Half a Century of Function A Retrospective Analysis of Tramonte Endosteal Screw Dental Implants that Lasted 50 and 36 Years. A Case Report

Introduction

The greatest expression of the circulation of this implant technique was represented by the national and international congresses held by the historic GISO (Gruppo Italiano Studi Implantari, Italian Implant Study Group), founded and directed by Giordano Muratori. From 1970 to 1997, the GISO conferences saw the participation of the most distinguished experts, documented by their published proceedings.

The recent conversion of delayed-load implantology to immediate loading has generated confusion in terms of concepts and definitions. The emerging implants used for immediate loading by the Swedish school, and identical to those employed for delayed loading, actually maintained the marked differences between the Swedish and Italian schools, since the immediate loading of the former is based on implants that are completely different from those employed by the latter. These substantial differences require a separate classification of the two approaches and identification by the names of the two schools to which they refer: the Italian school, on the strength of over half a century of experience, and the Swedish one, which has yielded to clinical and scientific evidence only recently.

Despite its belated acknowledgement of immediate loading, the Swedish school managed to produce vast literature in a very short time, thanks to its comprehensive and widespread presence within academia. Such literature comprises studies on the immediate loading protocol, realized with implants whose design features are still linked to delay loading. Therefore, we feel it is essential to clarify the matter with a written protocol that can be used as a reference for the immediate loading and implant techniques of the Italian school.

By observing the implant introduced by Stefano Tramonte in 1964 [1], it is possible to notice how different it was with respect to implant types introduced up to that time.

Abstract

To illustrate an endosteal implantology case treated with Tramonte screws in two steps, in 1966 and in 1980, and currently (in 2016) in perfect conditions after 50 and 36 years of function respectively.

Materials and methods: Two years after the introduction of titanium in implantology, two screw shaped Tramonte implants (grade 2 titanium) were used, realizing an immediately loaded implant rehabilitation that has been lasting in time, well before modern implantology trends.

Results and conclusions: After analyzing international literature, regarding the duration in time of implant success, most probably this case represents a testimony of the longest lasting functional prosthesis on an implant based structure.

Success and duration of implants depend on these fundamental factors: metal biocompatibility, oral hygiene, and most importantly, scrupulous systematic gnathological control of dynamic and centric occlusion.

Keywords: Tramonte screw, Time test, Titanium, Immediate loading
[2] (Figure 1). By introducing this screw, titanium started to be used in implantology [3], thus facilitating the realization of all subsequent implants [4].

At first (1959) Tramonte used screws cast in chrome-cobalt [5,6] (Figure 2), by making them with a thinner profile and honing their threads to make them sharper than the ones experimented 20 years earlier by the Strock Brothers, in Boston [7].

These implants were provided with a solid prosthetic abutment that continued into a robust core with a helicoidal, cylindrical, sharp thread. Their prostheses could be installed immediately, without waiting for healing osteogenesis.

Self-tapping Tramonte screws are some of the most important implant based prosthetic achievements of the 60s (Figures 3 and 4). They have evolved in time, but their principle has remained valid even now in the dental implant world [8]. Although they require a greater surgical skill with respect to other implant types, they allow performing the following:

1. Minimally invasive surgeries that often can be performed flaplessly.
2. A primary stability supporting immediate installation of temporary prosthetics, and further permanent prosthetics, without waiting for a lengthy stabilization by bone healing (osteointegration).
3. Great resistance to occlusal loads, as they oppose to them the depth of their levers, at the same time spreading the applied loads along the broad horizontal planes of their threads.
4. Transfer of occlusal loads to deep trabecular bone, thus sparing crestal bone from abnormal loads and consequent horizontal resorptions that may occur [9].
5. After insertion, the possibility to parallelize implants by bending their abutments directly in the mouth, then to prep them by using a tungsten carbide bit and immediately applying prostheses. After 60 days, where osteointegration is confirmed, temporary prostheses can be replaced by permanent ones.
6. This type of implant has the longest control time period offered by any current implant type, including blade implants [10-12], as Tramonte screws have been used by hundreds of implantologists during more than half a century.

Case Description

The authors declare that this study has been realized in
compliance with the ethical standards established in the Helsinki declaration, and that informed consent has been obtained from all participants before their inclusion in the study.

This case refers to a female Caucasian patient, aged 87 when this article was written. The patient was first treated in 1966 because of missing 23 – 26 teeth. At that time, Prof. Ugo Pasqualini, who performed the first surgery, inserted a Tramonte screw in position 24, as an intermediate pillar for a prosthetic rehabilitation 22 – 27 (Figures 5 and 6). The Tramonte endosteal screw implant made of grade 2 titanium has a thread diameter of 5 mm, its length is four spires (according to the identification classification adopted by the author), its core diameter 2 mm.

Such rehabilitation consisted of a threaded abutment applied on 22, with an internal thread to screw the prosthesis on it, a telescopic cap on 24 and another on 27 (Figure 7).

The bridge, manufactured in ceramic-gold, was screwed on 22 and cemented temporarily on 24 and 27. This was done because a missing canine, destined to support lateral disclosure movements, and the caution of the operator with respect to an implantology technique that was in its pioneer stages at that time, suggested not to insert implants in difficult anatomical areas, such as the one presented by the patient, very visible in the picture of that time (Figures 8 and 9).

The patient was examined periodically. In 1979, in one of the x-ray checks, a slight peri-implantitis was noticed at the emergence, limited to the first spire of the screw. Probably, this was due to an excessive load caused by the choice of inserting a single implant to help support a rather extended bridge. A slight diastasis may be observed along the lamina dura proximally to 27. It must be noticed, in the x-ray, that there is denser bone along the most apical spires of the screw, indicating lamellar bone deposition, indicating a morphological structural adaptation of the whole bone portion subjected to functional load propagation (Figures 10 and 11) [14-16].

In June 1980 the patient complained of a bridge mobility and
pain in 24 and 27, documented by clinical and x-ray images. The cause of such event was identified as failure of the root of 27, with consequent unscrewing of the screw holding the telescopic crown in 22, decementation of the bridge, and consequent implant pain (Figures 12 and 13).

Then the natural element 27 was replaced with a new Tramonte screw (Figure 14). The new Tramonte endosteal screw implant, made of grade 2 titanium, has a thread diameter of 4 mm, its length is four spires, and its core diameter is 2.25 mm. This surgery was performed by Dr. Marco Pasqualini.

After the soft tissues healed, it was loaded with a new 5 element prosthesis, with 22 still screwed on the threaded abutment inserted in the natural root. As the new bridge was placed, even the implant in 24, that was slightly painful, went back to a stable situation (Figure 15).

Figure 10: Bridge at the 13-year checkup, after modest periimplantar pain (arrow) (1979).

Figure 11: X-ray of modest periimplantar pain at the first spires of the screw and of the natural root.

Figure 12: The same bridge in June 1980. Notice the serious inflammation of the soft tissue around the implant.

Figure 13: X-ray highlighting the increased bone resorption around the first two spires of the implant. This resorption cupping later healed spontaneously with new bone growth after the permanent prosthesis was placed.

Figure 14: The implant inserted in 26 to replace the natural tooth (1980).

Figure 15: The new bridge. The arrow indicates the incisal discoloration of 21 (1980), present even after almost half a century (2014).
Figure 16: Cone beam performed 48 years after placement of the first screw proves the complete osteointegration of this implant. All this is documented by the 3D image, not showing any dehiscence.

Figure 17: Cone beam performed 34 years after inserting the second screw.

For both placements the dedicated surgical kit has been used, and the surgical protocol perfected by their inventor in the mid-60s has been followed [13].

Both implants have been monitored and documented with clinical pictures and x-rays from that time until the present. The patient, now 87 years old, presents some osteopenia but is otherwise in good health, active and lively.
Global results

X-ray and photographic controls performed 34 and 48 years later documented a complete osteointegration of the two Tramonte screws, and the total absence of any recession of adjacent tissues. There is no change in the bone tissue around the implants. Also, a targeted cone beam image underlines the formation of a pseudo-“lamina dura” around the implants (Figures 16-19).

Figure 18: In the sagittal section of 24 the complete integrity of the vestibular table can be noticed.

Figure 19: Same sagittal view of 26. Notice the bone thickening of the “lamina dura” type around the implant spire.

The modifications of the peri-dental tissue of the patient, who was 37 years old when the first implant was inserted, are interesting, as they demonstrate the physiological deterioration of the maxillary morphological conditions, while around the implants a bone tissue of good density is preserved (Figures 20-22).

Conclusions

This case report is one of the most complete clinical documentations ever performed to this day on implant-based prosthetics on immediately loaded emergent endosteal implants, on a single patient. It proves:

Figure 20: View of the palate soft tissues (2016).

Figure 21: The Bridge in 2016.

Figure 22: X-ray in 2016.
The complete healing of bone tissue without loss around the two immediately loaded Tramonte implants after 36 (1980 -- 2016) and 50 (1966 -- 2016) years of functional activity.

The lengthy lack of clinical signs of inflammation in the tissues around the implant emergence areas.

The absolute tolerance of a traditional type prosthesis, that has not caused any problems to the implants after half a century of function in a mouth with worsening conditions, both because of normal tissue losses due to aging, and because of decreased hygiene, frequent in aging persons.

**Discussion**

This work, encompassing 50 years of time, validates the design features of this implant as particularly suitable for immediate loading. This is confirmed by the first great histological research on the biological seal around implants in humans (1972) [19,20] performed during this time period. Further theoretical studies by Lemons on implant morphology biomechanics, and by James on the most suitable implant emergence to avoid bone resorptions around it, validate it further [21-23].

Also, we believe we can claim that the theoretical basics that have determined this implant design, among the first ones specifically conceived for immediate loading, have introduced an area of biological respect and introduced the use of titanium in implantology. Their results, proved by subsequent studies and research, are totally valid [16-18].

Immediate loading is a highly reliable and predictable technique, thanks to the possibilities offered by the welding of implants to titanium bars, the use of implants that can be parallelized immediately by bending their necks, the possibility of employing angled placement techniques that permit the installation of any design, making the surgical and prosthetic phases more effective, and - lastly - the possibility of finding a prompt solution to the lack of primary fixation that can always affect implants, regardless of the type of technique used. In most cases, complications and failures can be avoided through careful and correct diagnosis, and specific planning. Nevertheless, these complications can easily be overcome with quick, simple and effective solutions.

Tramonte’s endosteal screws, that are the first dental implants made of titanium in the history of implantology (1964), like all implants are not entirely risk-free. One of their limitations, albeit a relative one that is easy to surmount, is a consequence of the fact that they can be inserted into the bone directly through the soft tissue, with a quick and almost bloodless surgical procedure. This means that surgery must be performed on suitably large alveolar ridges free of undercutts. In case of doubt or based on personal preference, the operator can flap the mucosa for direct vision of the underlying bone.

The flapless approach is not compulsory for this protocol, but represents a variant of the traditional technique, and the surgeon should evaluate its use carefully while planning the procedure. Tramonte also added an ingenious bone caliper to his toolkit, which permits good assessment of any undercuts even during flapless surgery.

The last risk connected with the use of a self-tapping screw - fortunately quite rare but also the most serious - is the possible monolateral impact of the screw threads with an area of compact bone. This can potentially divert the screw insertion path outside of the osteotomy, leading to necrosis, ischemia and resorption of the compressed bone tissue, which will subsequently be expelled with the implant itself. An attentive operator will always detect a deviation of the screw and, being aware of the consequences, he/she must immediately remove it and modify the osteotomy, choose another implant site or replace the cylindrical screw with a conical implant [24,25].

In any event, self-tapping screws offer:

1) Virtually bloodless surgery, which can often be performed with a flapless approach;
2) Immediate stability, permitting immediate loading with a temporary prosthesis and then a permanent one, without waiting for later stabilization by reparative osteogenesis;
3) High resistance to occlusal loads, counterbalanced by the long lever arm of the implant as well as stress dispersion along the wide horizontal planes of the threads;
4) A longer history than any other current implant, since Tramonte’s screws have been used successfully by hundreds of professionals for more than four decades.

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**References**


