Incorporating Retrievability in Fixed Implant-Supported Prostheses by Transverse Fixation in the ITI Abutment System

• **Peter A. Taylor,** BSc(Hon), DDS •

Abstract

This article describes the use of the ITI implant system in rehabilitation of the maxillary anterior sextant of a 41-year-old patient. The Syn-Octa TS abutment system was used in this case, along with a customized transfer aid for intraoral positioning of these elements. This system offers the advantage of retrievability of the prosthesis in multiunit cases.

MeSH Key Words: *dental implants; dental prosthesis design; dental prosthesis retention/methods*

© J Can Dent Assoc 2004; 70(7):459–63
This article has been peer reviewed.

The options available for restoring missing teeth have expanded in recent years with the development of implant-supported prosthetics, which are associated with improvements in predictability of performance.[1,2] In addition, the number of abutment systems being used in the restoration of edentulous areas with implants has increased dramatically.[3] Specifically, the ITI implant system (Institut Straumann AG, Waldenburg, Switzerland) allows for both screw-retained and cemented restorations, and this company's selection of abutment systems includes the Syn-Octa prosthetic system.[4,5] The ITI implant is a 2-part implant with an internal octagon in the 8° Morse taper. The internal octagon is used to precisely position the Syn-Octa abutment over the implant and to provide resistance to rotational forces under functional and parafunctional loads.[6]

A further development of the Syn-Octa abutment is the Syn-Octa TS system for transverse screw-retained crowns and bridges.[6] This system is appropriate where occlusal and incisal screw retention is contraindicated because of esthetic considerations or axial alignment of the screw. The Syn-Octa TS abutment is also ideal when esthetic demands require submucosal placement of the implant shoulder. When a cemented abutment is used in such a case, later removal of the cement is difficult, and periodontal abscess around the implant is a potential complication.[7] Finally, in the replacement of multiple missing teeth with long-span fixed prostheses, the Syn-Octa TS abutment system allows for more lasting and precise control of occlusion and prosthesis retrievability.[8] These features are important in the event of implant failure, soft-tissue changes around the prosthesis, and structural and esthetic problems involving the superstructure after delivery of the prosthesis. Consequently, use of this system can minimize the costs incurred by patient, dentist and laboratory, and can shorten the duration of chairside procedures.

This article describes restoration of the maxillary anterior region with 4 Syn-Octa TS abutments placed in conjunction with a customized splinted transfer aid, which allowed accurate positioning of a multiunit prosthesis.[9,10]

Case Report

A 41-year-old woman presented with a failing 6-unit fixed partial denture, which had 2 retainers spanning from the maxillary canine teeth from right to left. Both of the abutments had root fractures that necessitated their extraction. The patient's medical history revealed moderate hypertension, high cholesterol levels and mild arthritis, all managed with appropriate medication. The dental history included partial oligodontia with generalized slight to moderate and localized severe periodontitis. The patient had a very sensitive gag reflex. Her concerns were esthetics,

Figure 1: *Four ITI implants in a 41-year-old woman, at 3 months after placement, with the healing caps in place*

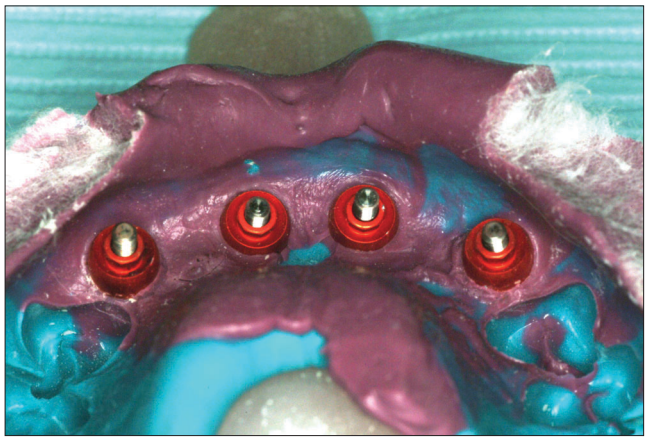

Figure 2: *A polyvinyl impression with screw-retained impression caps was made in a custom tray.*

Figure 3: *Facial view of acrylic provisional prosthesis.*

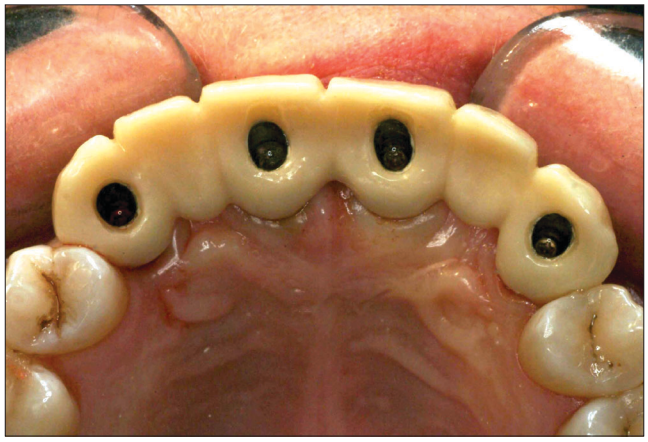

Figure 4: *Palatal view of acrylic provisional prosthesis shows the lingual access holes.*

function and the avoidance of any prosthesis that would stimulate the gag reflex.

The options for restoration of this area were limited (because of the relatively wide span) to either a cast removable partial denture or a fixed implant-supported prosthesis. The risks and benefits of each type of treatment were described in detail, and the patient decided to proceed with the second option.

Technique

The following procedure was followed in creating the patient's new prosthesis.

1. Maxillary and mandibular impressions were taken with irreversible hydrocolloid (Blueprint Cremix, Dentsply Ltd, Addlestone, UK), and a face-bow transfer (Denar Corp., Anaheim, Calif.). The impressions were poured using precision stone (Ash Temple, Don Mills, Ont.) and were mounted on a semiadjustable articulator (Denar Corp.). A diagnostic wax-up was created on the maxillary cast, and a surgical stent was fabricated by the laboratory to establish and relay to the oral surgeon information about the type and position of the implants.[11,12] In addition, the wax-up provided guidance for the final shaping and positioning of the prosthesis.
2. In consultation with the oral surgeon, it was decided to use 4 implants, so as to maintain symmetry and balance in the esthetic zone. Therefore, treatment involving 4 retainers and 2 pontics was planned; the Syn-Octa TS system was selected for the reasons described above.
3. Four ITI implants were placed (4.8 × 10 mm standard collar), and the patient was given a transitional removable partial denture made of cold-cured acrylic for use during the healing and integration phases of treatment. The healing period lasted for 3 months before final impressions were obtained (**Fig. 1**).
4. The healing caps were removed, and an implant-level impression was made using a custom tray incorporating 4 separate perforations for the screw-retained impression caps (**Fig. 2**). To maintain accuracy and rigidity of the final impression with minimal flow in the palate, the material chosen was a heavy-body polyvinyl siloxane putty (Affinity, Clinician's Choice, New Milford, Conn.),

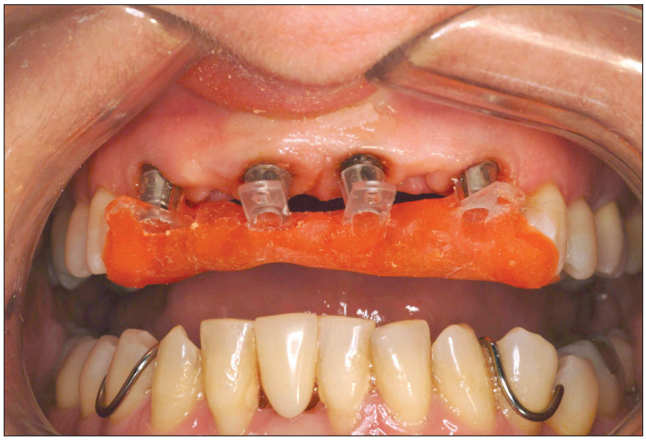

Figure 5: *Combination Duralay and transfer aid assembly positioned over the TS abutments.*

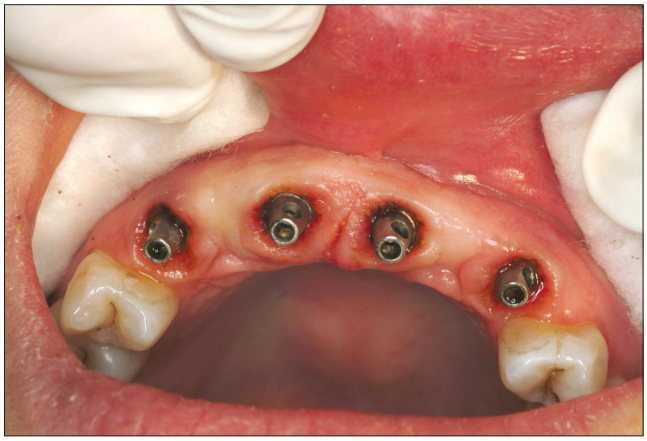

Figure 6: *Syn-Octa TS abutments oriented over the appropriate implant.*

with a medium-body wash (Monophase Affinity, Clinician's Choice) around the impression caps.

5. A provisional restoration was fabricated on each implant with Syn-Octa titanium posts. These posts were shortened below the occlusal plane, and, with the esthetic wax-up as a guide, an acrylic resin shell was fabricated by the laboratory. At chairside, the shell was relined with methyl methacrylate (Lang Dental Manufacturing, Wheeling, Ill.) over the posts (filled with wax). The provisional restoration (**Fig. 3**), once fully set, was removed from the implants and subsequently trimmed, checked for occlusion and polished. Lingual access holes (**Fig. 4**) permitted gold screws to be tightened, to secure the provisional prosthesis; the access holes were then filled with a flexible composite (Fermit, Ivoclar Vivadent Inc, St. Catharines, Ont.).
6. A porcelain-fused-to-metal fixed partial denture with Syn-Octa TS abutments was fabricated. The laboratory also fabricated a combination Duralay (Dental Manufacturing Co., Worth, Ill.) and transfer aid assembly to correctly reorient the position of the Syn-Octa TS abutments from the master cast to the patient. Two types of tertiary elements are available for the Syn-Octa TS abutments: gold copings for the cast-on technique or plastic copings for the burn-out technique. In this case, the superstructure was waxed, invested and cast over the latter type of tertiary elements to produce a 6-unit framework.
7. The patient returned for a try-in of the Syn-Octa TS abutments and corresponding framework. The transfer aid assembly was used to position the abutments precisely over the appropriate implants (**Figs. 5** and **6**). The abutment screws were torqued to 35 Ncm with a screwdriver, ratchet and torque controller device. The framework was then placed over the abutments, and the clinician checked for any interference from adjacent teeth or from the abutments themselves. Once seated passively, the framework was secured by hand-tightening the transverse screws with a TS screwdriver and a small hex driver tip (Rash 2N; Implant Innovations Canada Inc, Montreal, Que.) with a slow-speed handpiece at low torque. The seating of the framework was evaluated by independently tightening the terminal screws while assessing for any rocking or marginal discrepancies. The fit of the final casting was evaluated by viewing selected radiographs obtained with the unit securely in place, with all TS screws tightened.[13] Occlusion was then assessed and adjusted to provide anterior disclusion. All of the units were disassembled, and the transfer aid assembly was used to transfer the abutments back onto the master cast. The provisional prosthesis was then repositioned and secured.
8. The shape and position of the teeth for the final prosthesis were determined on the basis of the provisional prosthesis, with consideration given to phonetics, function, occlusion and esthetic appearance.[14] These aspects were assessed, with substantial input from the patient, during the framework try-in appointment. Once the clinician and the patient were in agreement, a putty index (Affinity, Clinician's Choice) of the provisional prosthesis was used to record the results.
9. The framework, abutments, transfer assembly and putty index were sent to the laboratory on the master cast for porcelain veneering. The patient attended the laboratory for custom staining.
10. The patient returned to the office for final delivery of the Syn-Octa TS abutments by means of the transfer aid assembly, followed by placement of the prosthesis (**Figs. 7** and **8**). Following re-evaluation of the elements discussed in item 8, above, the abutments were torqued to 35 Ncm, and the TS screws (**Fig. 9**) were tightened by hand only. The final occlusion was

Figure 7: *Facial view of final prosthesis.*

Figure 8: *Palatal view of final prosthesis shows the TS attachments.*

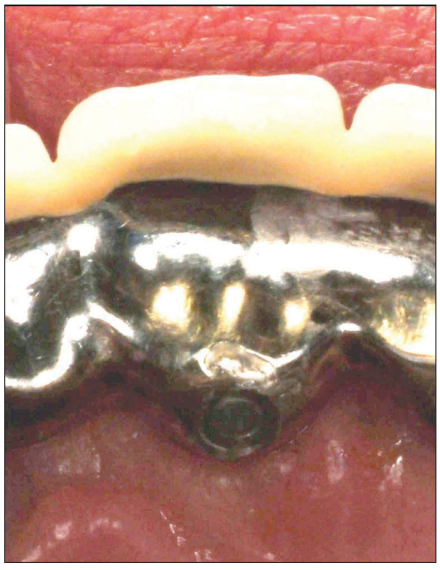

Figure 9: *Syn-Octa TS access hole and screw.*

established as canine rise and anterior protrusive. The openings to the TS screws were filled with Fermit.

11. Once insertion of the prosthesis was complete, a final irreversible hydrocolloid impression was made and poured in Resin Rock (Whip Mix Corp, Louisville, Ky.). A processed acrylic resin maxillary occlusal splint, with uniform centric occlusion and anterior excursive guidance, was fabricated to prevent any damage to the prosthesis or the implants, particularly during nocturnal parafunction.[15]

Upon delivery of the occlusal splint, the TS screws were checked and tightened (by hand), and the soft tissue was reassessed. The importance of proper self-care around the splinted abutments, as well as the necessity of regular hygiene appointments, ideally at 3- to 4-month intervals, was emphasized.[16]

Discussion

The use and success of screw-type implant systems that have traditionally been transocclusal are widely recognized.[1,4] The Syn-Octa TS system allows for extension of this proven method of retainer attachment in a more esthetic manner.[6] This system further improves the periodontal outcome in cases where the implant placement is greater than 2 mm beneath the gingival crest. There is no need for removal of cement, which might lead to localized periodontal abscess.[17]

The simple yet exquisitely accurate fabrication of a combination Duralay and transfer aid assembly to meet the positional requirements for these TS attachments assists the clinician enormously at chairside when he or she is transferring the components from the master cast to the patient's mouth. Once the abutments are in place, the framework is fitted in the usual manner. The simplicity of the TS system of attachment provides the key element of retrievability for single crowns or multiunit fixed splints. Retrievability may be critical if the clinician decides to reassess the soft tissue around the retainers; if the esthetic demands of the patient necessitate modification to the prosthesis; if there are changes in the pontic or ridge adaptation; or if there are complications because of failure of porcelain, metal framework or implant. Any required modifications can be made in less time and at lower cost than would be the case with cemented, less retrievable prostheses.

In the absence of long-term studies evaluating factors that affect the health of the tissue surrounding implants, tissue response cannot be accurately predicted, especially in the case of implants placed in the maxillary region.[18] The management of such cases is considerably enhanced by retrieval mechanisms, such as those available in the Syn-Octa TS system. ◆

Acknowledgements: *The author would like to acknowledge staff at the Rotsaert Dental Laboratory (Hamilton, Ontario) for their contribution to the success of this case, Dr. Robin Listrom for implant placement, and Dr. Donald Gratton for his helpful suggestions. In memory of Milka Sarapa, the technician at Rotsaert Laboratory who worked with Dr. Taylor on this case. Ms. Sarapa, a long-time collaborator of Dr. Taylor, passed away while the article was in press.*

Dr. Taylor *maintains a private practice in Oakville, Ontario. He is also clinical instructor, division of prosthodontics, The University of Western Ontario School of Dentistry, and staff dentist, Oakville Trafalger Memorial Hospital.*

Correspondence to: *Dr. Peter A Taylor, 401–345 Lakeshore Rd E, Oakville, ON L0P 1B0. E-mail: taydent@aol.com.*

The author has no declared financial interests in any company manufacturing the types of products mentioned in this article.

References

1. Taylor TD, Agar JR. Twenty years of progress in implant prosthodontics. *J Prosthet Dent* 2002; 88(1):89–95.

2. Fiorellini JP, Weber HP. Clinical trials on the prognosis of dental implants. *Periodontology 2000* 1994; 4:98–108.

3. Binon PP. Implants and components: entering the new millennium. *Int J Oral Maxillofac Implants* 2000; 15(1):76–94.

4. Hebel KS, Gajjar RC. Cement-retained versus screw-retained implant restorations: achieving optimum occlusion and esthetics in implant dentistry. *J Prosthet Dent* 1997; 77(1):28–35.

5. Sutter F, Weber H, Sorensen J, Belser U. The new restorative concept of the ITI dental implant system: design and engineering. *Int J Periodont Rest Dent* 1993; 13:408–31.

6. Sutter F, Grande V, Sutter FJ Jr, Bragger U, Lang NP. Transversal fixation of restorations in combination with the Octa abutment of the ITI dental implant system. *Clin Oral Implants Res* 1996; 7(3):291–6.

7. Pauletto N, Lahiffe B, Walton JN. Complications associated with excess cement around crowns on osseointegrated implants: a clinical report. *Int J Oral Maxillofac Implants* 1999; 14(6):865–8.

8. Rigdon TF. Retrievable/fixed prosthetics for implants and natural dentitions. *Int J Oral Implantol* 1991; 8(1):59–62.

9. Higginbottom F. Transfer system for cement-retained restorations on nonsubmerged dental implants. *Quintessence Dent Technol* 1997; 20:55–62.

10. Mendonca G, Fernandes Neto AJ, Neves FD. A customized guide for transferring angled abutments. *J Prosthet Dent* 2002; 87(6):698–9.

11. Smith BG. Dental crowns and bridges: design and preparation. 2nd ed. Chicago: Year Book Medical Publishers Inc; 1990. p. 85–9.

12. Small BW. Surgical templates for function and esthetics in dental implants. *Gen Dent* 2001; 49(1):30–2, 34.

13. Kan JY, Rungcharassaeng K, Bohsali K, Goodacre CJ, Land BR. Clinical methods for evaluating implant framework fit. *J Prosthet Dent* 1999; 81(1):7–13.

14. Grasner GN, Meyers ML, Iranpour B. Resolving esthetic and phonetic problems associated with maxillary implant-supported prostheses. A clinical report. *J Prosthet Dent* 1989; 62(4):376–8.

15. Perel ML. Parafunctional habits, nightguards, and root form implants. *Implant Dent* 1994; 3(4):261–3.

16. Lang NP, Wilson TG, Corbet EF. Biological complications with dental implants: their prevention, diagnosis, and treatment. *Clin Oral Implants Res* 2000; 11(Suppl 1):146–55.

17. Keller W, Bragger U, Mombelli A. Peri-implant microflora of implants with cemented and screw retained suprastructures. *Clin Oral Implants Res* 1998; 9(4):209–17.

18. Toijanic JA, Ward CB, Gewerth ME, Banakis ML. A longitudinal clinical comparison of plaque-induced inflammation between gingival and peri-implant soft tissues in the maxilla. *J Periodontol* 2001; 72(9):1139–45.