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## Case Report

# An immediate implant placement technique to rehabilitate multi-rooted teeth by pre-extraction interradicular implant bed preparation using remaining roots as a guide: A case presentation

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### ABSTRACT

The introduction of osseointegrated implants have revolutionized the art and science of modern dentistry giving a new lease of life to the restorative aspects in day-to-day practice. Immediate loading (IL) of dental implants can significantly decrease treatment time and thus increase patient acceptance. IL of dental implants has recently gained popularity due to several factors including reduced trauma as well as aesthetic and psychological benefits to the patient. The present case report describes the immediate replacement of partially edentulous maxilla using Nobel Active™ implant. It describes about the diagnosis, treatment planning and procedures involving the placement of single tooth immediate implant followed by uneventful healing.

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## 1. Introduction

Since Brånemark introduced the osseointegration concept, development has followed multifold and efforts have been made to reduce the treatment period. The goal of modern dentistry is to prevent tooth loss and to provide a healthy dentition with optimal functional efficiency, structural balance and esthetic harmony.<sup>1</sup> Due to the advantages provided by the implant supported prosthesis, like improved esthetics, improved hygiene accessibility, osseous preservation and reduced future maintenance, it appears that replacement of tooth with implants may be a more viable option for today's patient. It was shown that after extraction of natural teeth, the greatest reduction of the alveolar bone occurs in the first 6 months to 2 years.<sup>2,3</sup> For this reason, within the last decades, the 'gold standard' implant treatment protocol has been challenged

by experiments, which aimed at shortening the treatment period and by reducing the number of surgical procedures.<sup>4</sup> New protocols have been developed in which implants are placed at the time of extraction of the tooth, known as immediate implants.<sup>5</sup>

The first reports of placing immediate implants in fresh extraction sockets were by Schulte and Heimk<sup>6</sup> and Schulte et al,<sup>7</sup> who described this procedure as "immediate implant placement." Following these first publications, the concept of immediate implant placement has continuously gained attention in scientific as well as clinical dentistry. Immediate implantation has provided implant dentistry the opportunity to achieve better and faster functional results and a predictable treatment strategy with a very high-rate of success. Such implants have several advantages, such as reduced number of surgical treatments, reduction of time between tooth extraction and placement of definitive prosthetic restoration, prevention of bone resorption, and preservation of alveolar ridge in terms of height and

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width.<sup>8–10</sup>

In maxillary and mandibular molar regions, immediate implant placement involves a series of clinical challenges due to site-specific anatomical aspects such as comparatively large extraction sockets or reduced bone heights apical to the socket fundus.<sup>11</sup> Implant bed preparation in the presence of interradicular bone septa may prove challenging. Study's show that this working step often turns into a clinically challenging procedure since the osteotomy drill may deflect from the ridge or surface of the bone septa, making ideal implant positioning with respect to prosthetic as well as hygienic aspects difficult.<sup>12,13</sup> Thus, implant should be placed at the center of the extraction socket by means of engaging the inter-radicular septum. A surgical technique that involves the insertion of the implant into the interseptal/inter-radicular bone of a multirouted posterior tooth extraction socket must be considered to take advantage of the morphology of the trunk of the roots to guide the drilling process into the interseptal bone of the socket. This will help to obtain primary stabilization of the implants in a good position regardless of the size and shape of the extraction socket. Criteria to be considered before the implant placement include pre-existing tooth form and position, root and extraction socket morphology, geometry of the implant, and soft tissue conditions.<sup>14,15</sup> The objective of this article is to describe an anatomical-guided implant site preparation technique as an aid to place dental implants in multiradicular molar teeth in a favorable position to achieve predictable and favorable results. This article presents a case rehabilitated using a novel approach that gives improved guidance during implant bed preparation for immediate implant at multirouted extraction sites.

## 2. Case Report and Technique Used

A 24 years old individual with a noncontributory medical history and presented with a mandibular right first molar that was intended to be extracted due to failed endodontic treatment. The proposed extraction and subsequent loss of tooth at a young age had psychological impact on patient. On evaluation of the site with respect to the tooth to be extracted (46), adequate intra-radicular bone width was present with no active peri-apical pathology, thus, pre-extraction osteotomy with an immediate implant placement was planned.

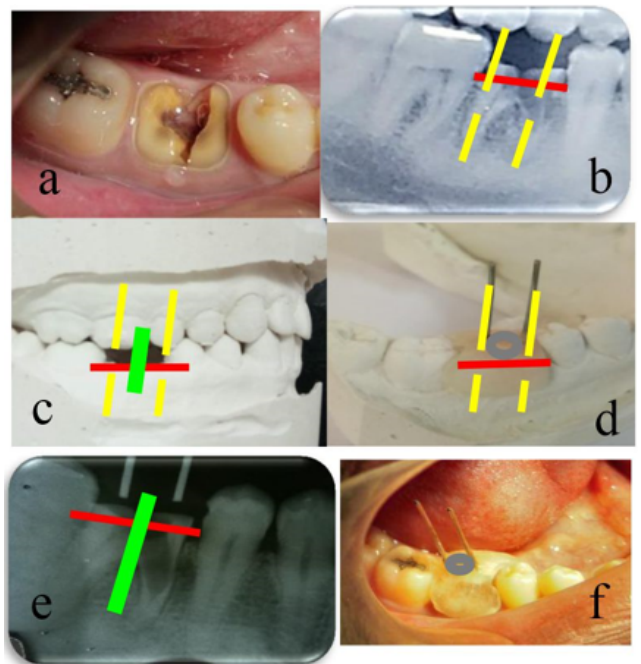
### 2.1. Surgical stent fabrication

Decoronation of tooth to be extracted (46) was done using straight fissure diamond bur, following which IOPA was taken (Figure 1), which was used to note the root anatomy and orientation. Working cast as made post decoronation was used to simulate angulation of remaining root complex as noted in IOPA (Figure 2a-c). The mesio-distal angulation thus noted was used to position straight wires on buccal

surface of a ridge retained acrylic surgical stent which will act as a guide in positioning drills in correct mesio-distal angulation (Figure 2d-f). An access hole for osteotomy drill(s) was made in middle of surgical stent, thus directing the drills in mid-crestal area as well as at inter-radicular area. The wires and access hole, thus positioned will act as a guide for orienting drills in correct angulation for sequential osteotomy (Figures 3 and 4).



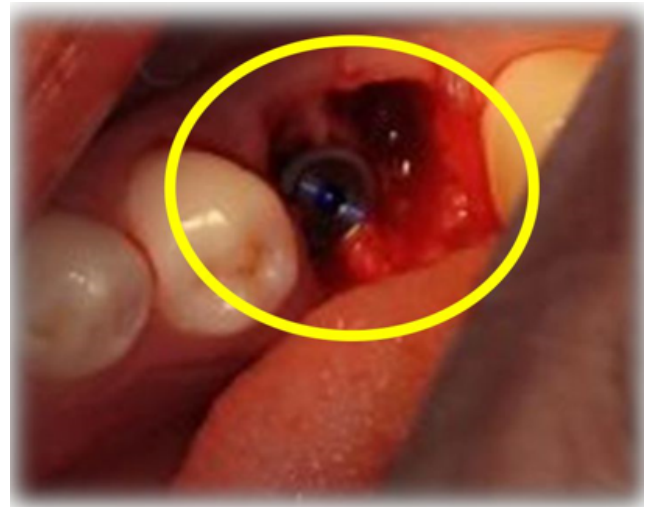
**Fig. 1:** Post de-coronation IOPA, used to note the remaining root complex geometry



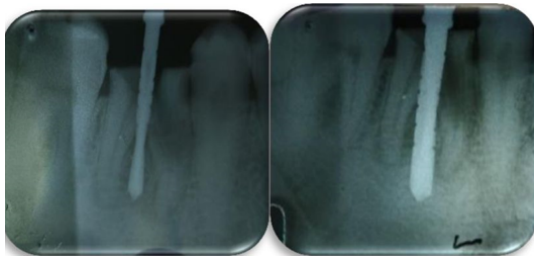
**Fig. 2:** Surgical stent fabrication using remaining root complex orientation and angulation as a guide



**Fig. 3:** Implant bed preparation using surgical stent



**Fig. 6:** Implant placed in interradicular bone septa



**Fig. 4:** Intra-operative IOPA confirming positioning and angulation of osteotomy drills



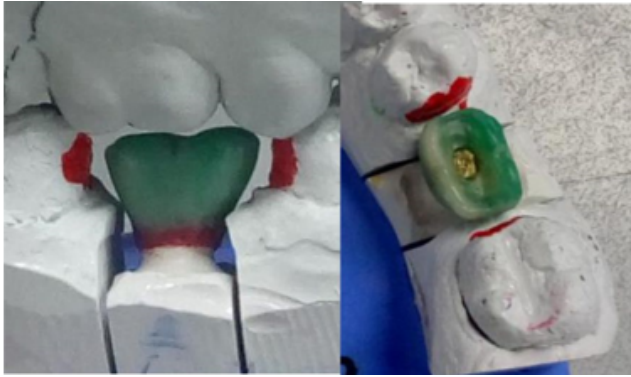
**Fig. 7:** Graft placed and surgical site sutured



**Fig. 5:** Atraumatic extraction of remaining root complex



**Fig. 8:** Abutment placed and provisional crown given for progressive loading



**Fig. 9:** Wax pattern of definitive prosthesis



**Fig. 10:** Final Prosthesis in situ



**Fig. 11:** Post-op intra-oral photograph and OPG

## 2.2. Osteotomy implant placement and rehabilitation

Following local anesthesia, surgical stent as fabricated, was placed at implant site. Subsequently and without any flap elevation, the osteotomies were performed directly through the stent and tooth's initially retained root complex, ie, pre-extraction inter- radicular implant bed preparation (Figure 3). The retained root aspects guided the osteotomy drills and allowed for precise positioning and angulation. The drilling depth was extended beyond the fundus of the socket in compliance with the preoperative radiographic assessment (Figure 4). After completion of the drilling protocol according to the manufacturer's instructions, the remaining root aspects were carefully and atraumatically extracted using a periosteal elevator (Figure 5). The extraction socket was thoroughly curetted, and a cylindrical screw type dental implant (5 × 11 mm; Alpha Bio-Tec) was inserted (Figure 6). With the coronal margin of the implant's endosseous surface placed underneath the ridge of the interradicular bone septum. Adequate insertion torque and sufficient primary stability allowed for a non-submerged healing. Post implant placement extraction socket was filled with graft and site was sutured to approximate wound margins and avoid food impaction (Figure 7). Healing was uneventful. Chlorhexidine rinses were prescribed three times a day for 1 week. The sutures were removed after 1 week. Three months after the surgical intervention, the patient presented with healthy peri-implant tissue conditions, and the prosthetic treatment was started using progressive loading protocol. Initially provisional crown was given for 6 weeks (Figure 8). Thereafter, final impressions were made, and a PFM crown with implant protected occlusion protocol served as the definitive restoration (Figures 9 and 10).

Implants showed successful osseointegration after an uneventful healing period of 5 months (Figure 11).

## 3. Discussion

Dental implant therapy is one of the pioneering treatment modality for replacement of missing teeth. Patients are more satisfied with implant supported prosthetic rehabilitation(s) in terms of comfort, stability and esthetics compared to conventional prosthesis.

The case presented in this article demonstrates a new approach of surgical stent/ template fabrication using existing root complex of multirooted tooth as anatomic guide. The surgical template aids in implant bed preparation during immediate implant placement at multirooted molar sites. With the osteotomy drills stabilized and guided by the retained root complex, this new technique allows for precise positioning and angulation of the implant, in interradicular bone septa of multirooted tooth. The surgical template as fabricated by the aforementioned technique have advantages of being precise, economical

and reduced technique sensitivity vis-à-vis surgical stents made by other techniques,<sup>14</sup> which are based on cone beam computed tomography and computer-assisted three-dimensional implant planning.

Evidence based review<sup>14</sup> shows that, use of a surgical template does not reliably prevent the osteotomy drill from deflecting from the ridge or the surface of existing interradicular bone septa at multirrooted extraction sockets. In this context, pre-extractive interradicular implant bed preparation may not be regarded as an alternative to the use of surgical templates but rather as a possible additional tool to template-guided implant surgery.

Immediate treatment approaches are gaining popularity in implant dentistry. Advancements & innovations in implant design and surface characteristics, have made immediate implant protocol more acceptable alternative vis-a-vis conventional implant rehabilitation treatment. With careful patient selection and accurate clinical procedures, immediate implants gives survival rates that are comparable to those of delayed implants placed in healed sites. With respect to immediate implants at maxillary or mandibular molar sites, Atieh et al<sup>15</sup> evaluated data from 1,013 implants in nine studies and reported implant survival rates ranging from 93.9% to 100% over an observation period of 12 to 133 months, with an overall pooled survival rate estimate of 99.0%. In another recently published review on immediate implants, Lang et al<sup>16</sup> documented comparable high survival rates for posterior implants, with an overall pooled survival rate estimate of 98.9% after 2 years. Beyond survival rates, however, evidence for the success and long-term prognosis of immediate implant placement at molar sites is rather scarce. Nevertheless, besides some patient related (i.e. presence of systemic diseases/co-morbidity) and treatment related aspects, the long-term prognosis and success of any dental implant is directly related to adequate oral hygiene maintenance and continuous/scheduled professional checkups.<sup>17,18</sup> This in turn demands a prosthetic design that provides access to patients for self-care as well as accessible for professional maintenance. Thus, ideal implant positioning is an important aspect of clinical relevance and treatment prognosis.<sup>19,20</sup> The presence of an interradicular bone septa may hamper ideal implant positioning in the case of immediate implant placement at multirrooted molar sites. Pre-extraction osteotomy, where retained root complex serves as an ideal template, may be regarded as a useful tool to counteract this clinical difficulty.

Proper diagnostic procedures plays an important role to establish the presence of any unfavorable conditions that could limit the application of the anatomically guided site preparation technique. The indications and contraindications are determined by position and condition of existing roots and interradicular bone. Few check criteria's to be considered which will promote success

rate and development of a good emergence profile are as under.<sup>21,22</sup>

### 3.1. Indications

1. Absence of active infection or any kind of pathology
2. Integrity of the roots (the body of the roots will guide the drill to the center of the interradicular septum, for that it is important that the roots count with adequate structure)
3. Bone coverage of 2/3 of the root (as at this point, the interradicular septum is wider and easier to engage the medial portion of the extraction socket to place the implant platform at an adequate height)
4. Adequate thickness of Intra-radicular bone

### 3.2. Contraindications

1. Unfavorable position of the tooth or remaining roots
2. Fused roots
3. Root ankylosis

Drilling through the dentin of retained root complex is similar to drilling through tissue slightly harder than dense cortical bone but ultimately is without any specific difficulty. Various techniques like socket shielding technique and implant placement through ankylosed teeth by Davarpanah and Szmukler-Moncler,<sup>23</sup> use drilling through dentin. However in this context, it is recommended to use new drills when pre-extractive interradicular implant bed preparation is to be employed.

Thorough curettage and copious irrigation of site prior to insertion of implant helps in avoiding deleterious reaction caused by drill debris and old endodontic filling material.<sup>12</sup>

Following tooth extraction, particularly extraction of a multirrooted molar tooth, the socket usually presents with dimensions that are considerably larger than the diameter of dental implants. As a consequence, immediate placement of implants into fresh extraction sockets consistently may results in a certain peri-implant marginal defect between the implant and walls of the socket. Therefore, in the literature, a variety of clinical approaches have been advocated to combine immediate implant placement with different regenerative procedures,<sup>24</sup> even though it has been demonstrated that regenerative treatment is not necessary for improved healing or successful osseointegration of immediate implants.<sup>25–27</sup> However, in an animal model, Araújo et al<sup>28</sup> demonstrated that the placement of deproteinized bovine bone mineral in the gap between an implant and the walls of a fresh extraction socket provided additional amounts of hard tissue formation and improved the level of marginal bone-to-implant contact.

Accurate engagement of the intra-septal bone along with atraumatic extraction helps in preserving the integrity of the walls of extraction socket & leads to development of an aesthetic restoration which is placed functionally and

anatomically in right position.

#### 4. Conclusion

The anatomically guided site preparation technique is recommended in cases where immediate implant placement is planned, and the area of the molar extraction socket, specially intra-radicular bone, can be preserved and not be compromised by traumatic extraction of the tooth. The case presented in this article represent a procedure of implant insertion that consists of a progressive preparation of the implant site using surgical stent fabricated using the anatomy and geometry of the root of the multi-radicular teeth to be extracted as a reference and as an aid to engage the inter-radicular septum of the alveolus to place the implants in favorable and proper positions. This approach represents a predictable and very useful tool to perform the implant placement in areas of multi-radicular teeth.

#### 5. Conflict of Interest

The authors declare that there are no conflicts of interest in this paper.

#### 6. Source of Funding

None.

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