Use of the Natural Tooth for Soft Tissue Development: A Case Series

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Endosseous implants have become a predictable treatment option for edentulous and partially edentulous patients. High rates of osseointegration (> 95%) are reported in much of the current literature, such that the emphasis has now shifted from merely successful osseointegration to esthetic implant placement. Many critical factors play a role in esthetics, including interarch space, smile line, available bone, width of edentulous space, gingival architecture, and tooth symmetry, shape, and length. A common esthetic factor is the creation of a soft tissue profile that is, ideally, identical to that of a natural healthy tooth. The technique presented here offers one way to achieve a predictable result.

The described technique uses a natural tooth to develop the soft tissue following extraction and immediate implant placement (Figs 1 and 2).

Extraction and implant placement are done as follows:

1. Extract the tooth asatraumatically as possible using a periotome. This helps keep the buccal plate intact.
2. Following extraction, sharp curettage should be carried out to...
remove remnants of any granulation or soft tissue, because these tissues may harbor pathogenic bacteria that can lead to postoperative complications.

3. Determine the width and length of the implant to be placed based on the dimension of the socket as well as the dimension of the extracted tooth.

4. Determine the position of the implant based on a minimum marginal bone thickness of 1.8 mm.¹

5. Position the implant slightly to the palatal in the extraction socket using a pilot drill, and widen palatally. This will give future support to the buccal bone.

6. Use a paralleling post to help guide proper angulation and positioning of the implant.

7. Place the implant with respect to the interproximal bone so that the hex shows buccally.

Tooth preparation then proceeds as follows:

1. Try in the acrylic resin abutment.
2. Prepare the abutment and hollow out the natural tooth so that it gives enough support for the soft tissue.
3. Place the natural tooth on the implant with light-curing composite, and cure.
4. Lute with temporary cement.
Method and materials

Ten systemically healthy patients (mean age, 47.1 ± 10.8 years; range, 35 to 61), six men and four women, participated in this study. Each patient was in need of a single implant in the maxillary anterior (seven central incisors, two lateral incisors, and one premolar). Teeth were extracted according to the technique described earlier.

Clinical and radiographic measurements were made at the time of prosthesis insertion and 6, 12, and 24 months after prosthesis insertion. Soft tissue height was measured from the crestal alveolar bone to the tip of the papilla. Appearance of each papilla was recorded based upon the classification described by Nordland and Tarnow:

- Normal = interdental papilla fills embrasure space to the apical extent of the contact point/area; class 1 = the tip of the interdental papilla lies between the interdental contact point and the most coronal extent of the interproximal cementoenamel junction (CEJ) (space present but interproximal CEJ is not visible); class 2 = the tip of the interdental papilla lies at or apical to the interproximal CEJ but coronal to the apical extent of the facial CEJ (interproximal CEJ visible); and class 3 = the tip of the interdental papilla lies at the level of or apical to the facial CEJ. Probing pocket depths (PPDs) were measured from the gingival margin to the implant sulcus depth. Radiographic bone levels were assessed using periapical radiographs. Patients also completed a questionnaire that evaluated their impressions of the overall treatment (very unhappy, not happy, neutral, happy, or extremely happy).
Table 1 shows the status of the papillae according to Nordland and Tarnow’s classification.2 Overall, all patients maintained their original papilla appearance, which was similar to their original shape prior to tooth extraction. One patient achieved a normal papilla appearance, while the remaining nine individuals maintained their papilla appearance (class 1).

Table 2 shows the changes in mean soft tissue height and PPDs over time. Soft tissue heights remained stable overall, but at 6 months after prosthesis insertion, minor soft tissue recession was noted (0.6 mm on the mesial, 0.5 mm on the distal). Nonetheless, this recession was reduced to 0.3 mm at 24 months after prosthesis insertion. A similar trend was noted in PPDs; at 6 months after prosthesis insertion, an average of 1 mm reduction in PPDs was noted at both the mesial and the distal aspects. After this time, it remained stable.

Radiographic bone levels remained consistent throughout the study period, with an average of 0.4 ± 0.2 mm of bone loss. No differences were noted between baseline and 24 months.

According to their answers to the questionnaire, patients were extremely happy with their treatment.

Discussion

Anterior implant esthetics is one of the most challenging tasks in implant dentistry, and a proper soft tissue contour is difficult for any clinician to achieve. The technique presented here offers one way to achieve a predictable result.

To consistently evaluate papilla contour, classifications have been proposed by Nordland and Tarnow2 and by Jemt.3 The reason the authors used the classification made by Nordland and Tarnow is because it met the criteria selected for the study. All patients achieved either normal or minimal papilla loss according to this classification. One critical factor in creating an esthetic papilla is the interproximal contact height. Tarnow et al4 evaluated natural teeth to determine whether the distance from the base of the contact area to the bone crest could be correlated with the presence or absence of the interproximal papilla.

| Table 1 Papilla status based upon the classification of Nordland and Tarnow² |
|---------------------------------|--------|--------|--------|--------|--------|--------|
| Status                          | Baseline | 6 mo   | 12 mo  | 24 mo  |
|                                | M | D | M | D | M | D | M | D |
| Normal                         | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 |
| Class 1                        | 10 | 9 | 10 | 9 | 9 | 8 | 10 | 9 |
| Class 2                        | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| Class 3                        | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

M = mesial; D = distal.

<table>
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<th>Table 2 Soft tissue height and probing pocket depths (mean ± SD)</th>
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<td>Time</td>
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A total of 288 sites in 30 patients were examined. Results showed that when the measurement from the contact point to the bone crest was ≤5 mm, the papilla was present almost 100% of the time. If the distance was 6 mm, the papilla was present 56% of the time, and when the distance was 7 mm or more, the papilla was present only 27% of the time. The immediate implant placement cases presented here helped to maintain the existing bone height, hence facilitating the appearance of papillae.

Choquet et al5 evaluated the presence or absence of interproximal papillae adjacent to single-tooth implants to determine whether there was a correlation with the distance from the base of the contact point to the crest of the alveolar bone. They found that the papilla was present almost 100% of the time when the measurement from the contact point to the crest of bone was ≤5 mm. The papilla was present ≤50% of the time when the distance was ≥6 mm. It is much easier to achieve a full papilla at short, square teeth with a flat, thick gingival architecture than at long, triangular teeth with a scalloped, thin gingival architecture because of the increased distance between the crest and the contact point. The present study was in agreement; the distance from the contact point to the alveolar crest was ≤5 mm in all cases, guaranteeing the appearance of papillae. It has been reported in the literature that after tooth extraction a minimum of 1 mm bone resorption and 2 mm apical migration on the facial free gingival margin occurs when no socket augmentation is performed.6

Our data indicate an average of 0.4 mm bone resorption and 0.6 mm of soft tissue shrinkage at 6 months postinsertion. The soft tissue remained stable throughout the study period, with a slight rebound (0.3 mm) at 1 year. This implies that minor creeping in attachment levels may occur, as was reported by Grunder,7 who found an average of 0.6 mm soft tissue recession and 0.4 mm of creeping attachment at 1 year post-crown insertion. This also suggests that immediate implant placement at the time of extraction reduced bone loss and gingival recession by half versus that seen in augmented sockets. One critical advantage of immediate implant placement versus socket preservation is that there is less crestal bone remodeling; it is therefore easier to create an esthetic emergence profile. Immediate implant placement may preserve existing alveolar bone, resulting in a more esthetic gingival profile. In addition, success rates for immediate implant placement range from 92.7% to 100%.8–12 This is in agreement with the results of the present study, which indicated a 100% implant success rate.

As stated in the literature, bone is critical for allowing proper adaptation of the soft tissue around an implant and can make the difference between having an embrasure that is completely filled with papilla or only partially filled.13 The underlying bone is the foundation that determines soft tissue profile. The most predictable way to achieve interdental papillae is by maintaining the interproximal bone height.13 One major benefit of immediate implant placement with flapless surgery is preservation of the bone and a chance for proper adaptation of the soft tissue. However, if any sign or symptom of active infection is present, such as the presence of purulent drainage, swelling, and pain, an implant should not be placed. The clinician shouldatraumatically luxate the tooth using a periotome from all directions when possible and extract the tooth with minimal pressure from the elevator or forceps to prevent expansion of the socket. Following atraumatic tooth extraction, buccal and lingual cortical plates need to be maintained. The goal is to maintain at least 1.8 mm of buccal plate beyond the diameter of the implant to prevent implant dehiscence and recession.1

The use of the patient’s natural tooth will allow a reproducible interproximal contact and proper shaping of the soft tissues. This technique can easily satisfy four of the five key factors presented by Kois13 for predictable esthetics: (1) relative tooth position is kept, (2) the form of the periodontium is modeled based on the patient’s natural tooth, (3) the original tooth shape is retained, and (4) the position of the osseous crest can be kept high with an immediately placed implant. The only factor that this technique cannot change is the periodontal biotype (thick vs thin). However, this should be considered when choosing this technique. Overall, the technique presented here, with proper patient selection, provides a predictable way to create an esthetic emergence profile that preserves pre-extraction papilla appearance using the patient’s own natural tooth as the provisional restoration.
Acknowledgment

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References


