Management of internal root resorption: A Review

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Abstract -

Internal root resorption is a type of resorption as a result of chronic pulpal inflammation, following caries or due to trauma. The predentin and the odontoblast layer of the canal wall get damaged, leading to exposure of the underlying mineralized dentin to odontoclastsresulting in internal root resorption (IRR). This article discusses about the etiology, the clinical and radiographic diagnosis, the contribution of the three-dimensional imaging (CBCT) to the diagnosis, and the conservative and surgical management of IRR.

Key words: Internal root resorption, perforation, management

Introduction

Resorption is a physiologic or pathologic phenomenon that results in the loss of hard tissues such as dentin, cementum or bone[1]. Andreasen has classified tooth resorption as Internal (Inflammatory, Replacement) and External (Surface, Inflammatory and Replacement)[2]. Internal resorption is an inflammatory process, it begins within the pulp space with loss of dentin and followed by cementum invasion[1]. Internal resorption can be detected by: Visual examination based on changed color in tooth crown, radiographic diagnosis, conventional and cone beam computed tomography, light microscopy and electron microscopy[3,4].At initial stage Internal root radiolucencies are not detectable on radiographs as they are small, or because of limitations of this 2 dimensional method. Cone beam computerized tomography (CBCT) is a more powerful tool which allows an earlier and more accurate diagnosis of these lesions[4]. At the same time, new materials are offered to induce a remineralization and healing[5]. The contribution of these new ways of imaging and these new materials allow an extension of the boundaries for the conservation of teeth[6].

Pathogenesis

Internal root resorption (IRR) is characterized by the loss of dentine due to osteoclastic activity. It occurs in conditions of pulpal inflammation: the blood supply brings the osteoclastic cells into the pulp chamber. Generally internal root resorption is classifies into two types, the internal root canal inflammatory resorption and the internal root canal replacement resorption.

(i) In the inflammatory resorption, the intraradicular dentine is resorbed associated with granulation tissue without adjunctive deposition of hard tissues adjacent to the resorptive sites. Radiographically appears a radioclear zone centered on the root canal.

(ii) In the replacement resorption, the dentin adjacent to the root canal is resorbed followed by concomitant deposition of bone like tissue in some regions of the defect. Thepulpchamber is partially or fully obliterated with irregular enlargement of the pulp space.

For root resorption two phases is required injury and stimulation. Injury is said to the nonmineralized tissues covering the interior surface of the root canal, the predentin and the odontoblasts layer. Infection is the main stimulation factor in IRR. The origin of the resorbing cells is pulpal, coming from the apical vital part of the pulp[7].

Etiology

Among various etiologic factors, trauma seems to be most common for the loss of predentin[8]. Persistent infection of the pulp by bacteria causes the colonization and spread of macrophage-like cells which is the primary prerequisite for initiation of root resorption [9]. It can beconcluded thatthe major contributory factors in the initiation of internal resorption, are trauma and pulpal infection/inflammation although the complete etiologic factorsaswellas the pathogenesis have not yet been completely elucidated[10]. Shifting of ph value to acid like in irreversible pulpitis results in resorption, so that the dentin and enamel substances are dissolved by chelation [11]. During tooth trauma, the interpulpal hemorrhage can develop. Developed blood clots are then organized and substituted by granular tissue which compresses dentin wall of the pulpal chamber or root canal [12]. They differentiate into dentinoclasts which is the cells responsible for resorption of the hard tooth structure, with activation of non-differentiated mesenchymal cells of the pulpal tissue [13, 14] . The transformation of non-differentiated cells of connective pulpal tissue into giant multinuclear cells in chronic trauma or inflammation condition is responsible for the resorption process [11].

Symptoms

Most teeth with internal root resorption are asymptomatic at the initial stage. As the resorption progress, the tooth is partially vital and may present symptoms typical of pulpitis. The inflamed connective tissue filling the IRR defect degenerates undergoes necrosis, and triggers an apical periodontitis .The tooth may then become symptomatic and perirradicular abscessesmayoccur.Other symptoms include Root perforation followed by sinus tract development, which confirms the presence of infection in the root canal, mostly by Gram-negative, strict anaerobes species[15].

Clinical diagnosis

Based on location and wideness of internal root resorption clinical signs may vary. When resorption is coronal “pinkspot”is observed. The pink color denotes the highly vascularized connective tissue adjacent to the resorbing cells. The color changes from pink to grey as the pulp degenerates[16]. Complete pulp necrosis stops the growth of the resorption as the blood supply and nutrients from the pulp chamber to resorbing cell are cut off and sealed. The response to vitality tests, thermal and electrical, is positiveuntilthelesion resultin aperforation.

Radiographic diagnosis

Usually internal root resorption appears as a ‘ballooning-out’ of the root canal in radiographs. The resorption lesion is radiolucent and has smooth, well defined margins and is oval or round in shape [17,18]. Early diagnosis of internal root resorption is difficult in conventional Xray. Root resorption may be confirmed using the parallax radiograph technique [19,20]. However, intraoral radiographs do not provide an indication of the true dimensions of such lesions [21]. The resorption defect may spread in all directions, this may not be reflected on the radiograph [20]. CBCT has been successfully used to evaluate the true nature and severity of resorption lesions [20,22] indicating that the clinician could confidently diagnose and manage the defect. One of CBCT’s major advantages over computed tomography (CT) scanners is the reduction in radiation exposure [20,23]. CBCT gives information about the following: (i) lesion size, shape and location (ii) presence of root

perforations, apical bone lesion (iii) root wall thickness, (iv) localization of anatomical structures : maxillary sinus, mental foramen, and inferior alveolar nerve. All these criteria corroborate the differential diagnosis and prognosis of root resorption

Conservative Dental Treatments of Resorbed Teeth

The treatment of choice for internal root resorption is root canal treatment as it seals the blood supply of the clastic cells by removing the granulation tissue. Instrumentation and filling is difficult in these cases. The access cavity must be as conservative as possible to preserve tooth structure and avoid further weakening of the tooth. A brisk bleeding might impair visibility in teeth with active resorbing lesions until the apical pulp tissue has been sealed and removed. The shape of the resorption defect usually makes it inaccessible to direct mechanical instrumentation[24]. The use of ultrasonic device activates and facilitates the penetration of the irrigation solution of hypochlorite to all the areas of the root canal system[19]. The Endo Activator are also preferred to achieve a complete chemomechanical debridement. However, even with the use of ultrasonic instruments, bacteria might still remain in confined areas[25]. Thus, an intracanal, antibacterial medicament improves disinfection of the inaccessible root resorption defects [26]. Calcium hydroxide is antibacterial and has been shown to effectively eradicate bacteria that persist after chemomechanical instrumentation [27,28]. Calcium hydroxide has also been shown to have a synergistic effect when used in conjunction with sodium hypochlorite to remove organic debris from the root canal [29,30]. Nevertheless, some case reports demonstrated the inability of calcium hydroxide to eliminate bacteria in ramifications because of its low solubility and inactivation by dentin, tissue fluids, and organic matter [31,32]. Despite these limitations, the use of multiple calcium hydroxide dressings has been advocated to enhance chemomechanical debridement of the internal root resorption defect. For complete seal of the resorptive area, the obturation material should be flowable. Many studies reported that Obtura II system performed better in obturating resorptive defects than CLC, Thermafil, and hybrid technique[33,34] In situations when the root resorption is progressed to perforation, mineral trioxide aggregate (MTA) should be considered the material of choice. MTA is biocompatible [35] and has been shown to be effective in repairing furcation perforations and lateral root perforations [36]. Ahybrid technique is where the canal apical to the resorption defect is obturated with gutta-percha, and then the resorption defect and associated perforation are sealed with MTA [37].

Surgical Treatment of Internal Root Resorption

When the lesion is inaccessible through the canal surgical approach is opted. It provides direct access to the lesion and to perform mechanical cleaning of the resorbed defect. The general guidelines of the endodontic surgery procedure must be respected[38]. Following local anesthesia a mucoperiosteal flap is raised. Followed by removal of cortical bone, the soft tissue lesion is curetted and the intraradicular dentin cavity is prepared with the aid of an operative microscope, cleaned, and dried. Filling material like MTA or Biodentine are placed and smoothed on its external surface followed by meticulous cleaning of the wound area. The flap is repositioned and sutured

Conclusion

The advent of CBCT no doubt has improved the clinician's diagnostic capability for internal root resorption. Further the CBCT's superior diagnosis accuracy resulted in an improved management of internal resorption. With the advent of Modern endodontic techniques such as ultrasonic, optical aids and thermoplastic filling techniques treatment of internally resorbed teeth with perforation could be managed with a fairly good prognosis Early diagnosis and treatment of tooth would inhibit resorption prevent further damage of tooth.

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