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Restoration of Maxillary Anterior Teeth with Immediate Implant Placement into Extraction Sites: A Case Report with One Year Follow-Up

Mohammed M. Albadani[1], Elfatih I. Elamin[2*], Manawar Ahmad[2] and Mohammed M. Al Moaleem[2]

[1]Implant Department, Private Practice, Qassem, Kingdom of Saudi Arabia.
[2]Prosthetic Department, College of Dentistry, Jazan, Kingdom of Saudi Arabia.

Authors' contributions

This work was carried out in collaboration between all authors. Author MMAL wrote the draft of the manuscript. Author EIE managed the literature searches. Author MA designed the figures, managed literature searches and contributed to the correction of the draft. Author MMAM provided the case, the figures and supervised the work. All authors read and approved the final manuscript.

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Case Study

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ABSTRACT

The demand for optimal esthetics has increased with the advent of the implant dentistry. It answers many questions concerning esthetics, like replacement of hopeless teeth in esthetic zone of maxillary arch. Now a days immediate restoration of a single tooth loss by implant supported prosthesis is highly predictable treatment.
This clinical report describes a protocol of an immediate tooth extraction, followed by placement of provisional denture in the prepared socket of maxillary central incisors. Surgical and restorative techniques are prescribed in the text. A review program of 3, 6, and 12 months was followed.

**Corresponding author: E-mail: drmoaleem2014@gmail.com;*

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1. INTRODUCTION

The most common causes for teeth loss are periodontal and endodontic lesions with destruction of the supporting tissues around the affected teeth [1]. The restoration of a single tooth in the anterior maxilla is a challenging task, especially when esthetics is compromised due to periodontically affected tooth [2-3]. For many years, the most commonly used prosthetic option to replace single missing tooth was the fixed partial denture. However, the preparation of the two abutment teeth causes unnecessary hard tissue loss. Subsequently implant supported fixed oral prostheses have been developed as an effective solution for this situation [4-5].

The preliminary data reports about immediate non-functional loading of maxillary anterior implant augmented with freeze–dried cancellous bone grafts with healing period of 6-8 months, has indicateda successful implant integration and stable peri-implant condition [6]. Therefore immediate loading has been used in the clinical routine of implant dentistry because of its high predictability [7].

This clinical case report describes a protocol for treatment of maxillary anterior periodontally compromised teeth lying in the esthetic zone, with immediate implant placement and bone grafting along with insertion of a transitional denture to enhance the healing process of the soft tissue around the implants [8-9].

2. CASE REPORT

A 42 years old Saudi patient was attended to the private dental clinic complaining of dull pain and recurrent discharging abscess related to the maxillary anterior teeth. The patient was non-smoker and medically fit. Introral examination showed a fistula between the maxillary central incisors with pus discharge on pressure (Fig. 1). In addition to that, grades II mobility was detected and 9 mm pocket depth was recorded at the mesial sides of both central incisors. Further clinical examination revealed necrotic teeth with the help of electrical pulp tester. Other than that the oral hygiene can be described as fairly good. The radiographic examination showed radiolucent area in between the maxillary central incisors with vertical bone loss (Fig. 2).

Fig. 1. Pre-operative clinical view of maxillary central incisor teeth

Fig. 2. Pre-operative periapical radiograph shows the bone defect

All clinical, radio-graphical data was analyzed and the treatments modalities were explained to the patient. The patient showed interest in an immediate implant-supported prosthesis type of restoration.

Prior to implant surgery, maxillary and mandibular impressions with alginate dust free impression material were taken. From the poured impression, diagnostic casts were prepared, and mounted in maximum intercuspation occlusion on a semi-adjustable articulator. A rubber base index was taken directly from the maxillary anterior teeth. A maxillary transitional denture was fabricated that can enhance the healing of extraction sockets as well as the esthetic appeal of the patient after extraction.

At the next appointment, local anesthesia was given. A full thickness flap was reflected with No. # 15 blades to preserve the interdental papilla (Fig. 3). Anatraumatic extraction of both the maxillary central incisors was done using the periotome which was inserted into the periodontal ligament space (Fig. 4). The periotome was gradually advanced toward the apex of the tooth. Care was taken to preserve the thin buccal wall of the maxillary incisors. An implant depth gauge was used to ensure the intact buccal bone plates.

Fig. 3. The reflected flap

Fig. 4. The extracted teeth Nos. 11 and 12

After extraction, curettage was done to ensure total debridement of infra bony pocket. The osteotomy started with 2 mm pilot drill which was placed into the socket with 13 mm implant length. The implant drill was extended up to 2-3 mm in the socket beyond the apex of the extracted teeth. Drilling was performed under copious amount of saline irrigation. An implant fixture of 3.75 x 13 mm (TIXOS CYLINDRCAL, Advanced Laser Technology, Italy) were placed in the extracted sites. One gram of bovine bone grafts (Cancellous and Cortical Granules, Natural Bone Mineral Matrix Deprotinized Bovine Bone, ACE-USA) was packed after the implant placement. A thin resorbable membrane (RCM, Resorbable Collagen Membrane, ACE-NUOSS, USA) was packed over the defected place to protect the bone graft (Fig. 5). Prei-apical radiograph was taken to check the position of immediate implants in relation to the extraction sites (Fig. 6). Furthermore, primary implant stability of 35 Nm torque was confirmed prior to the immediate provisionalization procedure. The flap was sutured in place in vertical mattress technique. The patient was prescribed 1 g of Amoxicillin/Clavulanate Potassium (Augmentin; GlaxoSmithKline) per day for 6 days and the non-steroidal analgesic Nimesulide (Mesulid®, Boehringer – Ingelheim, Germany) 100 mg, twice a day for 6 days. Chlorhexidine mouthwash 0.20% (INTERMED CHLORHEXIL, Greece) was prescribed as mouth rinse, three times a day for 2 weeks. After 48 hours a highly polished transitional denture was delivered to replace the extracted teeth as a temporary prosthesis.

Fig. 5. View of the seating surfaces of the implants

The protocol of immediate implant placement in the esthetic zone described by Assiry [10] and Konstantinous et al. [11], was used in the treatment of this case.

The patient was recalled after three months for the second stage surgery. The cover screws were removed and the gingival formers were placed for three weeks (Fig. 7). Customized metal temporary abutments were prepared extra-orally and hand tightened onto the implant. The provisional crowns (Success SD, PROMEDICA NEUMUNSTER, Germany) were

made using rubber index taken before and cemented with temporary cement (Temp-Bond^{NT}, Italy). It was made sure that the customized temporary abutments and its corresponding provisional restorations captured the cervical gingival emergence of the extracted tooth.

Fig. 6. A periapical radiograph for implants

Fig. 7. View after removal of gingival former

Three weeks later, the provisional restorations were removed and impression copings were screwed onto the top of the implant. Light polymerizing resin material (Liquidam, Discus Dental, Culver City, CA) was injected around the impression copings preventing the soft tissues from collapsing onto the impression copings. The final implant level impression was taken by open tray technique for the maxillary arch using plastic stock tray with addition silicon (Virtual Ivoclar Vivadent, Lichtenstein).

The maxillary master cast was poured with type IV dental stone (BEGO/ Germany) and mounted in maximal inter-cuspal position with the mandibular cast on a semi-adjustable articulator. Two individual metal ceramic crowns were fabricated in the laboratory (Fig. 8), using ceramic build–up (VMK 95, Vita, Germany) and shade guide selection (2M2 - 3D master) were followed as per the manufacturer's instruction. The crowns were tried-in, and the occlusion was adjusted in the centric and excentric mandibular positions. Finally the glazed porcelain fused to metal crowns (Fig. 8) were cemented with temporary cement. After 1 month, the crowns were permanently cemented using polycarboxylate cement (Prime-Dent Mfg. Inc. Chicago, IL, USA) following the manufacturer instructions (Figs. 9, 10).

Fig. 8. Porcelain fused to metal crowns on master cast

Fig. 9. Post-operative clinical view with cemented crowns

Fig. 10. Post-operative radiographic vies with cemented crowns

The patient was seen after 3, 6 and 12 months. The soft tissues around the implant supported restorations showed good tissue appearance with absence of inflammation or gingival recession (Figs. 11 and 12). The interdental papillae looked normal enhancing the optimal esthetic result obtained by the definitive porcelain fused to metal crowns.Patient's oral hygiene was enhanced using standard oral hygiene instructions during his follow-up appointments.

Fig. 11. Clinical view after 12 months

Fig. 12. Radiographic view after 12 months

3. DISCUSSION

Dental implant therapy is one of the pioneer treatment modality for the replacement of missing teeth. Patients are more satisfied with implant supported prosthetic rehabilitation in terms of comfort, stability and esthetics compared to conventional prosthesis [12].

In the present case, implants were successfully osseointegrated with no signs of pain or discomfort and no periapical radiolucency at the end of the 12 months. The plaque control was optimum. The gingival status was good throughout, there being no signs of gingival inflammation. This demonstrates that if proper care is taken following implant placement in a healthy patient, peri- implantitis is preventable [13]. High success rate and satisfactory esthetic results were achieved in our case similar to that obtained by Konstantinous et al. [11]. Therefore if pre-surgical evaluation has been satisfactory, and the concerned tooth has been extracted without traumatizing the soft or hard tissues, implant placement result in this situation will be successful. A good primary stability was achieved in this case, mainly due to the fact that implants were placed 3 to 4 mm apical to the base of the socket.

Frequently, when implants are placed into the extraction socket, a partial in congruency between the outer surface of the implant and the bony walls of the socket is often seen. This space is known as jumping distance or critical

space. Use of wider implant with use of bone graft material helped in obliterating the jumping distance [14]. None of our present implant showed any mobility at the end of 12 months, which indicated a good osseointegration confirmed by radiographs (Fig. 12). The width of keratinized gingival level of mucogingival junction and distance between mesial and distal papillae were all constant, indicating an adequate periodontal condition around the implants [15]. Repeated complains of periodontal fistula was corrected using the surface treated implants. Good healing of the soft tissue was achieved using transitional denture after implant placement. With excellent patient oral hygiene maintenance, good interdental papilla was achieved in follow up visits.

Using this technique, an implant can be osseointegrated and loaded using a provisional structure such that its function is restored immediately after the surgical procedure. In addition to the comfort and esthetics, there are psychological and functional advantages. Moreover, the adjacent gingival papillae are preserved. Although it is a very short period of follow up, it emanates that an immediate implant placement following tooth extraction is a viable treatment approach.

4. CONCLUSION

Replacements of the hopeless maxillary anterior teeth by an immediate implant supported prosthesis and bone graft is now a routine procedure in dental office. However, when a suitable protocol is followed, esthetically and functionally acceptable results can be obtained.

CONSENT

All authors declare that 'written informed consent was obtained from the patient for publication of this case report and accompanying images.

ETHICAL APPROVAL

Not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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