

Immediate Restoration of Single Implants Replacing Lateral Incisor Compromised by Internal Resorption

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Abstract: *Today, the diagnosis of internal root resorption is significantly improved by the three-dimensional imaging. Furthermore, the CBCT's superior diagnosis accuracy resulted in an improved management of the resorptive defects and a better outcome of Implant therapy of teeth with internal resorption. Implant has become a wide option to maintain periodontal architecture. Diagnosis and treatment planning is the key factors in achieving the successful outcomes after placing and restoring implants placed immediately after tooth extraction. The purpose of this clinical update is to report on the success and survival of Immediate restoration of single implants replacing right lateral incisor compromised by internal resorption.*

Keywords: *Internal Root Resorption, Extraction, Immediate implant, osseointegration*

I. Introduction

Resorption is a condition associated with either physiologic or a pathologic process resulting in a loss of dentin, cementum, and/or bone. (1) The etiology for resorption initiates from various injuries to the tooth, including thermal, mechanical, and chemical. (2) There are two different kinds of resorption external and internal. External resorption is resorption initiated in the periodontium and initially affecting the external surfaces of a tooth may be further classified as surface, inflammatory, or replacement, or by location as cervical, lateral, or apical; may or may not invade the dental pulp space. (1) Internal resorption is an inflammation process initiated within the pulp space with loss of dentin and possible invasion of cementum. (1) The pathology of internal root resorption (IRR) is caused by transformation of normal pulp tissue into granulomatous tissues with giant cells, which resorb dentin. (3) This, in turn, resorbs the dentinal walls, advancing from the center to the periphery. There are two classifications of internal resorption: internal root canal inflammatory resorption and internal root canal replacement resorption. (4,5)

- In the inflammatory resorption, the resorptive process if the intraradicular dentin progresses without adjunctive deposition of hard tissues adjacent to the resorptive sites. The phenomenon is associated with the presence of granulation tissues in the resorbed area and identifiable with routine radiographs as a radio clear zone centered on the root canal. (6,7)
- In the replacement resorption, the resorptive activity causes defects in the dentin adjacent to the root canal, with concomitant deposition of bone-like tissue in some regions of the defect. It results in an irregular enlargement of the pulp space with partially or fully obliterated area of the pulp chamber. (8)

Trauma and pulpal inflammation/infection are two of the major contributory factors in the initiation of internal resorption. (2) Caliskan et al. reported that in a study done on patients diagnosed with IRR, 43% of the patients had trauma as a common etiological factor, followed by carious lesions at 25%. (2,4)

Internal root resorption is typically detected clinically via routine radiographs. It is observed in all areas of the root canal, but it is most commonly discovered in the cervical region of the tooth. (3) One of the key ways to diagnose internal resorption (vs. external resorption) is to observe whether or not there is a defined outline of the pulp chamber. If the pulp chamber outline is within the lesion itself, it is likely internal resorption. If the pulp chamber outline is recognizable within a radiolucent halo, then it is likely external resorption. The use of CBCT has allowed for more accurate and complete diagnosis of IRR (and external root resorption) and is highly recommended in early presentations of potential resorption. (2,3)

IRR is usually asymptomatic, but pain or discomfort may be the chief complaint if the granulation tissue has been exposed to oral fluids. (3) The granulation tissue can clinically manifest itself as a "pink spot" where the crown dentin destruction is severe. (3) The pink shade is related to the highly vascularized connective tissue adjacent to the resorbing cells and when the pulp becomes necrotic, it turns grey/dark grey. (9,10) Teeth with IRR typically respond normally to pulpal and periapical tests until the lesion grows significantly in size, which then results in perforation. (11) Once necrosis of the pulpal tissue takes place, then the typical signs/symptoms of an abscessing tooth occur. Vital pulp tissue is required for IRR to take place; therefore, when there is complete pulpal necrosis, the growth of the resorption ceases because the resorbing cells are cut off from the blood supply and nutrients. (12,13,14)

The Decision-Making Must Take In To Consideration Several Criteria:

- (i) patient's age,
- (ii) tooth location,
- (iii) shape of the clinical crown,
- (iv) occlusion,
- (v) resorption location,
- (vi) resorption wideness,
- (vii) presence or not of root perforations and their wideness,
- (viii) resistance/weakness of the remaining root hard tissue,
- (ix) periodontal status,
- (x) ability to realize a restorative treatment on the concerned tooth.

From The Information Collected By Clinical Examination And CBCT, Several Options May Be Considered:

- (1) therapeutic abstention and monitoring, in absence of infectious signs and symptoms,
- (2) orthograde root canal treatment, with three options depending on the absence or presence of perforation of the radicular wall: complete root canal filling with gutta percha on nonperforated lesions; combined gutta percha in the root canal and MTA fillings for the perforation area; complete filling with a bioactive material (MTA or Biodentine) on apical perforated lesions located in a short root length,
- (3) retrograde apical treatment,
- (4) extraction and replacement by implants: the nonconservative treatment is indicated if the tooth is too weakened to be treated or restored.(3,10,12,14,15)

The purpose of this clinical update is to report on the success and survival of Immediate restoration of single implants replacing right lateral incisor compromised by internal resorption.

II. Materials And Methods

The patient is a 43-year-old healthy male who was examined in our office for a failing maxillary right lateral incisor. Clinically, all other maxillary and mandibular teeth were in good condition. Periodontal examination revealed healthy gingival tissue. The patient was concerned that his anterior tooth would fracture unexpectedly and desired an immediate replacement.



Fig 1. Preoperative clinical view of a patient with IRR of right lateral incisor

Several treatment options were considered. The first was extraction of the maxillary right lateral incisor and fabrication and placement of a conventional fixed bridge of porcelain fused to metal or an all-ceramic system. Fig. 2 The second option was extraction of the tooth followed by placement of a removable partial denture. The next option was extraction, provisionalization with a removable partial denture (flipper) followed by implant placement, healing while wearing the flipper and, finally, restoration of the implant.(16,17)

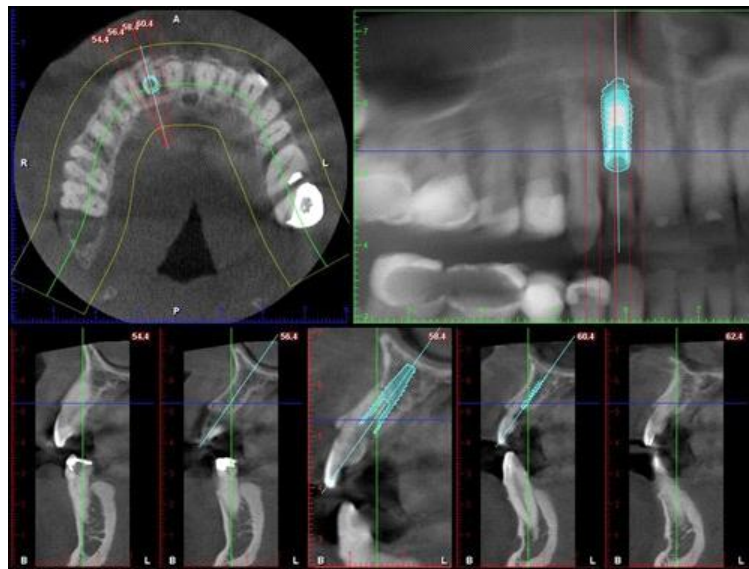


Fig 2. CT plan - shows 3.8x15 implant. I will actually position platform lightly more palatal than shown to get screw access through lingual

The best alternative was extraction and immediate replacement of the extracted tooth with an implant, followed by immediate loading with a nonfunctioning provisional. (18) Fig .3 After adequate osseointegration, a final restoration would be fabricated. Advantages and disadvantages of all options were explained to the patient. He decided to continue treatment with an immediate implant restoration. The patient was then referred to a periodontist for further evaluation and implant consultation. Implant examination revealed adequate bone height and width for implant placement immediately following extraction of the failing tooth. (19,20,21) Fig.4 A surgical date was scheduled with the periodontist for extraction of the tooth and placement of the implant. An appointment was coordinated with our office for the patient directly following the surgical procedure for provisionalization of the implant. The right lateral incisor was removed and a 3,8 x 15 mm implant was placed.



Fig 3 Tooth extracted

The patient presented in our office after the implant placement with a healing abutment in place. The healing abutment was removed. A immediate temporary abutment was placed and a provisional was fabricated. Fig.5 The provisional was polished and placed on the immediate temporary abutment with a small amount of flowable composite to enhance retention. The provisional crown was fabricated to be completely out of

occlusion and non-functional to insure the implant adequate osseointegration time undisturbed by occlusal forces.

The provisional restoration was observed periodically during the six month healing process to monitor gingival adaptation .

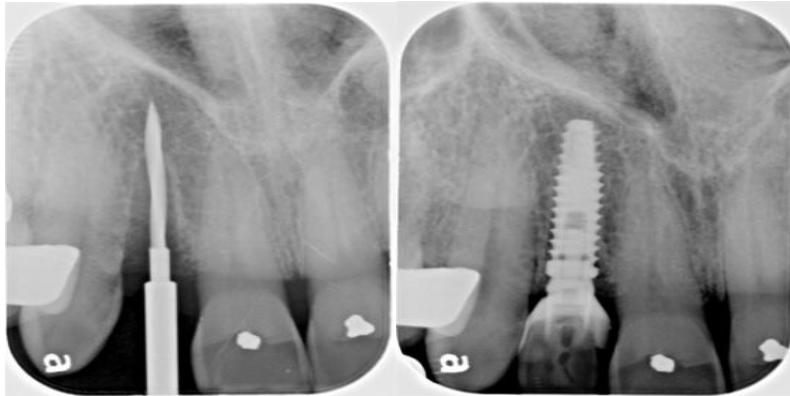


Fig 4;1.5mm pilot drill, Implant placed, titanium temp abutment, bonded facial veneer of natural tooth, grafted gap with xenograft, sealed sulcus with PRF.

The screw-retained structure was removed from the implant and another mount was connected to the implant to function as a transfer abutment for impressions. A definitive impression was made using a polyether material and was sent to a laboratory, where a master model was obtained from the impression.



Fig 5. Temporary prosthesis 12 hours after implant placement

A definitive abutment was prepared from the mount and refined, and a definitive metal-ceramic crown was created for aesthetic finalisation. The definitive abutment was positioned and screwed to the implant, and the definitive crown was positioned and cemented onto the abutment . The morphology of the occlusal surfaces was similar to that of natural teeth with occlusal contacts in maximum intercuspation and cusp inclination, and with functional contacts during lateral and protrusive excursions. The definitive restoration was placed seven weeks after implant placement.(21,22,23,24) Fig.6



Fig 6 The definitive ceramic-fused-to-metal restoration

At month 24, the clinical and radiographic parameters were optimal: the interproximal papilla and gingival buccal margin levels remained stable, and the interproximal bone level also showed no change over this period of time. Fig.7

III. Discussion

Dental root resorption involves the loss of hard tissues that compose the teeth (dentin, cementum and enamel).¹ Resorption occurs primarily by osteoclasts, large multinucleated cells that originate from the bone marrow. (1) Osteoclasts aid in the process of bone loss by releasing demineralizing agents and degrading enzymes that function in the breakdown of a tooth's hard tissues. (1,2) Resorption of the teeth is often difficult to prognosticate, diagnose and care for. Internal inflammatory resorption, the type of resorption identified in the following cases, is characterized by progressive loss of hard tissue in the tooth root.¹ This degeneration is typically found in the cervical region, but has been observed in all areas of the root canal system. (1,2,3,4,5)



Figure 7: X-RAY after 2- years

Internal resorption is generally asymptomatic and is discovered most frequently through radiographic examination. The loss of hard tissue is detected radiographically as uniform radiolucent expansion of the tooth canal. If internal root resorption is left to progress untreated, it may result in extension to the periodontal ligament through a crown or root perforation. (10,11,12,14,15) In the following cases of internally resorbed incisors with a poor prognosis, extraction followed by immediate placement of an implant is a desirable restorative option. The failing tooth is in the esthetic zone, and therefore an immediate and esthetic replacement is necessary following extraction. In the past, the non-restorable tooth was extracted and a removable partial denture was fabricated and placed for use during healing. After an adequate healing period, an implant was placed and buried under the gingiva, and the patient continued to wear the flipper until the implant had osseointegrated and was ready to be uncovered and restored. The patient would therefore wear the removable partial denture for upward of six to eight months. (7,9,17,19,21,23,24)

This clinical case shows that an immediate implant restoration placed in a postextraction site can constitute a safe and successful treatment procedure. Several authors have shown that immediately loaded postextraction implants have a survival rate of 94.5-100% after twelve months of follow-up. Correct clinical, prosthetic and surgical management of endosseous implants replacing missing teeth in the anterior maxilla enables the dental surgeon to achieve predictable aesthetic outcomes. The immediate placement in postextraction sites is a surgical option capable of ensuring ideal periimplant tissue healing, while at the same time preserving the pre-surgical gingiva and bone (21, 22). To achieve prosthetic success, it is essential to understand the patient's expectations and desires, paying particular attention to his or her psychological and socio-economic status,

as well as to his or her oral condition (23). The prosthesis should integrate itself from the biological, functional and aesthetic points of view (24). Some patients seek a rehabilitation capable of yielding the best aesthetic outcome possible despite the cost, whereas others request a rehabilitation capable of affording a satisfactory aesthetic result at a lower cost (25). In cases such as the one reported here, we propose a simplified technique, which makes it possible to reduce the number of implant components and materials involved, and consequently to reduce the cost of treatment, while maintaining acceptable aesthetic and functional outcomes. (21)

After tooth extraction, there is a geometric discrepancy between the extraction socket and the implant design. Larger diameter implants, possibly combined with guided bone regeneration, have been advocated to address this discrepancy (7,9,18,19,20). Tapered screw-vent implants have a larger coronal diameter that permits a survival rate of 98.5% for all implants placed, with no discernible bone loss in 88% of surviving implants, 1 mm of bone loss in 10.5% implants and 2 mm of bone loss in the remaining implants. Other studies have demonstrated a survival rate of 96.6-98.6% for tapered screw-vent implants and a crestal bone loss of 0.2-0.5mm.(9,18,19,21,23,24)

In the present case report and in another five clinical cases treated using the same technique, no evidence of complications at the abutment-implant interface or at the abutment- crown interface have been reported (25). The implant/ abutment interface represents a crucial element for maintaining the structural stability of the implant restoration and preventing mechanical problems capable of compromising the long-term success of the implant treatment (19,10,21,23,24,26). Initial stability of the implant at the time of placement is determined by the ability of the practitioner to engage existing bone and by the design of the implant to be stabilized in this bone.(20) Many practitioners have shown that the use of tapered implants allows for better initial stability in the bone. This stability can be increased by changing the shape of the osteotomy relative to the implant geometry.(22)

Implant placement at the time of extraction not only shortens the time of treatment but also prevents collapse of the alveolar bony complex that has been reported to be up to 60% volume of the socket and 3 mm to 4 mm of bone loss in both the buccal-lingual and apico-gingival directions.9 By placing the implant and associated grafting material, the initial collapse can be prevented and, thus, the crestal bone architecture can be maintained at pre-extraction levels.(7,9,16,17,26) Considering the results of these studies, the replacement of teeth with IRR failure history by immediate implant was successfully introduced into debrided infected dentoalveolar sockets. Based on a protocol that targets the elimination of the contaminated soft and hard tissues by meticulous debridement, this procedure was combined with pre- and postoperative antibiotics, eradicating the infection and establishing a favorable basis for bone healing and osseointegration.(16,17,19,21,23,24,26)

IV. Conclusion

Immediate placement of dental implants in the case of internal resorption and tooth failure can be a successful and acceptable treatment option provided there is proper case selection and treatment protocol. As with any dental implant procedure, the systemic health of the patient and smoking status can affect treatment success. Surgical protocols should include thorough debridement of the infected extraction site prior to implant placement and obtaining primary stability of the implant fixture. Additionally, the administration of systemic antibiotics, either preoperatively or post-operatively, has been utilized in all of the published literature. With the desire of both patients and clinicians to expedite treatment and reduce the number of surgical procedures, immediate placement of dental implants into infected sites should be considered as a viable treatment option for selected cases

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