Immediate Dental Implants

Educational Objectives

Following this unit of instruction, the learner should be able to:
1. Describe the different timings of implant placement.
2. Describe the outcomes of immediate implant placement.
3. Recognize the prevalence of mid facial mucosal recession around immediate implants.
4. Identify the risks factor for mid-facial mucosal recession.
5. List clinical guidelines to decrease risk for mid-facial mucosal recession.
6. Identify treatment alternative to immediate implant placement.

Timing of Implant Placement

The use of dental implants to replace missing teeth has been universally accepted based on a large body of scientific evidence since the early 1970s. While the initial guidelines published by Brånemark and coworkers (1977) required implants to be placed in healed alveolar ridges, the improvement in implant surface technology and understanding of wound healing around dental implant have allowed the development of more time efficient treatment protocol.

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The following commentary highlights fundamental and commonly accepted practices on the subject matter. The information is intended as a general overview and is for educational purposes only. This information does not constitute legal advice, which can only be provided by an attorney.

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From a surgical standpoint, the climax of these developments is represented by immediate implant placement, i.e. the implant is placed in the same procedure as the extraction.

Different classifications of timing of implant placement have been described. The terminology used in the present article uses the definitions established by the International Team for Implantology (ITI). This classification is based on the desired clinical outcome during the post extraction healing period quality of healing of the extraction socket.

Type 1: Tooth extraction and implant placement take place during one single dental appointment

Type 2: The extraction site is left to heal for 4 to 8 weeks allowing soft tissue healing over the extraction site before implant placement

Type 3: Following tooth extraction the site has healed for 12 weeks allowing for complete healing of the soft tissue and partial bony healing of the extraction socket

Type 4: Represents the implant placement in healed sites, similar to the Brånemark protocol.

Implants placed in a healed ridge (type 4) probably represent the most conservative approach and is widely propagated, especially in conjunction with ridge preservation procedure (SEE QRG Huynh-Ba Ridge preservation).

Outcomes Assessment of Type 1 Implant Placement

The outcomes of immediate implant placement (Type 1) has been documented as a predictable, safe and effective approach to replace extracted teeth, with survival rates greater than 95% in longitudinal studies up to 10 years. In comparative trials immediate implant placement (Type 1) and implant placement in healed ridges (Type 4) yielded similar survival rates without any statistical significant difference.

While these results are encouraging, the assessment outcome (survival rate) falls short when trying to reflect patient satisfaction with a given procedure. Indeed, the patient may rely more on the subjective aesthetic perception of an implant supported restoration to evaluate the outcomes, successful or not, of therapy. For example the case depicted in Figure 1 illustrates an implant that would be considered as a positive outcome if survival is the outcome measured. However, to the patient eyes this situation is an esthetic failure.

Figure 1

Clinical picture illustrating an esthetic failure following immediate implant placement at site #10 (Courtesy of Dr. Brian Mealey, DDS, MS)

In an effort to address this shortcoming many studies have reported esthetic outcomes of dental implant therapy including the level of the mid-facial mucosal margin.

Soft Tissue Management

Many immediate dental implants are placed in the anterior region so a patient may maintain the appearance of an intact dentition. Several factors must be carefully considered during planning and therapy in an attempt to minimize tissue recession and maximize the esthetic outcome.

Immediate Implants and Recessions

One of the major aesthetic concerns following immediate implant placement is the recession of the facial peri-implant mucosa. The incidence of peri-implant mucosal recession (up to 1mm) reported ranges between 8 and 40%. Moreover, emerging evidence seems to indicate that these dimensional changes are not affected by the implant surface characteristics.

Some of these studies reported up to 2mm of peri-implant mucosal recession following immediate implant placement, leading to discrepancies between the positions of soft tissue margins around the implant supported restoration and its contralateral natural counterpart. In esthetic sensitive areas, this loss of symmetry leads to unpleasant esthetic outcomes.

Risk Indicators of Recessions

Several putative risk factors have been associated with the development of soft tissue recessions around immediate implants including a non-intact facial plate following extraction, a thin buccal plate, a facial positioning of the implant and thin periodontal phenotype. The paragraphs below present some relevant literature for each of these risk factors and some suggested clinical strategies in order to control them.

• Loss of buccal plate integrity:

Prior to implant placement, the least traumatic extraction (see QRG on Atraumatic tooth extraction) must be performed with the goal to maintain the integrity of the socket bone walls. This is of paramount importance since it has been shown that the presence of a dehiscence defect of the buccal plate at the extraction led to a significant amount of buccal plate resorption, which in turn can lead to recession.

Therefore, in case the integrity of the socket bone walls was not maintained, it is recommended to reconstruct the alveolar ridge and place the implant in a staged approach.

• Thin buccal plate:

Pre-clinical and clinical studies have convincingly demonstrated that the pattern of alveolar ridge resorption and remodeling following tooth extraction was influenced by the width of the buccal plate. Due to the thin nature of the buccal plate, especially in maxillary anterior sites, ridge resorption will decrease the width of the alveolar ridge and a loss of the vertical height of the buccal plate is expected following tooth extraction. It is important to mention that the sole placement of a dental implant in the extraction socket cannot prevent these physiological changes from happening.

Moreover, emerging evidence seems to indicate that the presence of a dehiscence defect on the buccal side can lead to the development of soft tissues recessions with the development of soft tissues recessions around immediate implants including a non-intact facial plate following extraction, a thin buccal plate, a facial positioning of the implant and thin periodontal phenotype. The paragraphs below present some relevant literature for each of these risk factors and some suggested clinical strategies in order to control them.

Grafting the residual horizontal defect present between the implant and the internal wall of the buccal extraction socket to compensate for the resorption of the buccal plate has been proven successful and has become common clinical practice. Some studies have suggested that bone grafting on the external aspect of the buccal
plate, also known as over-contouring, will increase the thickness of buccal bone wall and possibly maintain soft tissue stability over time.50, 51

• **Buccal positioning:**
  Chen, et al. (2007)17 convincingly demonstrated that the main factor related mucosal buccal recession following immediate implant placement was the implant shoulder placed too facially in relation to the emergence profile of adjacent teeth. These findings were further confirmed by other clinical studies.19, 42, 52, 53

In a healed ridge, the guidelines for placement of a dental implant in the bucco-lingual position recommend to have the implant bed prepared in such a way that the implant shoulder is positioned about 1 mm palatal to the point of emergence at adjacent teeth.29, 54 Given the previously mentioned dimensional changes following tooth extraction, it becomes obvious that the positioning of an immediate implant in a correct oro-facial position has to be adapted to these specific healing patterns. Therefore, it has been suggested that implant shoulder should be placed approximately 2mm palatally to the point of emergence at adjacent teeth.17, 31

• **Periodontal phenotype:**
  Traditionally, the gingival phenotype characterized the quality of the soft tissue around teeth taking in account four parameters including the width of keratinized tissue, the gingival thickness, the shape and size of the interdental papillae and the crown width/height ratio. Usually a thin gingival phenotype is associated with a limited amount of keratinized tissue, a thin gingiva with long interdental papillae creating a marked gingival scalloped architecture and reduced crown width/height ratios, i.e. triangular shaped teeth. Conversely, a thick gingival phenotype is associated with large zones of keratinized tissue, a thick gingiva, short interdental papillae with a flat gingival architecture and an increased crown width/height ratio or squared shaped teeth.30, 55, 56

Teeth with a thin gingival phenotype have been shown to respond less favorably to periodontal procedures including regenerative periodontal surgery55 and gingival recession coverage.57 Similarly, individuals with a thin gingival phenotype had less favorable soft tissue esthetic outcomes following implant therapy.12,18,58,59

The explanation as to why patient with a thin periodontal tissue phenotype may be at greater risk for mucosal recession following immediate dental implants may lay in the fact that a thin periodontal tissue phenotype is associated with a thinner underlyng buccal plate thickness as compared to a thick phenotype.60, 61 This, in turn, reinforces the importance of the buccal plate thickness and its potential role in the development of mucosal recession following immediate implant placement.

### Recession Coverage

Since mucosal recessions around immediate implants are fairly prevalent, a legitimate question that may arise is if, similarly to gingival recession on teeth, mid-facial soft tissue recession coverage on implants can be attempted using traditional periodontal plastic surgery strategies.

In a case series published by Burkhardt and Lang (2008)62, 10 patients who displayed mid-facial recession (range: 1.9mm to 4.7mm) around a single implant in the anterior maxilla were treated using a connective tissue graft and a coronally advanced flap. While complete coverage was achieved immediately after surgery 8 case out of ten, over time soft tissue shrinkage was observed. The mean recession coverage achieved at 6 months, was 78.6% and none of the treated site presented with full recession coverage. The authors concluded that while improvement can be expected, recession coverage around implants is not predictable. Along the same line, a recent article by Levine, et al. (2014)63 prepared for the 5th International Team for Implantology Consensus Conference (Bern, Switzerland, April 2013)  reviewed the available evidence for soft tissue augmentation procedures to treat peri-implant mucogingival defects. The essence of the review indicated that recession coverage around implants is at best unpredictable and that good scientific support is lacking in the treatment of these particular conditions.

Taken together, it can be concluded that preventive strategies should be implemented to avoid mucosal recession as no scientifically sound established treatment protocol is available at present to treat these unfavorable outcomes.

### Clinical Considerations

#### a) Anatomy

One of the requirements for successful immediate implants is the ability to achieve primary stability upon implant placement. Usually, the implant diameter is generally smaller than the dimensions of the tooth root. As a corollary, it is the amount of native bone engaged during implant bed preparation beyond the confines of the socket that will determine the surgeon’s ability to obtain primary stability.

Typically, the available bone apically to the root should be examined to ascertain that a least a couple of millimeters are present. This is mainly limited by the anatomy of surrounding vital structures such as the maxillary sinus and floor of the nose in the maxilla and the inferior alveolar nerve in the mandible.

In the anterior maxilla, it is not unusual to have the implant displaced slightly palatally to allow a screw-retained implant supported restoration with an access channel going through the cingulum of the tooth and to avoid a common cause of facial recession, i.e. facially placed implants. In this case, a cone beam computed tomography (CBCT) can be recommended to allow the evaluation of the amount of bone available palatally to the root of the tooth in the oro-facial plane.

A study by Kan et al. (2011) 64 showed that 81.1% of the roots of anterior maxillary teeth, i.e. canine to canine, are positioned against the labial plate. Therefore, in a majority of the cases the placement an immediate implant in the anterior maxilla in a palatal position is possible. Conversely, 1 maxillary anterior tooth out 20 might present very limited amount of bone available palatally to the root which might prevent immediate implant placement.

#### b) Periapical infection

The presence of a hopeless tooth with a chronic periapical infection does not represent a contraindication to immediate implant placement. Two independent randomized controlled clinical trials have clearly demonstrated that chronic periapical endodontic lesions do not impact the survival rate if immediate implant therapy.29, 65, 66.

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4. Kan et al. (2011)
The clinical recommendation is to ensure adequate removal of the granulation tissue around the lesion and rinsing with saline solution for proper debridement of the lesion. Moreover, the presence of a buccal fenestration at the site of the lesion should be treated, following implant placement, by guided bone regeneration (GBR) using a bone graft material covered by a resorbable membrane.66

c) Patient related factors
Among the factors to be considered patients expectation and patient smile line should be evaluated. High esthetic expectations and a high smile line would leave very little margin for errors and even a 0.5mm mid-facial recession may be deemed as unsatisfying to the eyes of a patient with high esthetic demands.

d) Soft tissue grafting at the time of implant placement
Many different techniques have been advocated to increase the thickness and the quality of the soft tissue around dental implants. However, the evidence to support an added benefit from these procedures is limited, weak and, therefore, cannot not be recommended as standard care.67,68

Alternative to (Type 1)
Immediate Implant Placement

The type 2 implant placement protocol as described by Buser, et al. (2008)69 represents a valid alternative to Type 1 implant placement. The readers are invited to refer to the original article describing this technique for more details. In brief, following tooth extraction a collagen plus is placed into the extraction socket and the site is left to heal to allow the soft tissue closure over the extraction socket. Four to 8 weeks later, implant placement is performed after full muco-periosteal flap elevation. In conjunction with implant placement a GBR procedure, using autogenous bone (harvested locally) and bovine bone mineral, is performed to overcontour the ridge at the implant site before the flap is coronally advanced and tension-free closure is achieved.

Studies68,70,71 have shown the prevalence for mucosal recession was lower in comparison to some of the studies mentioned earlier in which a Type 1 implant placement protocol was used. Moreover, radiographic evidence derived from CBCTs have shown that the outcome of the GBR procedure was maintained and stable over time.72,73

Conclusions on Immediate Implant Placement

Immediate implants represent a viable treatment modality. However, it is technique sensitive and requires a careful case selection and risk factor analysis to avoid suboptimal treatment outcomes.

The following conditions should be met for immediate implant placement:
1) An intact socket is present following extraction.
2) A thick periodontal phenotype is present.
3) Bone is available on the palatal and apical aspects of the extracted tooth to ensure primary stability.

Technique for Immediate Implant Placement

Prior to the surgery a 3 dimensional radiographic image is helpful to determine the amount of bone available outside of the confines of the socket to predetermine the ability of the surgeon to engage native bone and obtain implant primary stability (Figure 2).

Following local anesthesia, the hopeless tooth must be carefully extracted with the least traumatic technique in order to maintain the integrity of the extraction socket walls; especially the buccal wall. Periotomes are preferred over conventional elevators to decrease the amount of trauma to the bone. Once the tooth has been successfully extracted (Figure 3), careful clinical inspection of the socket must confirmed its integrity. In case, a dehiscence or a fracture of the buccal plate is present, implant placement should be aborted and ridge preservation/ augmentation should be performed.

If all the socket walls are intact, the implant bed preparation should start with the first drill (sometimes also called precision drill), which should be a fine, sharp and pointy drill (Figure 4). This first drill allows for repositioning the implant bed irrespective of the walls of the socket in the sagittal (oro-labial angulation, Figure 5) and in the frontal (mesio-distal angulation, Figure 6) planes.

The technical difficulty of preparing an implant bed in a freshly extracted site is the natural propensity of any implant drill to follow the path of the socket. In order to adequately place the implant in a correct
restoratively driven position, the implant bed must be displaced in relation to the socket. For example, in the anterior maxilla, the implant must be placed palatally in relation to the socket not only to fulfill the requirement from a restorative point of view but also to be able to follow the guidelines by Chen and co-workers mentioned above, which require the implant shoulder to be placed approximately 2mm palatally to the point of emergence at adjacent teeth (Figure 7).

While correcting the implant bed preparation is possible with subsequent drills of increasing diameter, the initial drilling with the precision drill should be carefully executed in order to set the position, axis and angulation of the implant bed in an optimal way. This in turn, allows a much easier implant bed preparation with subsequent drills.

Once the precision drill has enabled the ideal positioning of the implant bed, the use of drills of increasing diameter allow the completion of the osteotomy prior to implant placement in the correct restorative position (Figure 8).

The horizontal defect between the shoulder of the implant and the internal wall of the socket is grafted using, in the illustrated case, a freeze-dried mineralized bone allograft (FDBA) (Figure 9). A resorbable collagen membrane is then placed over the GBR site and the implant. A periosteal releasing incision may be necessary to advance the flap coronally and allow a closer approximation of the edges of the flap before the flap is sutured together and control radiograph is taken (Figure 10).

Post-operative care typically includes the prescription of systemic antibiotics for 7 to 10 days, analgesics and rinsing with a 0.12% Chlorhexidine solution twice a day for 7 to 14 days.

**Figure 5**
Planning of the implant placement based on the sagittal cross section of the CBCT. Notice the palatal position of the implant.

**Figure 6**
Precision drilled in the frontal view. Notice that not only does the precision drill reposition the implant bed towards the palate (as illustrated on the previous figure) but also in the frontal plane, the mesio-distal angulation is corrected.

**Figure 7**
Desired implant position on the sagittal cross section of the CBCT, leaving 2 mm between the shoulder of the implant and the internal wall of the socket.

**Figure 8**
Clinical view of the immediate implant #9 placed in the correct oro-labial and mesio-distal position.

**Figure 9**
The horizontal gap between the implant and the socket is grafted with FDBA.

**Figure 10**
Post-operative radiographic control.
References


References (continued)


POST-TEST

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1. Which of the following timing of implant placement, as defined by the ITI (International Team for Implantology), represents the most conservative approach, in which the dental implant is placed after complete healing of the extraction site (with ridge preservation)?
   a. Type 1 implant placement
   b. Type 2 implant placement
   c. Type 3 implant placement
   d. Type 4 implant placement

2. Which of the following statements about immediate implants is (are) correct:
   a. Immediate implants are technique sensitive.
   b. Immediate implants have a similar survival rate as implants placed in healed site
   c. Immediate implants require a careful case selection
   d. All of the above

3. According to the literature, what is the prevalence of mucosal facial recession following immediate implant placement?
   a. Less than 1% of the cases
   b. Less than 5% of the cases
   c. Between 8% and 40% of the cases
   d. More than 50% of the cases

4. The utmost important risk factor related to peri-implant mid-facial soft tissue recession is:
   a. The presence of a thick phenotype
   b. Implant placed too far facially
   c. A thin (<1mm) bony palatal wall
   d. The inability to achieve primary stability

5. If the buccal plate integrity has been lost following tooth extraction, what is the recommended procedure?
   a. Let the extraction site heal by itself for 3 months before implant placement.
   b. Use a staged approach including ridge augmentation first and implant placement after the ridge has healed.
   c. Proceed with immediate implant placement without any accommodation.
   d. Proceed with immediate implant placement with systemic antibiotic.

6. When placing an immediate implant in an extraction socket at what distance should the shoulder of the implant be in relation to the internal border of the buccal bone wall?
   a. 0.5 mm
   b. 1 mm
   c. 1.5 mm
   d. 2 mm

7. Recession coverage of an implant can be attempted by means of a connective tissue graft. Concerning this technique, which of the following statement is FALSE?
   a. The patient needs to have a good plaque control.
   b. The result of this procedure is more predictable around teeth (with Class 1 Miller recession).
   c. You will get complete long term recession coverage in a predictable way.
   d. The site cannot present deep probing pocket depth.

8. Type 2 implant placement has been suggested as a treatment alternative to type 1. Following this protocol, how many weeks following extraction is the implant placed?
   a. 1 to 2 weeks
   b. 2 to 4 weeks
   c. 4 to 8 weeks
   d. 8 to 12 weeks

9. All the followings apply to a precision drill EXCEPT:
   a. It pinpoints the entrance of the osteotomy site.
   b. It widens the implant bed preparation right before implant insertion.
   c. It is thin and pointy.
   d. It defines the osteotomy pathway irrespective of the extraction socket walls.

10. Post-operative care typically includes:
    a. Systemic antibiotics for 7 to 10 days
    b. Methyl-prednisolone
    c. Analgesics and 0.12% Chlorhexidine rinse
    d. All of the above
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