JOURNAL OF BIOLOGICAL REGULATORS & HOMEOSTATIC AGENTS Vol. 29, no. 3 (S1), 29-33 (2015)

SURVIVAL RATES OF NARROW *VERSUS* STANDARD DIAMETER IMPLANTS IN DIFFERENT TREATMENT OPTIONS: A RETROSPECTIVE STUDY

U. DELLE DONNE[1], W. BONI[1], G. CORRADINI[1], L. TETTAMANTI[2] and A. TAGLIABUE[2]

[1]Private practice, Milan, Italy; [2]Department of Surgical and Morphological Sciences, University of Insubria, Varese, Italy

Implant dentistry has had a great success in the last decades for replacing missing teeth; however, implant surgery needs bone availability. The use of narrow diameter implants (NDIs) may be an alternative approach in patients with atrophic maxilla or mandible. The aim of this study is to perform a study on NDIs to evaluate their survival rate. In the period between January 2008 and December 2013, 877 patients (498 females and 379 males) were operated at the BDD private Practice Clinic (Milan, Italy). The mean post-surgical follow-up was 30±17 months (max – min, 84 – 1). One thousand three hundred and forty-six implants (EDIERRE Implant System SpA, Genoa, Italy) were included in the present study, 112 (8.3%) 3.3 mm (i.e. narrow) and 1,234 (91.7%) 3.75 mm wide. All patients underwent the same surgical protocol and agreed to participate in a post-operative check-up program. SPSS program was used for statistical analysis. Survival rate (SVR) was 97.25% since only 37 fixtures were lost from a total of 1,346 implants. Cross-tabulation between failure diameter did not demonstrate any statistical differences between narrow and standard diameter implants. NDIs are reliable devices for oral rehabilitation.

Implant dentistry has had a great success in recent decades for replacing missing teeth; however implant surgery needs bone availability. A large number of surgical techniques may allow to increase maxillary and mandibular bone amount, such as small and big sinus lift, autologous bone graft, split crest, post-extraction, transposition of mandibular nerve, osteogenic distraction. However, these additional surgical techniques may present complications or failures and delay fixture osseointegration and prosthetic rehabilitation. The use of narrow diameter implants (NDIs) may be an alternative approach in patients with atrophic maxilla or mandibular (1, 2). In long-term totally edentulous patients with atrophic ridges, insertion of NDIs loaded with an overdenture may dramatically improve retention of the denture. In particular, patients wearing a lower denture usually complain of the poor retention. Patient compliance is directly related to the amount of denture retention which can be improved by fixture insertion (3). The introduction of NDIs, avoiding surgical techniques for increasing bone width, has therefore improved patient compliance towards implant dentistry (4). Pommer et al. (5), in a recent study, reported that patient satisfaction with graftless solutions for implant rehabilitation of completely edentulous jaws is generally high. Patients show negative appeal to invasive bone graft surgery (6). Flannagan (7) demonstrated that mini dental implants might successfully be used to support fixed partial dentures in mandibular sites in highly selected patients. Barikani et al. (8), evaluating the

Key words: augmentation, bone, graft, implant, narrow

Mailing address: Dr. Lucia Tettamanti,
Department of Surgical and Morphological Sciences,
University of Insubria,
21100 Varese, Italy
e-mail: lucia.tettamanti@uninsubria.it

0393-974X (2015)

DISCLOSURE: ALL AUTHORS REPORT NO CONFLICTS OF INTEREST RELEVANT TO THIS ARTICLE.

influence of mechanical characteristics of the implant on primary stability in different bone types, based on resonance frequency analysis (RFA), concluded that primary stability is not influenced by implant length and diameter, but by the different bone types.

NDIs have a diameter from 3 to 3.3 mm. Since a new type of implant (EDIERRE Implant System SpA, Genova, Italy) was recently distributed, we decided to perform a retrospective study on NDI to verify whether there are any differences in respect to standard diameter implants.

MATERIALS AND METHODS

Patients

In the period between January 2008 and December 2013, 877 patients (498 females and 379 males) were operated at the BDD private Practice Clinic (Milan, Italy). The mean post-surgical follow-up was 30±17 months (max – min, 84 – 1). One thousand three hundred and forty-six implants are included in the present study, 112 (8.3%) 3.3 mm (i.e. narrow) and 1234 (91.7%) 3.75 mm wide. All patients underwent the same surgical protocol and agreed to participate in a post-operative check-up program.

Subjects were screened according to the following inclusion criteria: controlled oral hygiene, absence of any lesions in the oral cavity, sufficient residual bone volume in order to receive implants of at least 3.3 mm in diameter and 9 mm in length.

The exclusion criteria were as follows: insufficient bone volume, a high degree of bruxism, smoking more than 20 cigarettes/day and excessive consumption of alcohol, localized radiation therapy of the oral cavity, antitumor chemotherapy, liver, blood and kidney diseases, immunosupression, corticosteroid treatment, pregnancy, inflammatory and autoimmune diseases of the oral cavity, poor oral hygiene.

Data collection

Before surgery, radiographic examinations were carried out with the use of an orthopantomograph and CT scan.

The implant survival rate (SVR) was evaluated according to the following criteria: (1) absence of persisting pain or dysesthesia; (2) absence of peri-implant infection with suppuration; (3) absence of mobility; and (4) absence of persisting peri-implant bone resorption greater than 1.5 mm during the first year of loading and 0.2 mm/year during the following years.

Surgical protocol

All patients followed the same surgical protocol.

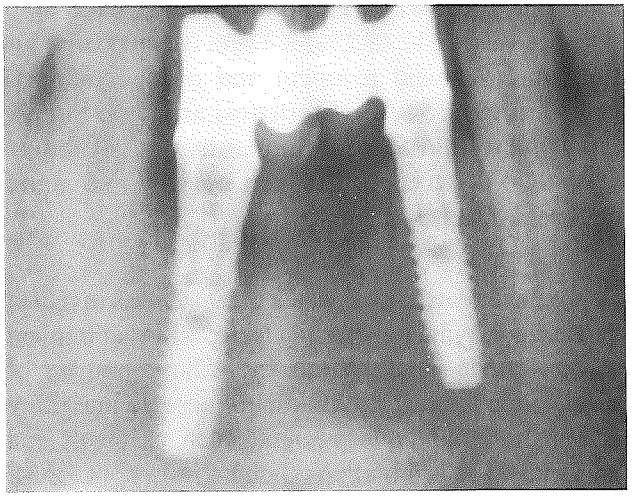

Fig. 2. *Post-surgical X-ray after one and half years of follow-up.*

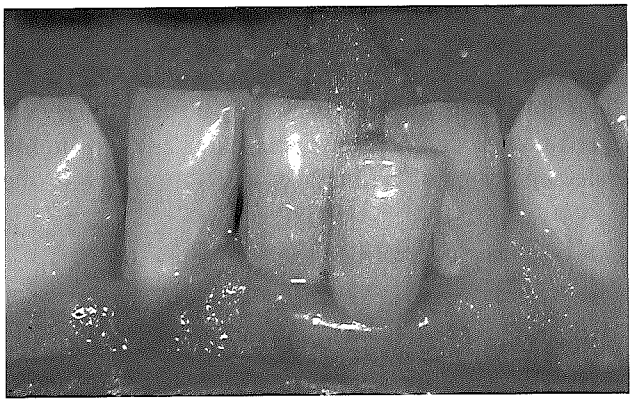

Fig. 1. *Intraoral photo.*

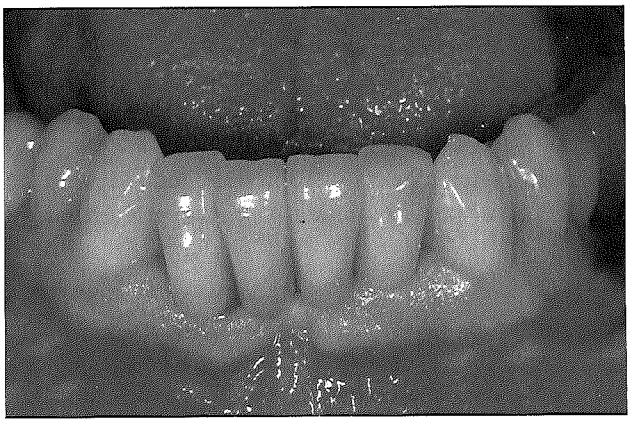

Fig. 3. *One and half year intraoral photo.*

The anaesthesia of the jaw was obtained by the injection of articaine and post-surgical analgesic treatment was performed with 100 mg of ketoprophene 3 times a day, if necessary. An antimicrobial prophylaxis was administered with 500 mg Amoxicillin twice daily for 5 days starting 1 hour before surgery. NDI were inserted in both jaws. Three surgeons (U.D.D., W.B. and G.C.) inserted all implants. Patients agree to follow a strict oral hygiene protocol and recall (Fig. 1 to Fig. 3).

Implants

A total of 1,346 fixtures were inserted: 674 (50.1%) in the mandible and 672 (49.9%) in the maxilla. One hundred and twelve (8.3%) implants had a diameter of 3.3 mm (i.e. narrow) whereas 1,234 fixtures (91.7%) had a diameter of 3.75 mm (i.e. standard). There were 73, 367, 467, and 439 implants with 9, 11, 13 and 15 mm length, respectively. Four hundred and sixty-six were immediate loaded whereas 306, 344, 192, and 38 were loaded after 3, 4, 6, 8 months, respectively. Implants were inserted to replace 326 incisor (24.2%), 107 cuspids (7.9%), 539 premolars (40.0%) and 374 molars (27.8%). One thousand one hundred and seventy-three fixtures were inserted with 35 N torques whereas the remaining 173 with a lower torque. Three surgeons (U.D.D., W.B. and G.C.) inserted all implants.

Statistical analysis

SPSS statistical program was used. Cross tabulation between variables and failures was performed and Pearson *Chi*-square test was used to detect those variables potentially associated with lost implants.

RESULTS

Survival rate (SVR) was 97.3% since only 37 fixtures were lost from a total of 1,346 implants. Cross-tabulation between failures and studied variables did not detect any statistical significant difference between narrow and standard diameter implants.

DISCUSSION

For osseointegration success the use of standard implants is recommended to obtain correct bone to implant contact. If the bone width is insufficient for the placement of standard implants, an implant-prosthetic rehabilitation with NDIs may be a good solution. NDIs are used in areas where ridge dimension is narrow or space is limited. These conditions are frequently found in jaws, in particular in premolar and incisors sites. Lack of sufficient space for a standard implant is also common in cases of agenesis.

Maiorana et al. (9) presented data showing stable marginal bone levels as well as healthy soft tissue around early loaded narrow-diameter OsseoSpeed™ TX 3.0 implants inserted in upper and lower incisors, after 3 years of function. The investigators found that a longer healing period before crown placement and loading associated with a stable probing pocket depth and a stable crown-gingiva distance contributed to statistically significant less marginal bone loss between loading and the 1-year follow-up visit, using a one-stage surgical procedure allowing to maintain the integrity of the peri-implant soft tissues.

Jawed (10), in a recent study, concluded that the role of implant diameter on long-term survival of dental implants placed in posterior maxilla is secondary to a well-designed surgical protocol, sufficient primary stability, and pre- and post-surgical oral hygiene maintenance.

Another study (11) confirmed that the use of NDIs was able to provide a statistically significant reduction in need for bone grafting among completely edentulous patients. Lambert et al. (12) reported that the use of NDIs to restore partial dentation in sites with limited horizontal bone thickness.

It is generally accepted that reduced diameter means a reduction in the contact surface between the implant and the bone, and in this case, osseointegration could be insufficient to withstand occlusal forces, and the risk of overloading is increased (12, 13). In addition, bone quality, a host-related factor, is believed to be one of the strongest predictors of implant outcome (14-16).

Previous studies have found SVR of NDIs is similar to standard implants (17-19). No differences were found in respect to tooth site or jaws. Analogue results were also obtained with different supported prosthesis, partial fixed prosthesis in respect to overdenture and full arch rehabilitation. Immediate loading could potentially affect NDI outcome. Oral hygiene and bacterial loading can affect SVR (20-22).

Our results give additional strength to the fact that NDIs can be successfully used and that fixtures from EDIERRE Implant System SpA, Genova, Italy

are reliable devices for oral rehabilitation.

ACKNOWLEDGEMENTS

We thank Prof. Francesco Carinci for statistical support and manuscript revision.

REFERENCES

1. Hirata R, Bonfante EA, Machado LS, Tovar N, Coelho PG. Mechanical evaluation of four narrow-diameter implant systems. Int J Prosthodont 2014; 27(4):359-362.
2. Scarano A, Murmura G, Carinci F, D. L. Immediately loaded small-diameter dental implants: evaluation of retention, stability and comfort for the edentulous patient. European Journal of Inflammation 2012; vol. 10:19-24.
3. Danza M, Lauritano D, Carinci F. Successful rehabilitation of partial edentulous maxilla and mandible with new type of implants: molecular precision implants. Case Rep Med 2014; 2014:307364.
4. Fogli V, Camerini M, Lauritano D, Carinci F. Success and high predictability of intraorally welded titanium bar in the immediate loading implants. Case Rep Dent 2014; 2014:215378.
5. Pommer B, Mailath-Pokorny G, Haas R, Busenlechner D, Furhauser R, Watzek G. Patients' preferences towards minimally invasive treatment alternatives for implant rehabilitation of edentulous jaws. Eur J Oral Implantol 2014; 7 Suppl 2:S91-109.
6. Franco M, Viscioni A, Rigo L, Guidi R, Zollino I, Avantaggiato A, Carinci F. Clinical outcome of narrow diameter implants inserted into allografts. J Appl Oral Sci 2009; 17(4):301-306.
7. Flanagan D. Mini Implants Supporting Fixed Partial Dentures in the Posterior Mandible: A Retrospective. J Oral Implantol 2014.
8. Barikani H, Rashtak S, Akbari S, Badri S, Daneshparvar N, Rokn A. The effect of implant length and diameter on the primary stability in different bone types. J Dent (Tehran) 2013; 10(5):449-455.
9. Maiorana C, King P, Quaas S, Sondell K, Worsaae N, Galindo-Moreno P. Clinical and radiographic evaluation of early loaded narrow-diameter implants: 3 years follow-up. Clin Oral Implants Res 2015; 26(1):77-82.
10. Javed F, Romanos GE. Role of implant diameter on long-term survival of dental implants placed in posterior maxilla: a systematic review. Clin Oral Investig 2015; 19(1):1-10.
11. Papadimitriou DE, Friedland B, Gannam C, Salari S, Gallucci GO. Narrow-Diameter versus Standard-Diameter Implants and Their Effect on the Need for Guided Bone Regeneration: A Virtual Three-Dimensional Study. Clin Implant Dent Relat Res 2014.
12. Lambert F, Lecloux G, Grenade C, Bouhy A, Lamy M, Rompen E. Less invasive surgical procedures using narrow diameter implants: a prospective study in 20 consecutive patients. J Oral Implantol 2014.
13. Cha JY, Pereira MD, Smith AA, Houschyar KS, Yin X, Mouraret S, Brunski JB, Helms JA. Multiscale analyses of the bone-implant interface. J Dent Res 2015; 94(3):482-490.
14. Imam AY, Moshaverinia A, McGlumphy EA. Implant-abutment interface: a comparison of the ultimate force to failure among narrow-diameter implant systems. J Prosthet Dent 2014; 112(2):136-142.
15. Lauritano D, Palmieri A, Vinci R, Azzi L, Taglabue A, Carinci F. Adipose derived stem cells: basic science fundaments and clinical application. An update. Minerva Stomatol 2014; 63(7-8):273-281.
16. Sollazzo V, Carinci F, D. L. The biophysical stimulation of osteogenesis: a review. European Journal of Inflammation 2012; vol. 10:65-70.
17. Lee JS, Kim HM, Kim CS, Choi SH, Chai JK, Jung UW. Long-term retrospective study of narrow implants for fixed dental prostheses. Clin Oral Implants Res 2013; 24(8):847-852.
18. Mangano F, Shibli JA, Sammons RL, Veronesi G, Piattelli A, Mangano C. Clinical outcome of narrow-diameter (3.3-mm) locking-taper implants: a prospective study with 1 to 10 years of follow-up. Int J Oral Maxillofac Implants 2014; 29(2):448-455.
19. Temmerman A, Keestra JA, Coucke W, Teughels W, Quirynen M. The outcome of oral implants placed in bone with limited bucco-oral dimensions: a 3-year follow-up study. J Clin Periodontol 2015; 42(3):311-318.

20. Carinci F, Scapoli L, Girardi A, Cura F, Lauritano D, Nardi GM, Palmieri A. Oral microflora and periodontal disease: new technology for diagnosis in dentistry. Ann Stomatol (Roma) 2013; 4(2):170-173.
21. Scapoli L, Girardi A, Palmieri A, Testori T, Zuffetti F, Monguzzi R, Lauritano D, Carinci F. Microflora and periodontal disease. Dent Res J (Isfahan) 2012; 9(Suppl 2):S202-206.
22. Scapoli L, Girardi A, Palmieri A, Carinci F, Testori T, Zuffetti F, Monguzzi R, Lauritano D. IL6 and IL10 are genetic susceptibility factors of periodontal disease. Dent Res J (Isfahan) 2012; 9(Suppl 2):S197-201.