Esthetic Replacement of a Maxillary Central Incisor with an ITI 15-Degree Angled Implant: A Case Report

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Single-stage implants are frequently used, but their use in the anterior dentition has not been widely published. The purpose of this case report is to present the esthetic result of a single-stage implant to replace a maxillary central incisor, and to demonstrate the unconventional use of a 15-degree angled ITI implant. A 15-degree 12-mm hollow cylinder was placed with the angle reversed facially. The emergence profile of the adjacent roots was matched with the transmucosal portion, turning at the osseous crest. The implant was restored after 6 months with an ITI gold coping and transverse screw-retained crown. The gingival margin and the papillae were shaped by the transmucosal portion and the restoration. To date, the implant has been loaded for 24 months with an ideal soft tissue esthetic and radiographic appearance. (Int J Periodontics Restorative Dent 1999;19:609-614.)

Dental implants placed in the esthetic zone pose several challenges. The difficulties stem from the routine ridge resorption of the alveolus. Resorption of the alveolus causes a loss of the gingival margin height and papillae height, and a narrow alveolus.1,2 The osseous resorption is primarily crestal and facial, but also occurs on the palatal aspect of the maxillary alveolus. Ridge augmentation is commonly used in severely resorbed ridges and usually provides a ridge for implant placement, but not always with positive soft tissue contours.2,3 Clinicians have tried to improve the esthetic results with specially designed abutments and customized crowns. Numerous articles have discussed these concepts with 2-stage implant systems, but not with single-stage implants.2,4-6

The single-stage implant technique has become commonplace and achieves a similar level of osseointegration as 2-stage Implants.7,8 The positive aspects of single-stage implants...
include one surgical procedure, no disruption of the transmucosal portion of the implant with a second surgery, and the lack of a "microgap" abutment interface at the osseous crest. The ITI dental implant system (Straumann) was the first system designed for single-stage use. The restorative components all use an internal "Morse" tapered screw that emerges to 4.8 mm at the coronal interface. The biologic rationale for a single-stage system has been well documented, and success rates parallel 2-stage systems.

The use of single-stage implants has widely been considered for replacing posterior teeth or in edentulous cases where esthetics are not of primary concern. The difficulty in the esthetic zone is that the implant must be countersunk to allow for the proper emergence profile and for the subgingival porcelain-abutment interface. This requires the restoring clinician and surgeon to carefully plan the placement. Advances in standard treatment planning sequences such as radiographic and surgical stent fabrication now make this thorough treatment planning routine.

One of the unmentioned esthetic advantages of the ITI system is the gradual emergence of the transmucosal portion, which, when countersunk, can begin the proper emergence profile subcrestally. This author has placed multiple cases in the anterior maxilla, and this article presents one example. The primary purpose of this case report is to present the esthetic result of a single-stage implant to replace a maxillary central incisor, and secondarily to demonstrate the unconventional use of a 15-degree angled implant placed with the angle reversed facially.

Case report

The patient presented with the maxillary left central incisor missing; a temporary partial denture had been in use for the previous 6 months. The patient was a 28-year-old man demonstrating a high smile line and significant gingival display. The exam included study models, periapical radiographs, pretreatment photos, and transgingival sounding (bone mapping) to evaluate the facial-lingual osseous profile (Figs 1 and 2). The patient initially had a diastema between the central incisors. The treatment plan included closing the diastema with direct-bonding composite mesially on the maxillary right central incisor, and the left central incisor implant clinical crown width would then be fabricated to match. Moderate facial and palatal ridge resorption that would prevent ideal implant placement was noted. Site development prior to placement was discussed with the patient but declined because of the added expense. The decision to go ahead with placement was
made because adequate bone was available and the resorption was not severe.

Full-thickness crestal incisions were made with the flaps raised facially and lingually to the right central and left lateral incisors. A vertical releasing incision was made distofacial to the left lateral incisor without reflecting the papillae. The osseous ridge was 6 mm in width and dictated lingual placement in a vertical plane, 15 to 20 degrees to the adjacent central incisor (Fig 3). This would usually mean a significant facial depression with an excessively overcontoured facial emergence profile of the clinical crown, which is undesirable because of the unesthetic soft tissue depression and plaque retention of the overcontoured crown. The decision to use an angled implant allowed lingual placement with the angled transmucosal portion turning parallel to the adjacent teeth. The osteotomy was completed, and the 15-degree 12-mm hollow cylinder was placed with the transmucosal portion turned facially, following the profile of the right central incisor (Fig 4). A 5 mm × 9 mm × 2 mm subepithelial connective tissue graft was placed facially over the alveolar bone to further create a root prominence. A 3-mm healing abutment that extended to the gingival margin was placed (Fig 5). The flaps were closed using interrupted vertical mattress Gore-Tex sutures (3/0 WL Gore).

The temporary partial restoration was relined on the tissue surface to prevent occlusal loading.

The patient was allowed to wear the temporary partial denture only for cosmetic purposes during the first month. The implant was restored after 6 months with an ITI gold coping and a transverse screw-retained crown (Fig 6). The implant bevel was 2.5 to 3.0 mm subgingival, which allowed for the emergence profile to be 5 mm at the osseous crest, 7 mm at the gingival margin, and 9.5 mm at the proximal contacts. The final esthetic appearance is positive from a soft tissue and restorative perspective (Figs 7 to 9). To date, the implant has been loaded for 36 months and the radiographic appearance is ideal, with a stable radiographic pattern (Fig 10).
Fig 1 Pretreatment incisal view shows the facial depression of the extraction site.

Fig 2 Pretreatment facial view.

Fig 3 Diagram of the normal alveolus and original root angulation, left, compared to the resorbed ridge, angled implant, and final crown, right.

Fig 4 (left) Insertion mount in place intraoperatively. The angulation of the transmucosal portion parallels the adjacent central incisor. The facial location of the implant is similar to the adjacent central incisor that will shape the gingival contours.

Fig 5 (right) Wound closure with a 3-mm healing cap exposed.

Fig 6 Final palatal view shows lingual transverse screw.

Fig 7 Final facial view exhibits a prominent gingival form that matches the adjacent natural tooth.

Fig 8 Lateral view demonstrates an esthetic soft tissue and crown profile.
Conclusion

This case reveals how we must customize treatment to the individual. The versatility of the ITI implant for cosmetic restorations is very good with proper treatment planning. The implant requires submerging and the use of various healing abutments in the esthetic zone. The "esthetic plus" design has the titanium plasma-sprayed surface 1 mm coronal and the polished collar is only 2 mm.

A previously published paper by Vlassis\(^5\) reported on an ITI implant used in the anterior maxilla with a modified ridge-lap design to achieve an esthetic result while providing an occlusal access hole. It has been common with all implant systems to compensate for soft tissue irregularities with this design. Oral hygiene measures, however, are restricted in a modified ridge-lap prosthesis. The transverse screw restoration presented in this paper provides flexibility and little concern for a screw-access hole. Placement should be directed for the best esthetic result, and not for requirements of an occlusal access hole in a screw-retained restoration. The option of a cemented restoration with a custom abutment can also be used, preventing palatally angled implant placement.

Cemented restorations are routinely used with the ITI system. Maxillary lateral incisors are an optimal site for cemented restorations. Minimal countersinking is
needed for the narrow emergence profile. Wide central incisors should have the bevel of the implant 2 to 3 mm subgingival, and a cemented margin located at this level is not recommended. Deep subgingival cement margins can contribute to plaque retention, inflammation, and retained cement.

The ideal anatomic implant situation is to have a normal alveolus and the implant placed as far facially as possible, with the angulation parallel to the adjacent teeth.\textsuperscript{5,6} The restorative porcelain interface can continue at this angulation, supporting the gingival architecture to result in a root prominence, adequate papillary height, and a thin, scalloped facial gingival margin. The present case accomplished this by duplicating the emergence profile of the adjacent roots, with the 15-degree transmucosal portion turning at the osseous crest. The connective tissue graft augmented only the middle third of the alveolus to prevent a depressed appearance.

The gingival margin and the papillae were shaped by the transmucosal portion and the restoration. This case demonstrates the flexibility available with a single-stage implant system. It also demonstrates how the variables of placement location, angulation, selection of implant design, and use of adjunctive techniques such as connective tissue grafts may be required for a cosmetic result.

### References