology which often leads to advanced periodontal breakdown with deep periodontal pockets and angular bone defects. Clinical signs and symptoms are often difficult to diagnose. They present a big challenge to dentists for its diagnosis and treatment and the most common treatment modality is extraction due to its prognosis. We may prevent the tooth from being removed by reconstructing fracture fragments and then replanting it.

Key words: Root fractures, Trauma, Vertical root fracture

1. INTRODUCTION:

Vertical root fracture (VRF) is defined as complete or incomplete, longitudinally orientedfracture that typically occurs in the buccolingual plane. This fracture usually develops in the tooth root and may extend coronally[1]. It grows over time as a result of masticatory forces and occlusal loads, starting with an internal dentinal crack. Due to their poor prognosis, VRFs are one of the important cause of tooth loss after root canal treatment[2].

INCIDENCE AND PREVALENCE

Mandibular molars and maxillary premolars are the frequently diagnosed teeth with VRF after root canal treatment[3]. Fracture most commonly occurs in bucco‑lingual direction in anteriors and individual roots of molar teeth. Mesio‑distal fractures are less common[4]. VRF in vital teeth occurs more frequently in males due to factors such as stronger masticatory force, increased attrition, habitual chewing of hard food and less pliable supporting bone[5].

PATHOGENESIS

Soft tissue growth into the fracture space increases the separation of the root segments as VRF progresses to the periodontal ligament. Due to the communication with the oral cavity through the gingival sulcus, bacteria gains access to the fracture area and an inflammatory process is induced resulting in periodontal ligament breakdown, alveolar bone loss and granulation tissue formation. The periodontal ligament disintegrates along the fracture line, followed by bone loss, which is progressive, particularly in the thin buccal bone plate[6].

CLASSIFICATION

Vertical root fracture on the basis of separation of fragments is divided into complete and incomplete fracture. On the basis of relative position of the fracture to the alveolar crest is divided into supraosseous and intraosseous[7].

CLINICAL FINDINGS AND SYMPTOMS

Clinical findings most frequently seen were pain on percussion, pain on palpation, presence of a deep narrow pocket, and sinus tract/swelling.‘Halo’’-type radiolucency was the most common radiographic features related to VRFs. The patient’s symptoms may mimic many other possible diagnoses such as sinus problem, vague headaches or ear pain[8].

CLINICAL DIAGNOSTIC TESTS

- Direct visual examination should be done with good illumination and magnification
- A sharp probe helps in identifying the fracture line where separation has not occurred
- The use of disclosing dyes helps the clinician visualise a suspected crack by staining the fracture line.
- Pulp vitality tests can be helpful in diagnosing a VRF as fracture line may extend to the pulp causing inflammation and necrosis[9].
- Diagnostic information can be obtained if the patient complains of a sharp, sudden pain, especially while chewing
- Rubber wheels, cottonwood sticks or aids such as Tooth Slooth reproduces the biting pain described by the patient.
- Fiberoptic light may be used to see if a crack exists.The crack deflects light, limiting its transmission through the tooth and giving the broken segment a dark appearance [10].

RADIOGRAPHIC EXAMINATION

- Fracture (radiolucent) Lines[11].
- Radiolucent Lines seen along the root fillings or post:
- Double images
- Extrusion of cement or filling:
- Widening of periodontal ligament space:
- Radiolucent halos:

- Step-like bone defects:
- Isolated horizontal bone loss in posterior teeth:
- Unexplained bifurcation bone loss:
- V-shaped diffuse bone loss:
- Computerized tomography (CT)
- Surgical exploration [12].

PREVENTION

- Over-instrumentation should be avoided in teeth susceptible to fracture, i.e. the maxillary and mandibular premolars, as well as the mesial roots of mandibular molars.
- Fiberreinforced resin based composite posts with the same modulus of elasticity as dentin or prefabricated parallelsided posts with round edges and passive insertion are recommended[13].
- Nightguards can be used in patients with bruxism to minimize the risk of VRFs. Early treatment with castings with cusp coverage or internal splinting with adhesive ceramic restorations is recommended for teeth at risk.

MANAGEMENT

- Resecting the root (root amputation or hemisection) will save a multi-rooted tooth with VRF.
- The prognosis is un favourable in case of single rooted teeth.
- In case of extensive bone loss and uncertain prognosis extraction may be advised.

EXTRACTION AND REPLANTATION AFTER BONDING

- VRF can be successfully treated by extracting the fractured tooth, bonding the fragments followed by replantation either directly or with a 180 degree rotation [14].
- Application of a bio-resorbable membrane allows for regeneration of periodontal ligament cells around the teeth to reinforce periodontal healing by preventing any gingival connective tissue from making contact with the curetted root surfaces during healing.
- After replantation, this membrane also prevents ankylosis.
- Other treatment options like use of composite resins[15].Mineral trioxide aggregate and silver glass ionomer cement have also been used to bond the fracture line.
- Calcium hydroxide can be used to promote tissue repair and manage osseous defects
- Poor long-term prognosis has been reported with teeth cemented extra-orally with cyanoacrylate
- Dual-cured adhesive resin cement is preferred for bonding the fractured fragments because of its controlled polymerization.
- Orthodontic elastics is used to join the fractured segments which is then sealed with photocured resin liner followed the tooth should be endodontically treated and restored with a cast crown
- Fitting of orthodontic bands before endodontic treatment is essential to prevent propagation of a crack or fracture
- Fusing broken tooth roots with CO2 and Nd.YAG laser.

2. CONCLUSION

Treatment options often involve extensive procedures with poor outcomes and long-term prognosis has yet to be proven where successful outcomes have been claimed. Therefore, further clinical research on the treatment of teeth with VRF is required.

CONFLICT OF INTEREST : NIL
SOURCE OF FUNDING : NIL
ETHICAL CLEARANCE : NOT REQUIRED FOR REVIEW MANUSCRIPTS.

3. REFERENCES

[1.] Rivera EM, Walton RE. Cracking the cracked tooth code: detection and treatment of various longitudinal tooth fractures. Am Assoc Endodontists Colleagues for Excellence News Lett. 2008;2:1-9.
[2.] Kallel I, Moussaoui E, Chtioui F, Douki N. Diagnosis and Managment of Maxillary Incisor with Vertical Root Fracture: A Clinical Report with Three-Year Follow-Up. Case reports in dentistry. 2018 Feb 6;2018.
[3.] PradeepKumar AR, Shemesh H, Jothilatha S, Vijayabharathi R, Jayalakshmi S, Kishen A. Diagnosis of vertical root fractures in restored endodontically treated teeth: a time-dependent retrospective cohort study. J Endod. 2016 Aug 1;42(8):1175-80.
[4.] Pitts DL, Matheny HE, Nicholls JI. An in vitro study of spreader loads required to cause vertical root fracture during lateral condensation. J Endod. 1983;9:544-50.
[5.] Dhawan A, Gupta S, Mittal R. Vertical root fractures: An update review. J Rest Dent. 2014 Sep 1;2(3):107-113
[6.] Walton RE, Michelich RJ, Smith GN. The histopathogenesis of vertical root fractures. J Endod. 1984 Feb 1;10(2):48-56.
[7.] Prithviraj DR, Balla HK, Vashisht R, Regish KM, Suresh P. An overview of management of root fractures. Kathmandu University Medical Journal. 2014;12(3):222-30.
[8.] Moule AJ, Kahler B. Diagnosis and management of teeth with vertical root fractures. Aust Dental J. 1999 Jun;44(2):75-87
[9.] Cohen S, Bums RC. Pathways of the pulp. 6 th ed. St Louis: Mosby; 2002:2-24.
[10.] Cohen S, Blanco L, Berman L. Vertical root fractures: clinical and radiographic diagnosis. The Journal of the American Dental Association. 2003 Apr 1;134(4):434-41.
[11.] Meister F Jr, Lommel TJ, Gerstein H, Bell WA. An additional clinical observation in two cases of vertical root fracture. Oral Surg Oral Med Oral Pathol 1981;52:91-6.
[12.] Pia JC, Mitthra S, Prakash V, Subbiya A. Vertical Root Fracture-Diagnosis, Surgical Perspectives and Management—A Review. Indian Journal of Public Health Research & Development. 2019;10(12):2167-71.
[13.] Schwartz RS, Robbins JW. Post placement and restoration of endodontically treated teeth: a literature review. J Endod. 2004 May;30(5):289-301.
[14.] Fariniuk LF, Ferreira EL, Soresini GC, Cavali AE, Baratto Filho F. Intentional replantation with 180 degrees rotation of a crown-root fracture: A case report. Dent Traumatol 2003;19:321-5
[15.] Hasegawa A, Bando H, Fukai K, Vongsurasit T, Tsuchida T. Periodontal surgical approach to the vertical fracture of the root. The application of composite resin to the fractured root surface. Nihon Shishubyo Gakkai Kaishi. 1988 Dec;30(4):1180-5.