Welded titanium needle implants in treatment of bone atrophy

Indications, techniques and statistics

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The needle implants were designed and presented in the early 1960s by the French dentist Scialom. He understood that, using biomechanical properties related to implant divergence, thin cylinders of metal could ensure implant prosthetic structure reliability.

Initially, needle implants were made of tantalium. In 1972, thanks to Paoleschi, titanium became the material of choice for needle implants.

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Fig. 1: Needle implant 1.3 mm wide with its proper mandrel.

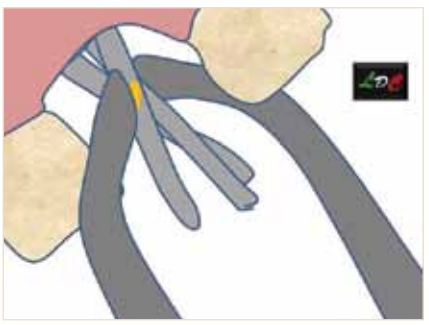

Fig. 2a: Scheme of intra-oral welding of a three-needles implant.

Fig. 2b: Picture after 20 years of a clinical case treated in the esthetic zone.

Fig. 2c: X-ray after 20 years of a clinical case treated in the esthetic zone.

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Following four months of integration, the soft tissue had healed nicely around the custom healing abutment, exhibiting optimal margins and gingival contours. The crown on tooth #8 was removed.

Removal of the custom healing abutment revealed an anatomically correct transitional contour between the implant and the restoration.

The matching gingival contours of the zirconia custom abutment conformed well to the emergence profile established during the healing phase.

The optimal esthetics, margins and emergence profile of the final IPS e.max® restoration were set up by the patient-specific contours of the custom healing abutment.

Clinical dentistry by Timothy F. Kosinski, DDS, MAGD

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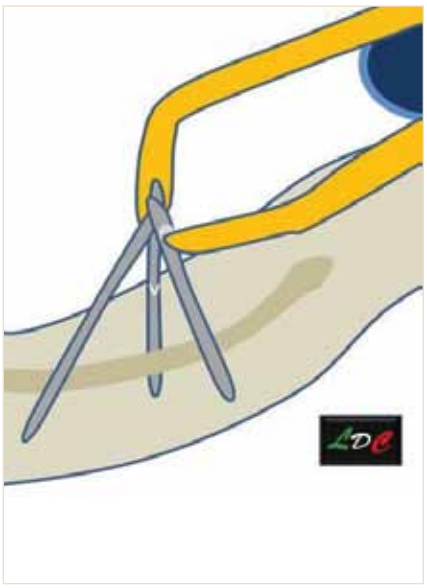

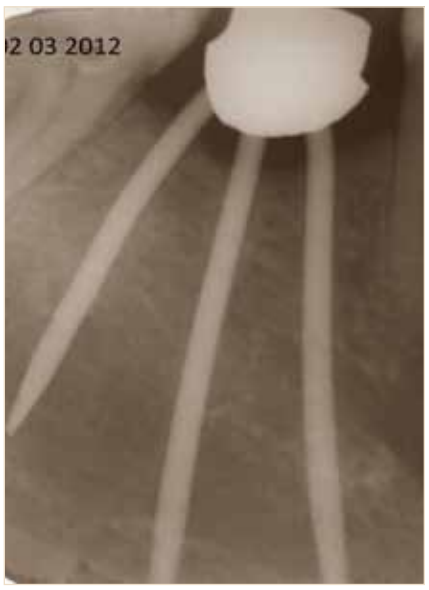

Figs. 3a-c: From left, the scheme and clinical case of three-needles implant used to treat D4 quality bone in zone 4.6; the five-year picture; and the seven-year X-ray.

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Needle implants are cylinders of titanium provided with a tip that ends with an obtuse angle, as to gently enter the bone tissue (Fig. 1). They are mainly used in diameters between 1.2 and 1.5 mm and lengths from 25 to 40 mm.

At the coronal end, there are two fins used for mounting on the mandrel that must be mounted on the surgical handpiece. The mandrel is provided with two grooves through which the fins of the needle enter. Needle implants go inside the bone tissue with a slow, swirling motion, using a surgical handpiece at low speed (double green ring, 25-30 rpm). The descent into the bone tissue is completed with a concave surgical chisel and hammer, stopping as soon as one hears the typical sound of the cortical bone reached in depth.

Needle implants require reliable means, which allow them to join together stably. During the '70s, Pier Luigi Mondani invented the intraoral welding machine, that allows an immediate connection of titanium implants. This apparatus was conceived to weld needle implants but can be successfully used as well to connect any titanium implant: emerging, submerged, endosseous or subperiosteal. The connection can be made either by welding a titanium bar to the implants or welding the implants directly to each other.

Indications

Welded titanium needle implants have some specific indications in cases of bone deficit, where the residual bone is sparse and therefore the stability of the implant system is entrusted to the cortical anchorage. The stability provided by anchoring to the cortical bone allows immediate loading. In particular, welded needle implants give very good results in the following situations of bone defect:

- upper anterior esthetic zone, as immediate postextraction implants (Figs. 2a-c);
- posterior inferior district characterised by rarefied bone (D3-D4) (Figs. 3 and 4);
- area below the maxillary sinus, exploiting the space between palatal and sinusal cortex (Fig. 5);
- as a support to other implants.

Statistical data

Between January 1996 and December 2012, we used 351 bicortical needle implants (ø 1.3 mm) in the posterior (behind the fourth) atrophic lower sector, during 77 surgical interventions, with immediate welding and loading. The implants were inserted in atrophic ridges of the D3 -D4 bone.

In this study, 85.7 percent of the patients were female, while male patients represented just 14.3 percent of the group. The average age of patients was 61.4 years, in a range from ages 26 to 83. The first evaluation of the patients was done using first-level X-ray examinations (intraoral and panoramic). For safety, we also used a TC to decide the direction of the implants along the side of the inferior alveolar canal.

After piercing the bone crest surface, the needle implant was mounted on the mandrel, and by a slow rotary motion, we arrived at the deep cortical bone. If you

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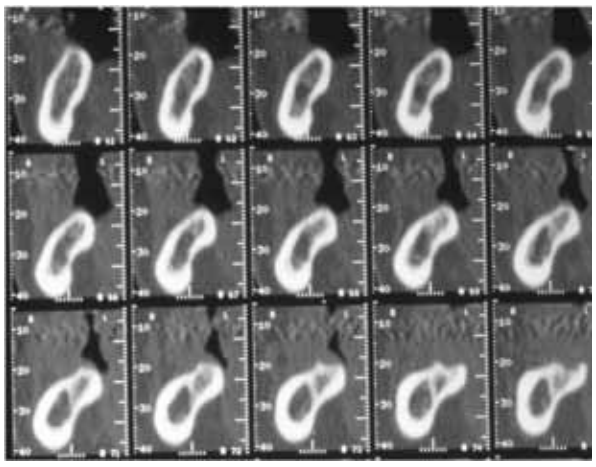

Fig. 4a

Fig. 4b

Fig. 4c

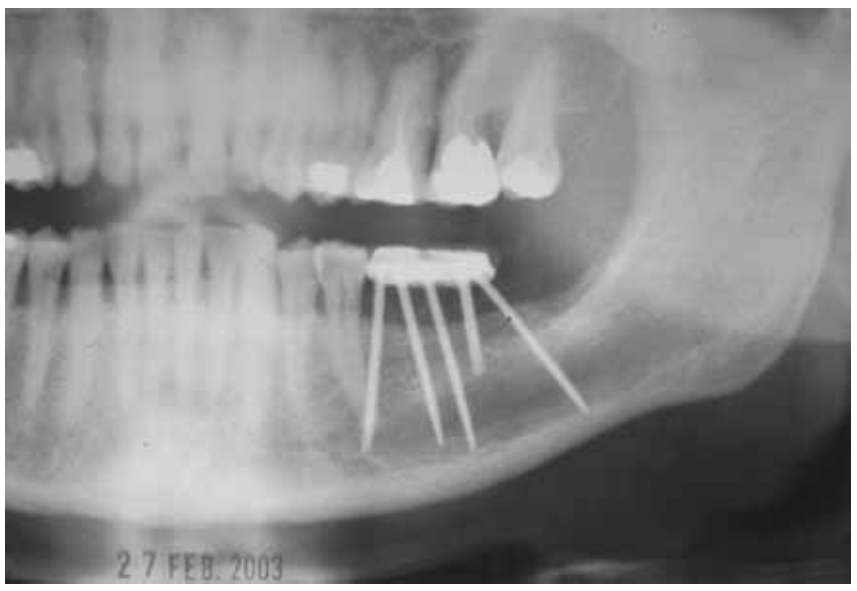

Fig. 4d

Fig. 5a

Figs. 4a-4d: Clinical case treated in the 36-37 zone: CT, picture during intervention, scheme of bar welding and X-ray with definitive prosthesis.

Figs. 5a-c:. Scheme, X-ray and 4-year picture of prosthetic bridge built on a three-needles implant embracing the maxillary sinus in the 4th zone and screw implant inserted in the tuberosity.

Fig. 5b

Fig. 5c

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are treating the lower back area and need to go along the inferior alveolar nerve side, it is advisable to be careful using a slow rotation (25-30 rpm), reversing the direction of rotation several times, which makes the descent of the implant much smoother and more accurate. When we arrived at the deep cortical bone, a gentle percussion allowed for affirmation of the typical "cortex sound," which gives the diagnostic confirmation that the implant has been placed accurately. The correct implant placement was verified by intraoperative X-ray.

The needle implants were put immediately in retention after insertion by intraoral welding of a titanium wire o bar. Actually, the welding of a series of deep bicortical needle implants guarantees immobility of the prosthesis on implants also when the bone is rarefied (Fig. 4).

Overall success of the implants studied during the 1996-2012 time period was 97.1 percent (341/351). Five-year success rate was 99 percent (296/299) and 10-year success rate was 95.8 percent (138/144).

Conclusions

The titanium needle implant is a valid therapeutic device, useful for dealing with immediate loading cases of atrophy in the esthetic zone, in the lower back area, in the seat below the maxillary sinus and as a support to other implants.

Mandatory requirement is that all the implants are bi-cortical and connected to each other by intraoral welding. They are not the first choice when the bone crest is thick and deep. This technique is suitable for cases in which bone is not particularly dense.

'The titanium needle implant is a valid therapeutic device, useful for dealing with immediate loading cases of atrophy in the esthetic zone, in the lower back area, in the seat below the maxillary sinus and as a support to other implants.'