



Implant Esthetics: Form Meeting Function

The 20th Academy of Osseointegration Annual Meeting
March 10-12, 2005
Walt Disney World Dolphin Hotel, Orlando, FL.

Long Term Survival of Small Diameter Implants

Park SH, Choi SJ, Classi A, Cho S-C, Froum S, Elian N, Tamow DP Department of Implant Dentistry, New York University College of Dentistry

“...Small Diameter Implants May be Used for Long Term Support According to this Clinical Investigation...”

Transitional implants were developed to support fixed provisional restorations. They also allow for load free osseointegration of conventional implants and provide a patient with immediate esthetics and function (1-7).

Transitional implants have many diverse applications. The foremost advantage of any TI system is the delivery of a stable fixed provisional prosthesis prior to or at the time of conventional implant placement. Transitional implants may function as dependable anchors for restorations functioning during healing of bone grafts and sinus lifts (8, 9), (Fig. 1 a-b). They may also facilitate accurate implant placement providing improved stability of the surgical template (10). Transitional implants have also been used for orthodontic anchorage and overdenture support (11-15). Small diameter implants formerly used as only TI can now be used for other applications including use in areas of limited bone (Fig. 2 a-d), limited space (Fig. 3 a-d), in physically impaired patients, and with patients who have limited finances (16-18).

A study performed at the Ashman Department of Implant Dentistry at NYU College of Dentistry, documented an overall survival rate of TIs supporting screw retained restorations of 83.3% (50/60). The survival rate in the maxilla was 62.50% (10/16) and in the mandible was 90.09% (40/44) (19).

Historically, transitional implants show osseointegration similar to conventional implants. Zubery et al. showed that the mean BIC (Bone to implant contact) of loaded implants placed in each side of the mandible in dogs was 46.1% (20). Froum et al. histologically evaluated TIs placed in humans and documented an average percentage of BIC of 52.9% ± 13.81 (21). This was similar to that of conventional machined surface implants as documented in the literature (22-24).

In a removal torque study by Simon et al., 55% of transitional implants demonstrated torque values above 20 Ncm which is also similar to that of conventional implants (25).

In a number of clinical cases, the TIs were retained for longer time periods than originally planned. These functionally loaded implants continued supporting fixed and removable restorations. The purpose of the present study was to investigate the survival rate of TIs using FDA submitted data, and to determine if the indications for the small diameter implants can be expanded to include long term use.

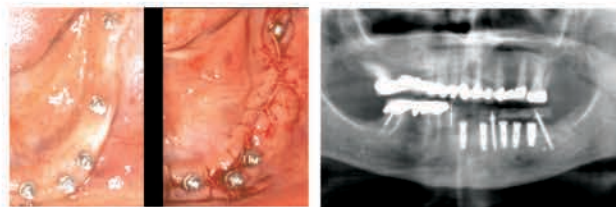


Fig 1a SDI placed (Left) & bone augmentation (Right)

Fig 1b Panorax after SDI & augmentation



Fig 2a Thin knife ridge with buccal concavity (Right)

Fig 2b Thin knife ridge with buccal concavity (Left)



Fig 2c SDI & supporting fixed provisional restoration

Fig 2d SDI & supporting fixed provisional restoration

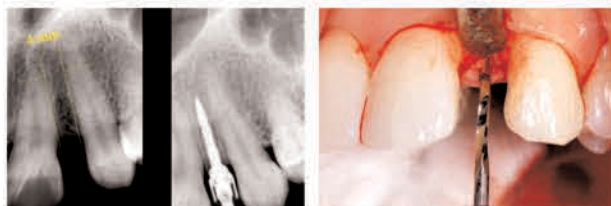


Fig 3a SDI placed in the maxillary left lateral incisor

Fig 3b Osteotomy using profile drill



Fig 3c Maxillary left lateral incisor prior to extraction

Fig 3d Small diameter implant supported restoration

MATERIALS AND METHODS

Clinical data in this study was obtained from information stored in the New York University School of Medicine Institutional Board of Research Associate (IBRA) approved anonymous data base (ADB). This consists of a pool of patient information from patients who had received dental implants at the Ashman Department of Implant Dentistry at NYU College of Dentistry Kraser Dental Center and at 10 other study centers. This study was approved by IBRA and is in compliance of Health Insurance Portability and Accountability Act (HIPAA) requirements.

Patients in this retrospective study were selected from a pool of patients who were treated in 11 centers (New York University Department of Implant Dentistry, University of Sao Paulo and 9 private clinical practices). Between 1993 and 2004 seventy-seven patients (31 male and 46 female), mean age of 55 years (range 17 to 93 years), received a total of 297 transitional implants with different planned functional times prior to removal. One hundred fifty five of the 297 TIs were placed in the maxilla and 142 in the mandible. The transitional implants were all manufactured by the same company (Dentatus USA) and were made of commercially pure titanium (cp Ti; grade 1) with machined surfaces. Fixed, removable and denture supported small diameter implants were used in a ratio of 66:3:9.

RESULTS

A total of 297 implants were placed in 77 patients in 11 different centers. Forty-two of these implants failed. This represents an overall implants survival rate of 85.9% (Fig. 4). The survival rate in the maxilla was 79.4% (123/155) and in the mandible was 93.0% (132/142) (Fig. 5). At the time of data collection one hundred twenty-nine small diameter implants in 38 patients were placed and functioned for more than 36 months as a long term usage in the patients who had limited bone volume or limited space. One hundred twenty-six of the 168 implants placed as TI were successfully retained supporting fixed provisional prostheses for the time period planned prior to removal.

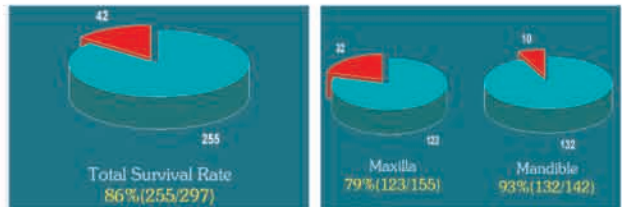


Fig 4 Total survival rate

Fig 5 Survival rate of maxilla vs mandible

DISCUSSION

Clinical (26, 27) as well as histological evidence (28-30) of osseointegration has been demonstrated with nonsubmerged, immediately loaded implants. Based on previous reports, splinting, with primary stabilization of individual immediately loaded implants was recommended to keep implant micromovement below a critical level and allow osseointegration (31). Albrektsson and Jacobson (32) reported that the bone-to-implant interfacial reaction was not determined by factors relating to the implant surface alone. They stated that parameters such as surgical technique and loading conditions were equally important for reliable osseointegration.

Godfredsen and Karlsson (33) showed a survival rate of 95.1% for the conventional machined implants that supported fixed partial prostheses in the mandible premolar area.

Simon and Caputo (25) evaluated removal torque of immediately loaded transitional endosseous implants in humans. Thirty-one 1.8 mm diameter transitional implants were placed in 4 patients to support provisional restorations and were subjected to immediate loading. Removal torque values were recorded using a modified ITI torque driver. These values were significantly lower in the maxilla (16.1 ± 4.8 Ncm) than in the mandible (24.0 ± 7.3 Ncm). They reported that stronger integration occurred in the mandible compared to the maxilla, and removal torque levels of these implants indicated varying degrees of integration.

Froum et al. (21) showed similar percentages of BIC regardless of whether the TIs were placed in the maxilla or mandible. This may have been a function of the location and the type of native bone present in the areas in which the TIs were placed. Proussaefs (34) reported that histologic evaluation of a single immediately loaded TI in function for 18 months in the mandibular arch of a 52-year-old woman revealed 81.3% BIC. He suggested that immediately loaded TIs could potentially achieve and maintain a high degree of osseointegration for a longer period of time than that currently expected (3 to 6 months).

The clinical integration and bone to implant contact (BIC) of TIs noted in previous studies may suggest a change in TI protocol. The present study showed a high survival rate of small diameter implants in function for a minimum of 36 months post insertion. Long-term studies are necessary to determine if these implants require removal or can function alone or in conjunction with permanent implants in the definitive restoration.

CONCLUSION

Small diameter implants were placed and functioned for various time periods in the maxilla and mandible. The overall survival rate of the 297 implants placed in 2 Universities and 9 private dental practices was 85.97%. The survival rate in the maxilla (79.4%) was less than that in the mandible (93.0%). More studies documented over longer time periods are necessary to determine if small diameter implants may be used as permanent implants or in combination with conventional implants.

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This Research was Approved by IRB (H12370-01B) and Sponsored by New York University Department of Implant Dentistry Alumni Association (NYUDIDAA) and the Office for International Programs