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Review Article

An insight into Pink Tooth

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ABSTRACT:

Internal resorption, an uncommon occurrence, has been a source of consternation in terms of both diagnosis and therapy. It is frequently asymptomatic and found by coincidence during normal radiography tests or by a distinctive clinical sign, a "pink spot" in the crown. This research focuses on the aetiology and pathophysiologic factors that contribute to internal root resorption. Smaller lesions have a fair prognosis; however, those with substantial resorption combined with perforation have a severely damaged tooth structure and a bad prognosis.

Key words: Internal root resorption, perforation, treatment

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INTRODUCTION

Resorption is a physiologic or pathologic process that causes the loss of hard tissues like dentin, cementum, or bone. ¹Andreasen divides tooth resorption into two categories: internal (inflammatory, replacement) and external (Surface, Inflammatory and Replacement).² Internal resorption is an inflammatory condition that starts in the pulp space with dentin loss and progresses to cementum invasion.¹ Internal resorption may be identified using the following methods: visual examination based on dental crown colour change, radiographic diagnostic, conventional and cone beam computed tomography, light microscopy, and electron microscopy. ^{3,4}Internal root radiolucencies are not evident on radiographs in the early stages due to their small size or the limits of this two-dimensional approach. Cone beam computerised tomography (CBCT) provides a more powerful method for detecting these lesions early and more accurately.⁴ At the same time, new materials are being developed to promote remineralization and healing. The contribution of these novel imaging methods and materials allows for an expansion of the limits for tooth conservation.⁶

PREVALENCE

Internal root resorption has been classified as intraradicular or apical depending on the location of the ailment. Intraradicular internal resorption is an inflammatory disorder that causes gradual deterioration of intraradicular dentin and dentinal tubules along the canal walls' middle and apical thirds. Granulation tissue alone or in conjunction with bone-like or cementum-like mineralized tissues may fill the resorptive gaps. ⁷ Male participants are more likely to be affected than female ones. ^{8,9}Although intraradicular internal root resorption is a rather uncommon clinical entity even after severe damage, it has been linked to a greater incidence of the problem in teeth that have received certain therapeutic techniques such as autotransplantation. ¹⁰⁻¹² Cabrini et al.¹³ removed 28 teeth's coronal pulps and treated the radicular pulp stumps with calcium hydroxide mixed with distilled water. Histologic evidence of internal resorption was seen in eight of the 28 teeth removed between 49 and 320 days following the surgery. C alixskan and Turkun investigated the long-term prognosis of endodontic therapy on 25 teeth with nonperforating and perforating internal resorption. The authors observed that maxillary incisors were the most usually afflicted teeth. The tiny sample sizes in these investigations made it impossible to make solid

conclusions about the occurrence of internal root resorption. Furthermore, in most previous research, the diagnosis of internal resorption was based exclusively on 2-dimensional radiographic data, with no additional 3-dimensional radiographic and/or histologic support. More epidemiologic research is needed to determine if there are ethnic differences in the appearance of intraradicular internal resorption.

Apical internal resorption is more prevalent in teeth with periapical lesions than intraradicular internal resorption.14The authors assessed the degree of internal resorption in 75 roots (69 with radiolucent periapical lesions and 6 vital control roots) using a 4point scale. They found that internal apical resorption occurred in 75% of periapical lesions and that vital teeth showed statistically less apical internal resorption than periapical lesions. In 48% of instances with periapical lesions, severe internal resorption was seen. In contrast, just one root in the control group showed minor internal resorption, which was thought to be temporary as a consequence of shock. Because apical internal root resorption is invariably associated with apical inflammatory external resorp- tion of the cementum from partially resorbed root apices, only intraradicular forms of internal root resorption will be discussed in the remainder of this article and will be referred to simply as internal root resorption. ¹⁵

ETIOLOGY

Trauma seems to be the most prevalent etiologic cause for predentin loss among the major etiologic factors.¹⁶ Persistent bacterial infection of the pulp results in the colonisation and spread of macrophagelike cells, which is the fundamental need for the onset of root resorption. ¹⁷ Although the whole etiologic reasons as well as the pathophysiology have not yet been completely explored, it may be established that trauma and pulpal infection/inflammation are key contributing elements in the onset of internal resorption.¹⁸ Shifting the ph value to acid, as in irreversible pulp, causes resorption, and the dentin and enamel components are destroyed by chelation. ¹⁹Interpulpal bleeding may occur as a result of tooth trauma. Blood clots that have formed are then organised and replaced by granular tissue, which compresses the dentin wall of the pulpal chamber or root canal. ²⁰ They develop into dentinoclasts, which are responsible for the resorption of the hard tooth structure, with the activation of non-differentiated mesenchymal cells of the pulpal tissue. ^{21,22}The resorption process is caused by the change of nondifferentiated connective pulpal tissue cells into large multinuclear cells in the presence of persistent trauma or inflammation. 19

SYMPTOMS

The majority of teeth with internal root resorption are asymptomatic at first. As the resorption progresses, the tooth becomes partly alive and may exhibit pulpitis-like symptoms. The inflammatory connective tissue that fills the IRR deficiency degenerates, necrotizes, and causes apical periodontitis. The tooth may then become symptomatic, resulting in perirradicular abscesses. Other symptoms include root perforation followed by sinus tract formation, confirming the presence of infection in the root canal, which is caused mostly by Gram-negative, stringent anaerobes. 23

CLASSIFICATION

There are several forms of resorption. Physiologic resorption is connected with deciduous dentition, culminating in exfoliation and the emergence of succedaneous teeth. Permanent teeth, unlike deciduous teeth, seldom undergo resorption unless triggered by a pathogenic condition. Traumatic traumas, orthodontic tooth movement, or persistent infections of the pulp or periodontal tissues may all result in pathologic resorption.² If the condition is not addressed, the afflicted teeth will be lost prematurely. Internal resorption occurs in the root canal's inner walls, while external resorption occurs on the root surface or cervical region. External root resorption occurs simultaneously with alveolar bone resorption, and the resorptive process manifests similarly to that of bone. 18

PATHOPHYSIOLOGY

Internal resorption is often caused by a continual chronic inflammatory process. Internal resorption progress is determined by two factors: the existence of living pulp tissue at/below the resorption region and partly or fully necrotic pulp coronal to the site of resorption, permitting continuous access of bacteria and their antigens into the root canal. Microbial stimulation is critical for the durability of resorption. ²⁴

The strength of the stimuli and the inflammatory process also influence the degree of development. The creation of clastic cells is linked to a viable blood supply, and necrotic tissue functions as a stimulant for their production. This explains why IR is described as an uncommon event in comparison to external root resorption.²⁵ The vascular alterations in the pulp cause hyperaemia, resulting in high oxygen tension and low pH levels, drawing many macrophages to the region and initiating the resorptive process. Following resorptive action, connective tissue may metaplasia to produce granulation tissue. ²⁶ The presence of a developing infection induces necrosis of the whole pulp tissue and restricts the resorptive process, which works as a protective mechanism, stopping the infection from advancing. ²⁴ The existence of a collateral blood flow from the periodontal ligament to the resorption site through an accessory canal may help to sustain the resorptive process. Internal inflammatory root resorption spreads symmetrically in all directions into the dentin surrounding the pulp in its most typical form.²⁴



FIGURE 1: Schematic representation of pathogenesis of internal resorption.

Internal resorption of the replacement type is caused by low-grade irritation of pulpal tissues, such as chronic irreversible pulpitis or partial necrosis, which is generally limited to a small region of the root canal. ²⁷ This linked low grade chronic infection causes a reactive lesion with the formation of metaplastic tissue similar to bone or cementum. ²⁸Wedenberg and Zetterqvist studied instances of increasing internal resorption and discovered that normal pulp tissue had been replaced with periodontal-like connective tissue with osteogenic potential. Furthermore, the process seemed to alternate between dentin resorption and mineralized tissue apposition, with the degree of the former being proportional to the strength of stimuli. ²⁹ Transient apical resorption may occur after luxation injuries, as seen by repeated X-rays demonstrating a decrease in radiolucency over a few months. It is a positive reaction since the injured pulp recovers quickly because to the existence of a functioning vascular network. Due to intrapulpal bleeding, an accompanying colour shift may develop and resolve immediately following revascularization of the coronal pulp chamber. Because this is a transitory procedure, the internally resorbed apex will resolve without incident. ³⁰



FIGURE 2: Diagrammatic representation of pathogenesis of internal resorption.

DIAGNOSIS CHARACTERISTICS OF CLINICAL PRACTICE

Internal resorption is often asymptomatic, with just around 2% exhibiting clinical symptoms. Males are more likely to be affected than females. ³¹ Internal root resorption caused by inflammatory reasons has an incidence of 0.01%-1%, according to Haapasalo.³² Internal resorption is often observed in the root's mid or apical region. They are identified accidentally on regular radiography or as a clinical symptom of a "pink spot" on the crown. The pulp might be partially or completely necrotic. In an aggressively growing lesion, the tooth may be partly alive and exhibit pulpitis-like symptoms. ³² The coronal pulp is often necrotic, although the apical pulp, which contains the internal resorptive defect, might remain viable. If the crown has been completely perforated and the granulation tissue is exposed to the oral environment, pain may be a presenting symptom.

The "pink tooth" is formed when the resorptive process has extended to the cervical region of the crown as a result of granulation tissue ingrowths.³² The position of "the spot": a colour change from inflammatory internal resorption visible normally in the centre of the tooth in the mesiodistal direction (unless in multirooted teeth), but in cervical resorption it is placed either mesially, centrally, or distally.³²

Progressive resorptions may cause substantial irreversible tissue loss. Due to root perforation, an external connection may form between the root canal and the periodontal ligament.

RADIOGRAPHIC FEATURES

Internal resorption is mostly diagnosed via radiographs. To be reliably identified on the radiograph, a significant quantity of pulpal dentin wall must be resorbed. When an infection progresses quickly along the root canal, resulting in necrosis of the whole pulp, resorption stops early and goes unnoticed both clinically and radiographically.³² Infection-induced/inflammatory IR is seen as round to oval-shaped radiolucencies inside the root canal, as well as symmetrical canal widening. Gartner et al. highlight the conventional radiological definition of internal resorption as a clearly defined symmetrical radiolucency of homogeneous density that balloons out of the pulp chamber or root canal. ³³

Internal resorption begins as a symmetrical lesion in the coronal pulp/crown region of single-rooted teeth with one root canal. Internal resorption, on the other hand, occurs in one section of the pulp chamber and extends locally into the surrounding dentin in multirooted teeth with a large pulp chamber. Internal resorption occurring apically may be difficult to identify radiographically when the resorptions are of the lower grades reported by Vier and Figueiredo.¹⁴ Because resorptive abnormalities on the facial/lingual/palatal features are often overlooked during inspection, diagnosis becomes a big difficulty. Newer radiographic methods, such as tunable aperture computed tomography (TACT), show a lot of promise for detecting these flaws. 34 Another diagnostic feature is how the pulp "disappears" into the lesion rather than extending through it in its normal structure. Lynch and Ahlberg described a case of bilateral idiopathic internal resorption in which the radiolucent regions were clearly defined, punched-out lesions with the pulp disappearing into the lesion. ³⁵

HISTOPATHOLOGY

Granulation tissue is the major component of an internal resorption lesion. The pulpal connective tissue is highly vascularized and inflammatory, with lymphocytes, macrophages, neutrophilic leukocytes, and plasma cells infiltrating. The mineralized dentin surface is covered with neutrophils and macrophages. There are also "resorptive bays" with many odontoclasts. Bacteria may be found in the dentinal tubules, the necrotic area of the coronal root canal, or the dentinal tubules connecting between the necrotic zone and the granulation tissue of teeth that are quickly resorbing. Allen and Gutmann discovered osteoid or cementum-like tissue as well as tiny calcifications in the pulp tissue in certain sections of the pulpal wall. ³⁶

CONSERVATIVE DENTAL TREATMENTS OF RESORBED TEETH

Root canal therapy is the preferred treatment for internal root resorption because it blocks the blood supply of the clastic cells by eliminating the granulation tissue. In circumstances, many instrumentation and filling are challenging. To maintain dental structure and minimise future tooth deterioration, the access cavity should be as conservative as feasible. In teeth with active resorbing lesions, rapid bleeding may limit vision until the apical pulp tissue is sealed and eliminated. The form of the resorption defect generally renders direct mechanical instrumentation unavailable.³⁷ The use of an ultrasonic instrument activates and enhances the penetration of hypochlorite irrigation solution into all parts of the root canal system. The Endo Activator is also recommended for full chemomechanical debridement. Even with the use of ultrasonic equipment, germs may still be present in limited places. ³⁸ Thus, an antibacterial intracanal medication enhances disinfection of inaccessible root resorption flaws. ³⁹ Calcium hydroxide is an antibacterial agent that has been demonstrated to successfully eliminate microorganisms that survive chemomechanical instrumentation. 40,41 When combined with sodium hypochlorite, calcium hydroxide has been proven to have a synergistic impact in removing organic material from the root canal. ^{42,43}Nonetheless, several case studies indicated calcium hydroxide's incapacity to remove germs in ramifications because to its limited solubility and inactivation by dentin, tissue fluids, and organic materials. 44,45Despite these restrictions, the use of repeated calcium hydroxide dressings to promote chemomechanical debridement of the internal root resorption defect has been proposed. The obturation material should be flowable in order to completely seal the resorptive region. Many investigations concluded that the Obtura II

method outperformed the CLC, Thermafil, and hybrid techniques in obturatingresorptive flaws. ^{46,47}Mineral trioxide aggregate (MTA) should be regarded the material of choice when root resorption progresses to perforation. MTA is non-toxic to humans. ⁴⁸ and has been shown to be beneficial in healing furcation and lateral root perforations. ⁴⁹ The resorption defect and accompanying perforation are sealed with MTA after the canal apical to the resorption defect is obturated with gutta-percha. ⁵⁰

SURGICAL TREATMENT OF INTERNAL ROOT RESORPTION

When the lesion is unreachable via the canal, surgery is used. It allows for direct access to the lesion and mechanical cleansing of the resorbed defect. The general endodontic surgery technique parameters must be followed. ⁵¹ A mucoperiosteal flap is raised after local anaesthetic. Following the excision of cortical bone, the soft tissue lesion is curetted, and the intraradicular dentin cavity is prepped, cleaned, and dried using an operating microscope. Following rigorous cleansing of the wound region, filling material such as MTA or Biodentine is put and smoothed on its exterior surface. Sutures are used to adjust the flap.

CONCLUSION

The introduction of CBCT has undoubtedly increased the clinician's diagnostic skills for internal root resorption. Furthermore, the increased diagnostic accuracy of the CBCT led in better treatment of internal resorption. Treatment of internally resorbed teeth with perforation might be treated with a pretty favourable prognosis with the introduction of modern endodontic procedures such as ultrasonic, optical assistance, and thermoplastic filling techniques. Early detection and treatment of tooth resorption might avoid future tooth damage.

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