

Single Implant in the Esthetic Zone: Protocols & Pitfalls

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INTRODUCTION

Implant dentistry has evolved in the past several decades with protocols established in almost all aspects of surgical and restorative management. Based on the time at which the implant is placed after extraction of the offending tooth, the ITII consensus report classified the placement protocols as follows:

1. Immediate placement (T1)
2. Early placement with soft tissue healing (T2, 6-8 weeks)
3. Early placement with partial bone healing (T3, 8-12 weeks)
4. Late placement (T4, >12 weeks)

T1 protocol involves immediate placement of implant in extraction socket and has been a matter of discussion in literature for several years. The shortened treatment time and the immediate gratification that this protocol can offer to the patients is its greatest advantage. The myth surrounding the immediate placement protocol is that placing implants in extraction socket will help prevent the loss of bundle bone on the crest of the labial cortical plate. However literature has shown, beyond doubt, that the bundle bone is lost and reorganizes itself, on an average by 1mm apical to its original position, irrespective of whether implant is placed in extraction socket or not. This loss of bundle bone leads to mucosal recession which became clinically evident in certain cases.

In cases where labial cortex has dehiscence or fenestration defects, using bone substitutes to graft the area simultaneously with implant placement became a challenge as it is difficult to achieve primary closure to protect the biomaterial without moving the muco-gingival junction. This led to the concept of early placement of implants, 6-8 weeks after the extraction of the offending tooth (T2 protocol).

The greatest advantage of the T2 protocol is that, in 6-8 week time, the resorption of bundle bone takes place at the crest of the labial cortex, thus allowing the operator an ability to alter the apico-coronal position of implant placement based on a more stable crestal bone level. This protocol also allows the clinician to have additional soft tissue to enable primary closure, in case use of biomaterials becomes necessary. This article describes a case with T1 protocol and enlists the clinical steps and pitfalls of the same.

CLINICAL CASE ASSESSMENT

Before finalizing on the decision of doing immediate extraction and placement in the esthetic zone these parameters need to be assessed.



FIG 1: Pre-operative smile



FIG 2: Pre-operative retracted frontal view



FIG 3: Pre-operative view of involved 21



FIG 4: Pre-operative radiograph of 21 showing internal resorption



FIG 5: Measuring interproximal height of bone



FIG 6: Socket after extraction of 21



FIG 7: The offending tooth

A. Free Gingival Margin Level of involved tooth

The more coronal the free gingival margin of the affected tooth as compared to adjacent teeth the better the chance of getting a good esthetic result. In such cases slight mucosal recession will not affect the esthetic outcome of the case adversely as we start off with excess tissue

B. Tooth Shape

Rectangular/Square teeth forms are

better replaced with immediate extraction protocols. A triangular tooth means the interdental soft tissue peak may be lost due to trauma from extraction and prosthetic procedures. This may lead to a dark triangle in the end result that will need exacting prosthetic protocols to be employed to salvage the situation.

C. Gingival Biotype

A thin biotype is more prone to mucosal recession as compared to a thicker one.

D. Scallop of Gingival Margin

A high scalloped gingival architecture is more prone to recession as the thin bone that accompanies the high scallop may be too fragile to hold on to its position. Once the extraction is done it may migrate apically and stabilize at that level.

E. Interproximal Height of bone

A greater than 5mm probing depth to bone in preoperative assessment means that the interproximal bone is already deficient. The prognostic value of this bone sounding is evident as in such cases on high bone crest situ-



FIG 8: Pilot drill in correct mesio-distal position



FIG 9: Final drill depicting correct bucco lingual position



FIG 10: Implant in correct 3 dimensional position in the socket



FIG 11: Extracted crown of tooth used to make a provisional



FIG 12: Provisional restoration



FIG 13: Provisional cemented at the day of surgery



FIG 14: Appearance of area at 4 months



FIG 15: Shade matching with final abutment *in situ*



FIG 16: Final characterized Lithium Disilicate restoration



FIG 17: Post-operative smile



FIG 18: Post-operative retracted view



FIG 19: Post-operative close-up view

ation the tendency to loose interproximal soft tissue is higher.

F. Upper Lip Line

In cases where the patients upper lip is long the chances of success with esthetic immediate implant placement are better as the crucial periodontal infrastructure will not be readily visible when patient smiles. This allows clinician to get away with minor post-operative mucosal recession in the short term. The higher the lip line, the more challenging the case becomes.

When all these six factors are favourable the chances of a successful esthetic outcome with immediate extraction and placement protocols are greater.

T1 Protocol: Immediate Extraction and Implant Placement

The patient (Figures 1, 2, 3) with offending 21 was found to have a draining sinus in the buccal tissue. Radiographic examination revealed internal resorption accompanying that tooth (Figure 4). After

doing the preoperative analysis we finalized the use of immediate extraction and implant placement protocol as the patient presented with few clinical factors in her favour. The single most important one being that her lip line was low and did not show the gingival interface while smiling. The Interproximal height of bone also was within normal limits (Figure 5). The biotype and scallop of gingival tissue was medium and the tooth form was not sharp triangular and achieving a good end result seemed to have a good prognosis. The draining sinus was taken care of with pre - operative antibiotics.

In cases of immediate placement after extraction in this region we need to have a plan for immediate provisionalization. A fibre reinforced bridge that is retained on palatal surfaces of adjacent teeth and made directly in the mouth can be used as a provisional. Alternatively a temporary abutment on the implant can be used to make a screw retained provisional using a putty matrix generated

from the preoperative casts. The extraction has to be as gentle as technically possible. Once the tooth is out, the socket is cleaned well and the integrity of the buccal cortex is assessed. If it's intact immediate placement may be considered.

In cases where the buccal cortex has a dehiscence or any other large defect it is prudent to defer placement of implant by 6-8 weeks. Such defects need to be grafted with bone substitutes and collagen membrane usage is mandatory. For guided bone regeneration around implants to succeed it's important to get a primary closure of soft tissue. However, on the day of extraction getting primary closure on the socket is technically challenging and the wound may gape open leading to failure of the graft. At 8 weeks the soft tissue closure becomes a non-issue and predictable GBR with simultaneous implant placement may be easily carried out.

Once the extraction was done (Figures 6, 7) and the socket walls on buccal aspect



FIG 20: Post-operative view depicting perfect emergence and excellent tissue health



FIG 21: Post-operative radiograph



FIG 22: Some cases with T1 protocol may show a CBCT image with thin buccal plate lost after few years

found to be intact the osteotomy is begun on the palatal wall with the pilot drill, such that at the end of drilling protocol we do not touch the buccal wall at all with drills. The diameter and mesio-distal position of the implant in this region should be chosen such that at least 2mm bone is left on both sides between implant and the adjacent tooth. Apico-coronally the implant platform must be 2mm deeper than the CEJ of the adjacent teeth. When done with the placement the screw access hole should be ideally accessible from the cingulum/incisal edge of the proposed final crown. These principles are universally applicable to all implant placement protocols in anterior maxilla1 (**Figures 8, 9, 10**).

Using an implant with a platform shift concept will allow additional soft tissue volume based on clinical experience although this concept is not universally validated in scientifically published literature. In this young patient we chose to use an implant with this concept. Our choice of provisionalization in this case was to use the final zirconia abutment torqued onto the implant at 35Ncm. We then chose to use the existing crown of the extracted tooth as cement retained provisional after relining it with flow able composite chair side (**Figures 11, 12, 13**). The provisional is kept out of centric as well as eccentric contacts to prevent any loading through micro motion of the implant.

At the prosthetic phase after four months (**Figure 14**) we did not remove the final zirconia abutment as an "one abutment-one time" concept on implants in the esthetic zone has shown to produce better tissue response as compared to repeated removal and re-engaging of the abutment on the implant which could lead to tearing of the delicate epithelial attachment on the implant leading to mucosal recession.

The final impressions are made after packing a dry cord gently (**Figure 15**) around the zirconia abutment and taking an impression the way we would do for crown and bridge. The final crown was made in lithium disilicate that was layered with low fusing ceramic and characterized to match the adjacent tooth perfectly (**Figure 16**). The crown was cemented with dual cure resin cement. The final result showed excellent healing of the soft tissues around the implant and a correct emergence profile for 21 (**Figures 17-19**). The post-operative radiograph revealed a well-integrated restoration and implant (**Figure 21**).

DISCUSSION

The greatest advantage of T1 protocol is that only one surgical procedure is needed and the overall treatment time is reduced. The patient's love this and even the clinicians get enticed as it allows them to get in faster with the implant placement. There is no doubt that in certain cases this protocol renders excellent short term results especially if all the six factors mentioned above a favourable. However caution has to be exercised by clinicians as there are several pitfalls of T1 protocol. The pitfalls of T1 protocol may be listed as follows1:

1. Socket Morphology may lead to compromised position and poor primary stability of implant
2. Grafting around implants placed in socket may be difficult as primary closure is tougher to achieve
3. Increased risk of mucosal recession especially in thinner biotypes
4. Adjunct soft tissue surgeries such as a connective tissue graft may be necessary for a successful esthetic outcome.
5. Thin facial bone, though intact at the time of implant placement may resorb leading to peri-implant and esthetic problems in the long term that are increasingly difficult to manage. Figure 22 illustrates the CBCT of a case of implant placed using T1 protocol where the buccal bone defect has engulfed close to 60% of the facial surface at 3 years leading to a potentially disastrous clinical implications for the patient as well as the clinicians.

TECHNICAL CONSIDERATIONS

Shade communication is crucial in single restorations such as these. It is not only the hue and chroma that matter in the final result. In our opinion it is the perfect shaping, texture and the matching of the Value that makes or breaks such cases.

The color of the zirconium abutment substrate helps in achieving a good value.

Added advantage of using a Zr abutment is that we could keep the margins minimally subgingival and this helps in providing a beautiful integration with the surrounding periodontal architecture.

As the underlying color to be masked was not too dark, we used Emax LT (Low Translucency) ingot for the final crown. The correct 3D placement of the implant left the ceramists with enough room for layering the Emax core.

After pressing the core a bisque bake trial

is carried out to perfect the shape and occlusion. Only after the final contours are finalized a minimal cut back of the core is done to be layered with veneering material. A detailed drawing to get all the characteristics of the adjacent central helped at this stage.

Using micro layering techniques with thin layer of T1/T2 Enamel shades of Emax Ceram, the various effects mimicking the white hypocalcification lines and other internal effects were finalized. Considerable time is spent in getting the reflections on the restorations to match the reflections on adjacent central. Having the patient present in the lab during final staining is crucial to achieve a good esthetic end result.

CONCLUSION

T1 protocol advocates immediate placement of the implant in the extraction socket. In the anterior maxilla this can be a successful treatment modality provided case selection is judiciously carried out in hands of a skilled and experienced clinician. When factors are not conducive to immediate extraction and placement it is prudent to defer the implant placement by 6-8 weeks and follow an early or delayed placement protocol.

REFERENCES

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