

Updated 10 keys checklist for immediate implant placement at maxillary central incisor sites

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Immediate Implant Placement (IIP) following tooth extraction is an attractive treatment modality, given its shortened treatment time and reduced surgical trauma. IIP in the esthetic zone has been widely considered a complex procedure that demands not only clinician experience, but also knowledge of the site anatomy, along with surgical training and use of an evidence-based checklist.

10 Keys Checklist

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|--------------------|---|--|
| treatment planning | 1 Esthetic risk assessment | <ul style="list-style-type: none"> Smile line Gingival phenotype Patient's expectations |
| | 2 CBCT analysis | <p>Virtual surgical and restorative driven treatment planning</p> <p>CONSIDER:</p> <ul style="list-style-type: none"> Intact buccal bone wall, the thicker the better (>1mm if possible) Alveolar process at least 8-mm wide The position of the alveolar socket in relation to the bone envelope - inside/outside Selection of an appropriately sized and positioned implant to allow for a buccal gap >2mm |
| | 3 Minimally traumatic tooth extraction | <p>Without flap reflection (if possible)</p> <ul style="list-style-type: none"> Followed by evaluation of the buccal and palatal plate status post extraction If there is any buccal height loss, other treatment options should be considered |
| surgical | 4 3D implant placement | <ul style="list-style-type: none"> Good available bone Positioned along the palatal wall |
| | 5 Use of a narrow or regular diameter implant | <ul style="list-style-type: none"> Good primary stability Buccal gap >2mm |
| | 6 Bone grafting of the buccal gap with a low-substitution bone material | |
| | 7 Buccal soft tissue grafting using a connective tissue graft (CTG) or a volume-stable collagen matrix | |
| prosthetic | 8 Immediate or delayed contour management of the emergence profile | <p>Using a customized healing abutment or temporary crown</p> |
| | 9 Use of a custom impression coping technique | <p>To duplicate the created transition zone.</p> |
| | 10 Screw-retained final restoration | <p>(when possible)</p> |

Fig 1. 10 keys for successful IIP at maxillary central incisors.

Renouard et al. (2017) addressed the role of human factors as the root causes of many complications/failures in dental implant practice. As in the aviation field, checklists should be seen as one of the safety nets for preventing undesirable consequences.

Taking into consideration the challenges of IIP at esthetic sites, Levine et al. (2017) proposed a checklist that included 10 keys to help clinicians achieve predictable outcomes (Fig. 1). The list has two treatment planning, five surgical and three prosthetic keys. To achieve optimal esthetic outcomes, all 10 keys must be followed in sequential order. If one of the planning or surgical keys cannot be completed, immediate implant placement should be aborted.

Site selection

The first step is to thoroughly get to know the patient in order to put them at ease and establish a rapport. The site to be treated should be evaluated both clinically and radiographically (CBCT). Patient smile line and expectations should be assessed as part of an Esthetic Risk Assessment (ERA).

The anatomy of the surgical site obtained from the CBCT reconstruction is of pivotal importance, as it determines whether the alveolar process/basal bone dimension is adequate to house an implant and to provide primary stability. If the CBCT evaluation reveals that the site anatomy is inadequate, IIP is contraindicated. To avoid esthetic complications, the recommendation then would be for either early implant placement with GBR or ridge augmentation six-to-eight weeks later.

A recent study by our team described anatomical predictors for successful IIP along with ridge preservation. Twenty-five implants were placed at maxillary central incisor sites and compared to the undisturbed contralateral sites. All implant sites underwent the same intervention: tooth extraction, IIP and socket grafting with Anorganic Bovine Bone (ABB).

The findings of the study demonstrated that after approximately five years in function, the alveolar ridge dimension was preserved 30-100% when compared to the corresponding untreated sites. Some sites were better preserved than others. Statistical models were used in an effort to explain the variability.

It was observed that the thicker the buccal bone 3mm from the crest, and the wider the alveolar process at the same level, the better the ridge preservation. Furthermore, socket

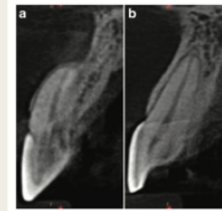


Fig 2. CBCT reconstructions illustrating two different case scenarios for IIP: a. Alveolar process <8mm in width, with a thin buccal wall and the alveolar socket outside the bone envelope. b. Alveolar process ≥8mm wide, with a thicker buccal wall and the alveolar socket inside the bone envelope.

sites outside the bone envelope presented a greater risk for poorer outcomes (Fig. 2). And finally, the wider the gap between the implant and the buccal bone, the lower the amount of ridge resorption.

To summarize, during virtual tomographic planning, the clinician should observe if: (a) there is an intact buccal wall, the thicker the better; (b) the width of the alveolar process is ≥ 8mm; (c) the alveolar socket is inside the bone envelope; and (d) the implant is at the ideal restorative position in addition to the buccal gap measuring > 2mm. Narrow or regular diameter implants are preferable. Planning for a computer-assisted implant surgery is recommended.

Implant placement and grafting

The surgery should follow minimally invasive protocols, with flapless tooth extraction, IIP in the planned position. Guided surgery is often recommended for achieving accurate positioning.

Filling the gap between the implant and the buccal bone with a low-substitution bone material is essential. Studies from our group have shown that gaps > 2mm grafted with ABB can preserve >90% of the pristine alveolar process dimension and promote a stable newly formed buccal bone wall after a mean interval of five years.

The first gap study included 28 implants immediately placed at maxillary central incisors with socket grafting (ABB) and 28 contralateral control sites. The sample was divided according to the gap dimension measured during surgery, resulting in two groups: the wide gap group, > 2mm, and the narrow gap group, ≤ 2 mm. After one-to-five years in function, a CBCT scan was obtained. The total cross-sectional area of the ridge in the wide gap group showed minor reduction, 8.8%, while the narrow gap group presented a significant ridge modeling of 41%. Thus, the wide gap was able to preserve more than 90% of the ridge dimension.

On the second gap study, the effect of the gap on the buccal bone wall was evaluated. Forty-two patients treated with 53 immediately placed implants were included, following the same surgical procedure. The patients were divided into two groups according to the dimension of the gap. After one-to-five years, it was observed on CBCT reconstructions that the thickness and height of the buccal bone was significantly greater in the wide group. Thus, a >2mm-wide buccal gap should be planned virtually and grafted, to allow for a stable buccal bone wall along the implant surface.

These studies showed that the gap dimension, as well as grafting the gap is important. However, it is well documented that grafting reduces the remodeling process but does not eliminate it. To compensate for this minimal remodeling, additional procedures are often required, such as soft tissue grafts.

Our group also studied the effect of Connective Tissue Grafting (CTG) following IIP and ridge preservation at maxillary central incisor sites. Sites treated with a CTG exhibited significantly better esthetic outcomes when evaluated using the Pink Esthetic Score/ White Esthetic Score index (PES/WES). Other studies have shown the importance of CTG to avoid mid-buccal recession and for phenotype conversion. Use of CTG or a soft tissue substitute is highly recommended.

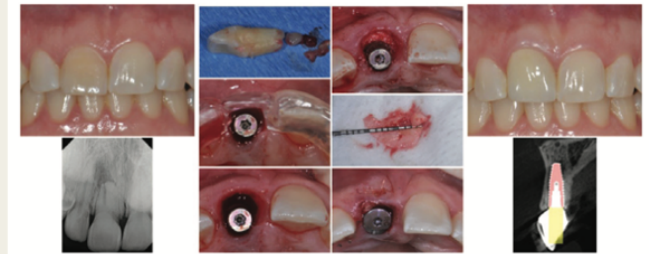


Fig 3. Clinical case illustrating the use of the 10 keys: online with bar code.

Prosthesis

The surgery is completed with soft tissue contour management, accomplished by using either a customized healing abutment or a provisional restoration.

Following integration and healing, the marginal tissues are captured during impression taking or scanning, and, when possible, a screw-retained prosthesis is fabricated and delivered.

In conclusion, well-documented evidence has shown that more predictable outcomes are achieved when using the 10 keys checklist described above. It helps clinicians achieve optimal outcomes when placing IIP with ridge preservation.

References available upon request.