Evaluation of Success Rates of Screw Retained Transitional Implants in the Mandibular Arch

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Introduction: Transitional implants (TIs) have been shown to be a viable method of providing fixed provisional restorations for the implant patient who wishes to avoid any removable temporary appliances during implant integration. Most of commercially available transitional implants were designed to support a cementable restoration. The main advantage of the new transitional screw retained implant (TSRI) is the avoidance of macro-movement during healing period and removal of the provisional appliances.

Materials and Methods: Between March 2001 and May 2003 seven patients (5 male, 2 female) received a total of 32 TSRIs. All of the TSRIs were placed in the mandible. Twenty-seven TSRIs in 6 patients were used to support provisional prostheses, while 5 of the TSRI in 1 patient were planned to support a long term full arch fixed restoration.

Results: At the time of evaluation for the prospective report the TSRIs were functioning for an average time of 10 months (range 2- 31 months). A total of 2 implants in 2 patients became mobile. The success rate of the screw retained transitional implants therefore was 93.75 %. All of the prosthetic complications were corrected with no loss of function. The survival rate of the fixed restorations supported by TSRIs was 100 %. **Conclusion:** The current investigation has demonstrated the successful use of the transitional screw retained implant for the support of fixed provisional prostheses in the mandibular arch.

According to the original documented surgical and restorative protocols for submerged and non-submerged implants, healing in the absence of functional loading for a period of 4 to 6 months was deemed necessary to achieve osseointegration (1-4). Where inadequate bone levels existed surgical techniques have been used to augment areas for placement of implants (5, 6). In order to avoid premature undesired loading of implants and augmented areas, patients were required to refrain from wearing any removable prostheses for at least 2-6 weeks after the surgery. Therefore tooth-supported fixed or removable provisional restorations were utilized (7). However, this type of restoration was not feasible in every patient due to lack of supporting teeth. Today immediate functional loading of implants is being advocated by some dentists on multiple or single implants (8-14). This technique reduces the number of surgical procedures and shortens the treatment time. The use of multiple implants for fixed implant supported restorations requires cross-arch stabilization and at least four or five implants longer than 10 mm, and is mainly indicated in fully edentulous patients (12). Immediate loading of single implants has been demonstrated. However, to date long term documentation is lacking on immediate functionally loaded implants.

Several years ago the concept of the immediately loaded transitional implant (TI) was introduced (15, 16). The TI supported prostheses provided an implant patient with a fixed temporary prosthesis prior to and during the immediate postoperative healing phase (17, 18). The main advantage of fixed provisionals supported by TIs was to avoid transmucosal loading of permanent implants and bone-augmented areas. These provisional restorations were often used as a guide for occlusion and esthetics in planning the final implant supported restoration.

Currently there are several different transitional implant systems available. However, to date all documented cases presented in the literature utilized cemented provisional prostheses on these implant systems. The disadvantages of cemented prostheses include the following difficulties; retrievability, removal of subgingival cement remnants, and the challenge of fabricating a provisional with minimal occlusal clearance. Moreover, the macro-movement caused by the removal of cement retained provisional restorations occasionally caused loosening or fractures of the TIs (19). In an attempt to avoid these complications a new transitional screw retained implant (TSRI) has been introduced.

The advantage of screw retained TIs is the avoidance of this macro movement and the ease of insertion and removal of the provisional appliances. Additional advantages include the ability to fabricate a provisional in cases with minimal occlusal clearance and the ability to use non-resorbable as well as resorbable sutures in implant or augmentation surgeries.

This study was undertaken to document the success rates of screw retained TIs in the mandible.

At New York University Department of Implant Dentistry seven patients (5 male, 2 female) received a total of 32 TSRIs in the mandibular arch between March 2001 and May 2003. The average age of the patients treated was 61.3 years (range 42 – 86 years).

Fig 1 Implants insertion

Fig 2 Abutment connection

Fig 3 Titanium bar connection

Fig 4 Trial of vacuun shell

Fig 5 Application of resin

Fig 6 Clinical View of Restoration

Fig 7 Occlusal view

Fig 8 Post-op panorex view

Fig 9 Frontal view

Medical clearance was required on 4 of the patients and obtained. No patient was a smoker, but one had smoked within months of the study. Twenty-seven TSRIs in 6 patients were used to support provisional prostheses, while 5 of the TSRIs in 1 patient were planned to be used for long term support of a full arch fixed restoration. Three patients received 4 TSRIs each and 4 patients received 5 TSRIs. Three cases were full arch cases, the other 4 had a partial dentition present. The opposite dentition was a complete denture, a fixed partial denture or a removable partial denture. Six of the 7 patients final restoration was planned to be a fixed prosthesis, and in 1 patient the final outcome was an overdenture.

Sequence of the Procedures to Fabricate a TSRI Supported Prosthesis

Presurgical Procedure:

The patients were instructed to start rinsing one day prior to surgery with 0.12 % Chlorhexidine gluconate (Peridex). The patients were premedicated with 2 g of Amoxicillin one hour prior to the surgery, except for one patient with an allergy to penicillin, who was prescribed 600 mg Clindamycin.

Surgical Procedure:

1. Anesthesia: the intraoral surgical area was anesthetized utilizing lidocaine 2 % (with epinephrine 1:100,000) with block and infiltration anesthesia
2. Crestal incision
3. Reflection of full thickness flap
4. Drilling of channels with laser-marked drill to the full depth at approximately 800-1000 RPM with copious supply of sterile water or saline solution
5. In hard bone, the channels are enlarged with a reamer
6. Indentation over the channels with a 3 mm round cutting instrument
7. Insertion of the TSRIs
8. Removal of screw cap and coping
9. Completion of installation with R/A driver at low speed
10. Placement of protective spacers
11. Placement of the index coping in full contact with the implant platform

Prosthetic Procedures:

12. Insertion of metal bars into the silicon holding sleeves
13. Insertion of brass plugs into the screw-caps
14. Placement of clear self-curing resin into splint
15. Attachment of dentate forms or pre-fabricated bridges with tooth color auto-cure resin
16. Removal of brass plugs and screw caps for occlusal adjustments
17. Plugging of screw-cap openings with short endodontic paper-points
18. Capping with composite resin

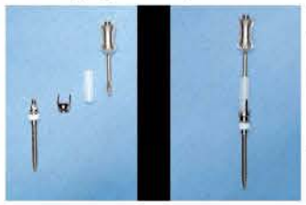

Fig 10 Transitional implants and assembly

Patient ID	Gender	Age (years)	Time (months)	No TSRIs	Mobility	Long Term	Foll Part	Opp Dent	Final Rest
1	M	47	10	4	0	No	F	CD	Hybrid
2	M	67	7	5	1	No	F	RPD	FPD
3	M	65	8	4	0	No	P	FPD	FPD
4	F	86	31	5	0	Yes	P	FPD	FPD
5	M	67	2	5	1	No	F	CD	FPD
6	F	55	3	5	0	No	P	CD	OD
7	M	42	9	4	0	No	P	FPD	Hybrid
Average		61.3	10						
Total				32	2				
Success rate				93.75%					

Table 1 Patients data and result

RESULTS

At the time of evaluation for the prospective report of the screw retained transitional implants were functioning for an average time of 10 months (range 2 to 31 months). One implant became mobile after 2 months, but it was maintained until the permanent implants were loaded 2 weeks later. The prosthesis was occluding with a complete denture. Another implant became mobile after 6.5 months and had to be removed immediately. However, the prosthesis that was supported by 4 other TSRIs was maintained with no loss of function. Therefore the success rate of the TSRIs was 93.75 %. Prosthetic complications that occurred was screw loosening in one case with an opposing complete denture and a broken provisional in another case with an opposing removable partial denture. Both were corrected with no loss of function. Even though there were some prosthetic complications, the survival rate of the fixed restorations supported by TSRIs was 100 %.

DISCUSSION

Stress during the healing phase. The goal is to ensure a stress-free maturation of the bone surrounding the submerged implants, and unimpinged healing of a bone-grafted site. The TI supported provisional prostheses allow the patient to wear a stable prosthesis that will mimic the final restoration (17, 20). El Attar et al. (21) reported that patients experienced greater satisfaction because of the immediate restoration of function and esthetics. Additional uses that include support of a surgical guide (22) and orthodontic anchorage (23) expand broadly the applications. The small diameter allows for minimal bone destruction, whereas the length gives anchorage to the TIs.

Today transitional implants in addition can provide long term support of fixed provisional prostheses in areas of limited bone which would precede the use of standard diameter implants (24).

The literature regarding transitional implants consists mainly of case reports (17, 18, 20, 25-28). A histological study in dogs was done by Zubery et al. (29), which reported that TI failure maybe be associated with low quality of the bone at the implant site, relative excessive loads and insertion of the TI's via the mucosa. Froum et al. (30) showed that the average percentage of bone-to-implant contact of transitional implants was 52.9%, which is similar to that of the conventional machined surfaced implants (31).

Transitional implants are generally made of commercially pure titanium or titanium alloy and are designed as one-piece implants composed of root and crown replacement segments. These TIs have a self-threading tapered screw design with diameters that range from 1.8 to 2.8 mm and implant screw length between 7 and 14 mm.

Disadvantages of the TI technique include additional chair time required, increased laboratory expenses and a requirement for sufficient inter-implant bone. In addition, TI failure and fracture may result in localized bone loss. Proper placement and design of the implant supported TI restoration is essential to avoid the later complications. The TSRI that was used in the current study enables retrievability that should decrease the incidence of fracture complications.

All of the cases in the study were on the mandibular arch. Further data is needed to determine if these TSRIs would be successful in the maxillary arch.

CONCLUSION

The current investigation has demonstrated the successful use of the transitional screw retained implant for the support of fixed provisional prostheses in the mandibular arch. The survival rate of TSRIs in this study was 93.75 %. Of the provisional fixed transitional screw retained implant supported restorations in this study, 1 maintained its function up to 31 months. This may imply long-term effective use of TSRIs for the implant patient.

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