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CASE STUDY

IMMEDIATE IMPLANT PLACEMENT AND LOADING IN THE ANTERIOR AESTHETIC ZONE

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ABSTRACT

65 yrs old male patient presented with a fractured upper left central incisor. Intraoral examination and cbct reviled, thin gingival biotype and thin buccal bone plate respectively. Immediately following extraction, implant was place and loaded immediately using buccal shell technique; guided bone regeneration and connective tissue grafting were done simultaneously. After 4 months of healing the screw retained provisional helped us achieve a emergence profile similar to as that of the adjacent teeth. Impression were made to replicate the emergence profile and transfer to a customized abutment which was screw retained onto the implant. Final cemented prosthesis was a zirconium crown layer with lithium disilicate. PES/WES score of the case was recorded at the time of delivery of the final prosthesis and again recorded at 1 year follow up. Mild improvement in the score was recorded.

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INTRODUCTION

The imminent loss of a single tooth in the esthetic zone in a patient with an otherwise healthy periodontium can be a stressful experience. (Kan and Rungcharassaeng, 2010) The development of foreseeable and novel implant therapies for optimal esthetic outcomes requires a thorough understanding of the underlying biological processes of bone and soft tissue healing following tooth extraction. (Berglundh and Giannobile, 2013) Attaining pleasing esthetics in the anterior maxilla involves many clinical parameters but is principally related to the peri-implant mucosal architecture in comparison with the contra-lateral natural tooth. (Cooper, 2008) The integrity of the hard and soft tissue dimensions is vulnerable to physiological and structural changes following tooth loss. (Araujo *et al.,* 2015) Horizontal and vertical bone change surrounding the extraction socket may create papilla loss, labial tissue recession, and poor unstable gingival foundations for an esthetic final restoration. Although single-implant tooth replacements have been documented with success, traditional guidelines have suggested that 2 to 3 months of alveolar ridge remodeling following tooth removal and an additional 6 months of load-free healing are needed for implant osseointegration. This extended treatment period and the need for a removable prosthesis during the healing phase may be inconvenient to certain patients. (Albrektsson *et al.,* 1981) If a harmonious gingival form exists around the tooth proposed for extraction, immediate implant placement and provisionalization may effectively preserve the vertical height of the interdental papilla. (Kan *et al.,* 2003) Immediate implant placement may be defined as implant placement immediately following tooth extraction and as part of the same surgical procedure or as implant placement immediately following extraction of a tooth which must be combined in most patients with a bone-grafting technique to eliminate peri-implant bone defects. This technique has a number of proposed advantages such as preservation of bone and soft tissue, decreased total treatment time, reduced number of surgical procedures, reduced overall cost, and betterpatient acceptance. (Glossary of Oraland Maxillofacial Implants, 2007; Chen *et al*., 2004)

The literature search for the 4th ITI Consensus Conference 2008 in Stuttgart, Germany concluded that bone augmentation procedures are effective in promoting bone fill and defect resolution at implants in post-extraction sites, and that these procedures are more successfulcfor immediate and early implant placement when compared with late implant placement. The majority of studies reported survival rates above 95%. (Belser *et al.,* 2009; Furhauser *et al.,* 2005) A critical factor in determining the success of implant supported restorations in the anterior maxilla is the esthetics of the crown and surrounding soft tissues. New indices such as the Pink Esthetic Score (PES) and the White Esthetic Score (WES) provide practitioners and researchers a new method to objectively evaluate esthetics. However, patients often perceive esthetics differently than dental professionals. Therefore, the esthetic outcomes perceived by the dental professionals and the patients and their correlation need to be taken into

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consideration. Furhauser and colleagues (Furhauser *et al.,* 2005) developed the 7 criteria Pink Esthetic Score (PES) to objectively evaluate the peri-implant soft tissue (Figure 1). The PES was shown to have a good intraexaminer agreement. (Gehrke *et al.,* 2008) Belser and colleagues developed the White Esthetic Score (WES) to objectively evaluate implant supported restorations based on 5 criteria. The authors combined a simplified 5 criteria PES with the WES to evaluate anterior implant supported restorations. (Belser *et al.,* 2009) An arbitrary score of 6 was set to represent the minimum WES required for clinical acceptance and a minimum PES was set at 8. (Cosyn *et al.,* 2010) There seems to be emerging evidence supporting the reproducibility of the PES and correlation with patient satisfaction but similar evidence for the WES is scarce. (Lai *et al.,* 2008) This case report describes a step wise planning and execution of immediate implant and immediate loading for a fractured tooth in aesthetic zone.

Case report

65 year old male patient was referred to department of prosthodontics with history of fracture maxillary anterior tooth (Fig.1). The patient did not have any medical conditions and was not taking any medications that were associated with a compromised healing response. Patient did give a positive history for smoking but less than 10 cigarette's per day. The SAC (straightforward, advanced and complex) assesment tool was used for diagnosis and treatment planning of this case. Surgical assessment of this case revealed this case to be classified as a complex case. The modifiers added for diagnosis were, patients high expectation, low smile line, thin gingival biotype, immediate loading, mild smoker, history of trauma. Furthermore on radiographic evaluation, IOPA revealed endodontic obturation filling present in apical third and post space prepared in rest of the canal. CBCT (fig 2) investigation revealed very thin buccal plate to be present. After overall assessment of the case, immediate placement and loading protocol with simultaneous hard and soft tissue grafting was planned to achieve the desired results.

MATERIALS AND METHODS

Following local anaesthesia, papilla preserving incision was planned with the two vertical incision extending beyond the mucogingival junction along with horizontal incision extending laterally in order to give more flexibility to the flap for easy closure. The fractured tooth 21 was extracted atraumatically with the help of luxators (Fig. 3). The integrity of socket wall was evaluated for any fenestration or defects. The length of the extracted tooth was measured to give a rough idea of the depth of the socket (Fig. 4). A hard vacuum pressed surgical stent (Fig. 5) was used to guide a prosthetically driven implant placement. Lancelet drill attached to a drill extender was used to get a purchase point by engaging the palatal wall of the socket. The final neck position of the implant was planned to be 3 mm below the CEJ (Fig. 6) of the adjacent teeth. Osteotomy was enlarged to accommodate 3.75 mm in width and 11.5 mm in length SPI implant (Alpha Bio)(Fig. 7), with final torque of 45 Ncm. Temporization procedure was planned using buccal shell technique, a prefabricated poly-carboxylate crown of the fitting dimension was chosen and the lingual part shrugged off only keeping the buccal shell intact (Fig. 8). A temporary titanium abutment was screwed onto the implant and the buccal shell adjusted, the remaining space was filled up with Paracore, core build up material (Coltene). Remaining space was filled with paracore and it was shaped and polished with soflex disk (3M), to encourage proper soft tissue architecture to develop around it (Fig 9). The circular profile of the gingival former differ from the rather triangular profile of the cervical portion of the tooth to be reconstructed. Hence, adjustment in shape was done to achieve a natural, aesthetic soft tissue profile. The temporary abutment with the provisional crown was attached to the implant and hard and soft tissue grafting was performed. The buccal dehiscence, defect was filled with synthetic bone graft material (nova bone putty) covered by collagen membrane (periocol-GTR) (Fig. 10). Connective tissue harvested for the palate was placed over the collagen membrane (Fig. 11) for contour augmentation and the site was sutured using interrupted sutures (Fig. 12). After 4 months' time period intraoral radiograph and CBCT was performed (Fig. 13 and 14) to evaluate the integrity of the implant and the condition of the grafted bone material. After satisfactory healing of the hard and soft tissue and achieving the desired emergence profile and final prosthesis was fabricated. A so-called individual impression of the provisional restoration was made in order to transfer the emergence profile that was developed, so as to help the technician understand better of the clinical situation. The provisional crown was removed from the mouth and open tray impression post was placed in the lab analogue (Fig.15) and this assemble was inserted into a putty of addition silicon. The space surrounding the impression post was filled with flowable composite to replicate the emergence profile of the soft tissue. The final impression in the mouth was made using this customized impression post (Fig.16), and master cast fabricated. A custom abutment was fabricated replicating the emergence profile and impression for the final prosthesis was made after gingival retraction with a 00 cord (ultradent). Final prosthesis (Fig.17) was made in zirconia layered with litium disilicate to achieve the highest aesthetic results possible. The final crown was cemented using resin modified glass ionomer cement (U 100, 3M).

Fig.1. Pre operative

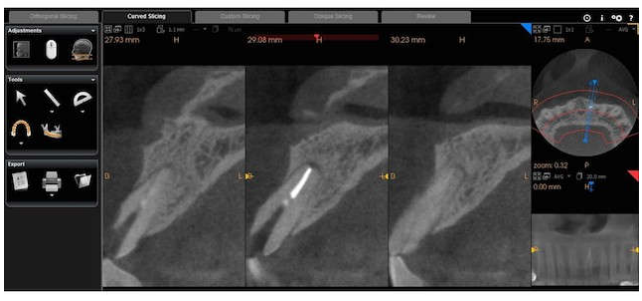

Fig.2. CBCT investigation

Fig.3. Atraumatic extraction

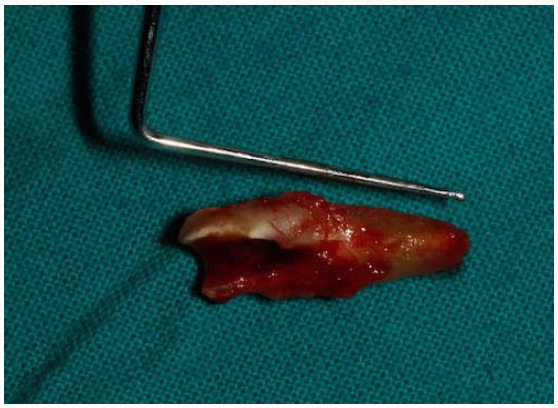

Fig.4. Length of extracted tooth measured

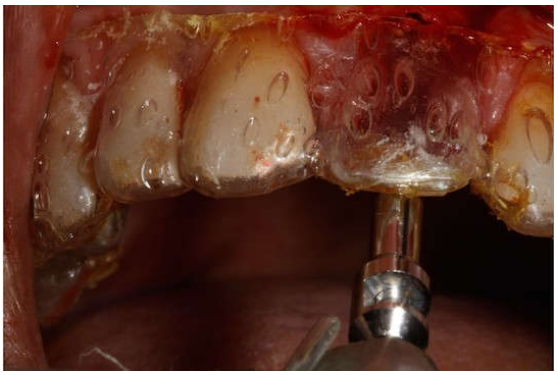

Fig.5. Pilot drill with surgical stent

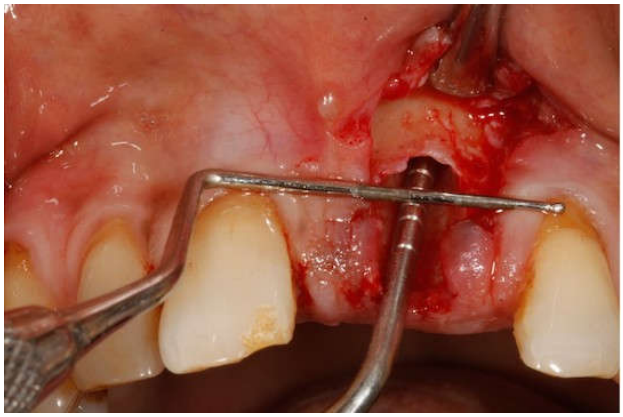

Fig.6. Implant placed 3mm below the CEJ

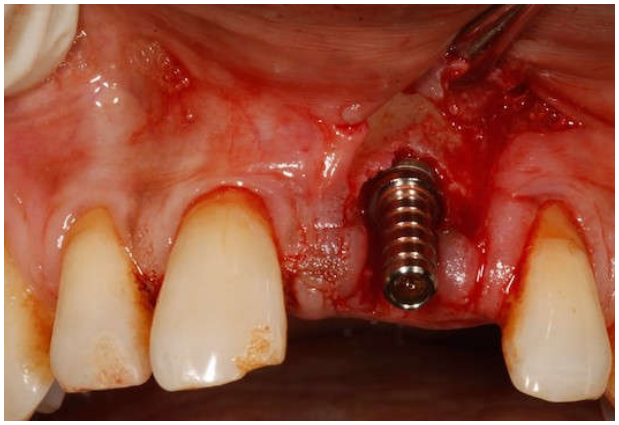

Fig.7. Placement of implant and temporary abutment

Fig.8. Buccal shell of poly-carboxylate crown

Fig.9. Temporary crown to encourage proper soft tissue architecture to develop around it

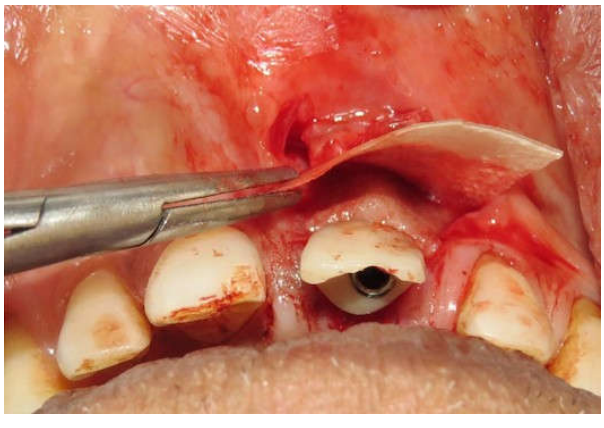

Fig.10. Bone graft material covered by collagen membrane

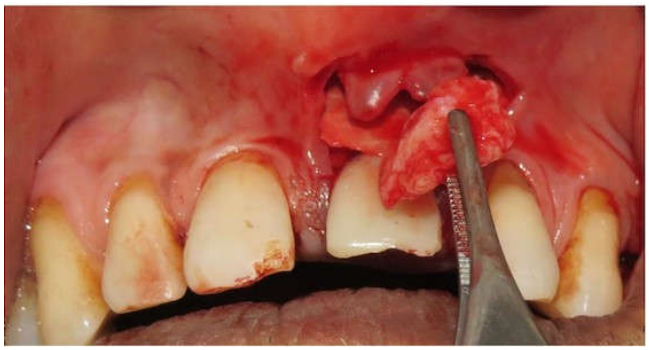

Fig.11. Connective tissue graft

Fig.12. Sutures placed

Fig.13. After 4 months

Fig.14. CBCT scan after 4 months

Fig.15. Assembly inserted into putty

Fig.16. Final impression with customized impression post

Fig.17. Final prosthesis

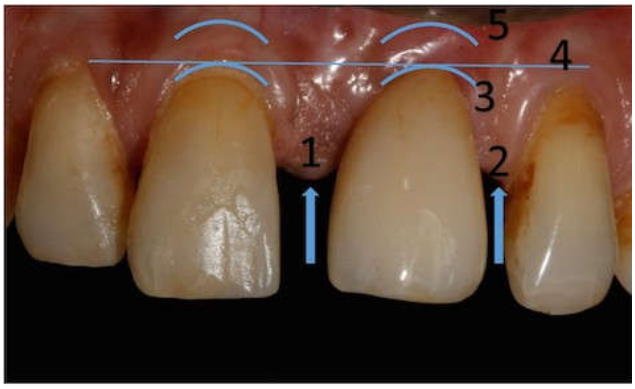

Fig.18. After 1 year follow up

Fig.19. PES and WES

Fig.20. PES and WES after a year

Table 1. Pink and White esthetic Score

Pink Esthetic score (PES)		
Parameter	Finished case	1 yr follow up
1.Mesial papilla	2	2
2.Distal papilla	2	2
3.Curvature of facial mucosa	1	1
4.Level of facial mucosa	2	2
5.Root convexity/ soft tissue colour and texture	1	2
Maximum score	8	9
White Esthetic Score (WES)		
6.Tooth form	2	2
7.Tooth volume/outline	1	1
8.Colour	1	1
9.Surface texture	2	2
10.Translucency/ characterization	2	2
Maximum score	8	8

DISCUSSION

In cases of anterior failing teeth, sites with a thin or damaged facial bone wall, when the local bone anatomy allows a correct 3D implant position and good primary stability, immediate implant placement is most frequently used technique. There seems to be a correlation between facial bone wall phenotype and soft tissue biotype. (Lai *et al*., 2008) However, the facial soft tissue thickness in the anterior maxilla is generally thin (Cook *et al*., 2011), 16 and the majority of maxillary anterior teeth should be anticipated to have a thin soft tissue biotype. In addition to these factors, the facial bone wall is often not intact and has been damaged by pathological processes associated with vertical root fractures and endodontic complications. Hence contour augmentation with autogenous bone along with low substitution rate bone substitutes helps in reducing the post-surgical bone resorption. A connective tissue graft helps improve the tissue biotype and also increase the amount of keratinization. 3-D correct implant positioning is the key to overall predictable aesthetic outcome. Implant should be 1.5 mm away from adjacent natural teeth, the implant neck of a bone level implant without a polished collar should be at least placed 3-4mm below the CEJ of the adjacent teeth. This allows in forming a transitional mucosa which will help creating a natural emergence profile of the prosthesis. Primary stability is achieved by placing the implant mainly engaging the palatal bone and at least 3mm apical to the socket depth.

To optimise aesthetic outcome, the use of provisional restoration with adequate emergence profile is recommended to guide and shape the peri-implant tissue before definitive restoration. In addition the provisional prosthesis helps in diagnosis of the type of future definitive restoration. Maturation and stabilization of the soft tissue around the provisional restoration requires a minimum of three to 12 months of time (Grunders, 2000; Small and Tarrnow, 2000; Oates and coworker, 2002). In most aesthetic cases, implant shoulder are located subgingival, resulting in deep interproximal margins. This shoulder location makes seating of the crown and cleaning of excess cement difficult. Hence a screw retained abutment- restoration interface is advisable to solve this problem. A mesostructure, i.e., a customised individual abutment, was prepared according to the soft tissue profile. Such an abutment not only serves to condition the transitional mucosa but also allows the crown margins to be placed as closed to the marginal gingiva as possible, so as to remove the excess cement as effectively as possible. One year follow up of the case shows stable results of the prosthesis and hard and soft tissue (Fig.18). There was no pain on percussion, no bleeding on probing, absence of any soft tissue inflammation, no mobility and absence of any radiolucency. Aesthetic evaluation of the case after completion and after 1 year follow up was carried out using the PES/WES scoring system. The results (Table 1) showed that the PES (Fig.19, 20) increased after a year follow up with more maturity of soft tissue around the implant. The WES remained the same. Both the PES/WES scores were above average and the case had an aesthetically acceptable result.

Conclusion

Majority of the failures of implants in aesthetic zone occur when the factors discussed above are not taken into consideration. Along with iatrogenic factors like faulty implant positioning there are anatomical limiting factors of hard and soft tissue which poise a challenge in achieving predictable aesthetic results. Hence developing a standardized protocol and following it meticulously helps in achieving the desired outcome with predictability.

Clinical significance

The key to a successful outcome of an implant case in an aesthetic zone depends on various surgical factors and prosthetic factors like planning and execution, patient selection, type of implant selection, 3D positioning, soft-tissue stability, use of provisional restoration & location of prosthetic

shoulder. If this factors are taken into account, we can expect a similar outcome in every case.

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