

ISSN 1824-0852

Trimestrale - Poste Italiane S.p.A. - Spedizione in abbonamento postale D.L. 353/2003 (convertito in legge 27/02/2004, n. 46, art. 1, comma 1, DCB Roma)
In caso di mancato recapito rinviare al C.P.R. Roma Romanina Stampa per restituzione al mittente previo pagamento resi

ANNALI DI STOMATOLOGIA

ORGANO UFFICIALE
DEL



A Journal of Odontostomatologic Sciences

Vol. LIII - No. 3 - July/September 2004 - Quarterly



CIC Edizioni Internazionali

ESTRATTO DA:

**Annali di
stomatologia**

Vol. LIII - No. 3 - July/September 2004

**EMERGING TRANSMUCOSAL SINGLE-STAGE IMPLANTS WITH ELECTRO-WELDING
AND IMMEDIATE LOADING**

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Autorizzazione del Tribunale di Roma n. 2472 del 28/12/1951



CIC Edizioni Internazionali

Emerging transmucosal single-stage implants with electro-welding and immediate loading

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Submitted for publication: 16/09/2004
Accepted for publication: 29/09/2004

Summary

Emerging transmucosal single-stage implants with electro-welding and immediate loading

The authors present an implant method that uses emerging transmucosal single-stage implants welded using an intra-oral electric solder.

Implant and welding techniques are described and the benefits, both for the surgeon and for the patient, are analyzed. The authors highlight the advantages of application post-extraction and immediate loading (even under difficult anatomical conditions) with minimum trauma.

Key words: emerging transmucosis monophasic implants, immediate loading, intra-oral electric solder, pin implants, post-extraction implants, screw-implants.

Sommario

Impianti emergenti elettrosaldati con riabilitazione protesica immediata

Gli autori presentano una metodica implantoprotesica che utilizza impianti emergenti ad ago e a vite solidarizzati con saldatrice intraorale.

Dopo aver descritto le caratteristiche di queste tipologie implantari e della saldatrice, elencano i vantaggi che questa metodica può offrire al chirurgo ed al paziente, come, fra l'altro, la possibilità di eseguire impianti post-estrattivi a carico immediato e in condizioni anatomiche difficili, con minimo traumatismo.

A dimostrazione di quanto presentato mostrano i risultati raggiunti con la descrizione di tre casi clinici.

Parole chiave: impianti emergenti, carico immediato, saldatrice intraorale, impianti ad ago, impianti post-estrattivi, impianti a vite.

Introduction

Intra-oral electro-welded implants constitute the basis of an implant method that uses emerging screw or pin im-

plants, joined by titanium bars, which are welded intra-orally during a single surgical session (Apolloni, 1989).

Screw implants, due to their self-tapping property, guarantee very high primary stability, whether or not they are used in association with pin implants, and they provide a means of overcoming, brilliantly, a number of anatomical difficulties. These devices are a valuable therapeutic tool in the prosthetic rehabilitation of both simple and complex clinical cases.

Devised by Parisian dentist, Scialom (1965), pin implants were introduced in Italy through the work of Mondani (1984), creator of the intra-oral electric solder, which facilitates and maximizes the use of these pins (Mondani, 1982).

There are many different types of screw, which are associated with their various creators; the most widely used are those developed by Tramonte (1965, 1971, 1989, 1966a, b) and by Garbaccio (1981, 1983).

Popular in the '70s, intra-oral electro-welded implants do not today enjoy the high profile they deserve. This is because of:

1. difficulties adhering to strict surgical protocols; and
2. greater interest in the use of the two-stage technique following the spread of the osteointegrative concepts proposed by the Swedish school in the early '80s (Branemark, 1977, 1983). These concepts were based exclusively on the application of the implants in two different surgical sessions and did not make provision for immediate loading or for the application of implants in the post-extraction sites, at least not for many months.

Conversely, emerging electro-welded implants immediately offer high primary stability, even in post-extraction sites (Apolloni, 2002) and allow the application, in the same surgical session, of temporary dental prostheses. Furthermore, the technique provides a means of overcoming the anatomical limitations of the intra-osseous implant technique, such as those seen in cases presenting reduced transverse bone tissue; finally, it does not require extensive and traumatic lifting of the oral mucosa, or invasive surgical procedures at bone level. All these are advantages that reflect the current trend towards less invasive methods (Riccardi, 2002).

Thanks to its particular characteristics, this method is indicated in the following cases:

1. patients not wanting to undergo to invasive surgery
2. old patients
3. cardiopathic patients
4. diabetic patients
5. hemopathic patients.

The most important advantage of this method for the patient is that it allows him/her to come out of surgery with the temporary elements already in place – and the functional, aesthetic and psychological benefits of this are considerable.

Furthermore, the fact that this implant method allows immediate loading (in physiological occlusion) makes it the one that most rapidly restores the entire stomatognathic apparatus to normal conditions; it also reduces the waiting time for application of the definitive elements.

In order to be able to apply the temporary elements immediately, at the end of the surgical session, the implants inserted must already offer good stability. This is achieved by means of the bi-cortical insertion of the implants (in different planes), after which they are welded together (Pasqualini, 2001).

To carry out this procedure, the intra-oral solder devised by Mondani is employed, which, with a very brief power delivery (less than two thousandths of a second), joins the two metallic surfaces by means of crystallization (i.e., a process of atom sharing that results in the creation of a crystalloid structure in the area of junction).

The solder, exploiting the high temperature that is generated on the welding surfaces by the considerable resistance of titanium to the flow of electric current, works by binding all those materials that, like titanium, are poor conductors of electricity, such as surgical steel and non-noble metal alloys.

Thanks to the very low conductivity of the titanium and to the brevity of the exposure to the electric current, no tissue damage results from this procedure. Furthermore, unlike industrial solders that operate only in the presence of argon and without oxygen in the atmosphere, this solder works in presence of oxygen, water, physiological oral fluids and blood.

The pin implants can have a diameter of 1.2, 1.3 or 1.5 mm, and they can vary in length between 27 and 40 mm.

Normally the pins are inserted using a method of rotation (a slow-rotating handpiece), or by means of pressure (using a pneumatic surgical mallet). Being extremely fine, the pins can safely be inserted even in thin areas of bone, such as those around the mandibular canals (Brusca, 2003).

Screw implants have varying lengths and diameters and are inserted using a mandrel following a minimum of preparation, the latter performed using a small-diameter surgical bur.

Clearly, the operator must ensure not only the stability required in order to achieve and maintain the osteointegration, but also the presence of a prosthetic structure that respects the principles of correct occlusion (Dal Carlo, 2003).

Materials and methods

This paper examines three selected clinical cases that required prosthetic rehabilitation treatment, due to the absence of dental elements and the extremely poor periodontal conditions of the remaining teeth. Before treatment the patients were informed about the procedures, verbally and in writing, and signed a written informed consent form. A detailed check-up was performed in order to gain a complete overview of the patients' state of health; x-rays (endo-oral and orthopantomographic) were performed and impressions were taken. Antibiotic

(amoxicillin 1 gram) and anti-inflammatory (sodium naproxen 550 mg) treatments were administered. The screw and the pin implants used, made exclusively of titanium certified for medical use in accordance with the ASTM F67 specification, the titanium bars, and the intra-oral solder were produced by "Acerboni Silvio" (Lecce, Italy) and conformed fully with all relevant legal requirements.

Clinical cases

First clinical case

The patient was a 54-year-old female, with advanced periodontitis of dental elements 13-12-11-21-22-23, which showed reconstructions of infiltrated composite material (Fig. 1). The other teeth had been absent for many years. Reduced bone thickness was observed in the lingual-vestibular aspects, and a very low maxillary sinus bilaterally (Fig. 2).

Anesthesia was performed and all the dental elements of the superior maxillae were extracted (Fig. 3). In the same surgical session, eight titanium screws were inserted, six in the sites of the extractions and two in distal sites (Fig. 4). The screws had diameters at thread level of 3.5 mm, 4 mm, or 4.5 mm, had three, four or five threads, and ranged in length from 25 to 30 mm (Figs 4, 5). All the screws, which offered good primary stability, were also welded together by titanium bars



Figure 1 - Initial situation.

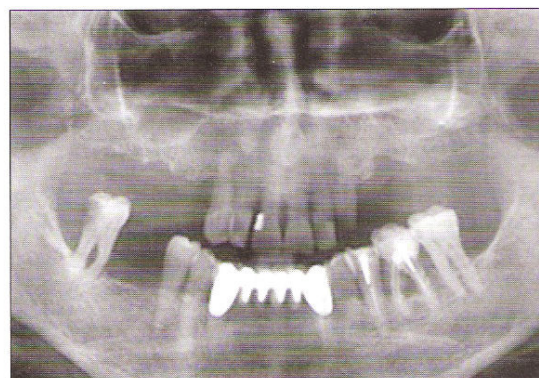


Figure 2 - Initial orthopantomography.



Figure 3 - Extractions of 13-12-11-21-22-23.



Figure 6 - Cut and soldered implants with titanium bars.

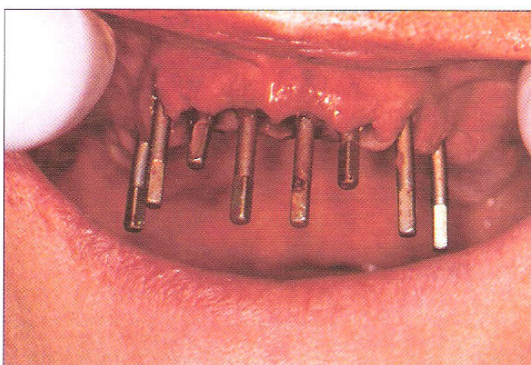


Figure 4 - Application of eight screw implants.

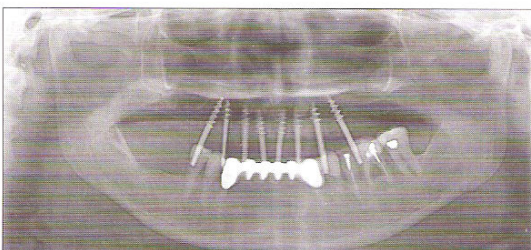


Figure 5 - Orthopantomography of the inserted implants.



Figure 7 - Smile with temporary crowns.

with the intra-oral solder; the parts of the screws left emerging were then cut off (Fig. 6). With this method we obtained an extremely rigid structure that linked and secured the implants and offered an adequate base for the overlying prosthetic structures. The stability offered by this implant system was such as to allow the immediate application of ten, fully functional temporary resin crowns (Fig. 7).

The post-surgical period was complicated only by the presence of many, painful aphthae, which nevertheless did not interfere with normal mastication.

Application of the definitive prosthesis was delayed for a few months in order to ensure complete stabilization of the post-extraction bone tissue rearrangements (Fig. 8).

Second clinical case

The patient was a 71-year-old female who presented conditions of very poor oral hygiene. Dental elements 23 and 24 were missing.

The woman, who had undergone a partial gastrectomy several months earlier, felt debilitated and wished to deal with the problem linked to her missing teeth in the most quick and painless way possible.

After performing local anesthesia, two screw implants and two pins were simultaneously inserted. The implants were then welded together using titanium bars (Figs 9, 10). Again, the primary stability achieved was great enough to allow the application of two temporary



Figure 8 - Smile with final prosthesis.



Figure 11 - Inserted temporary crowns.

crowns during the same surgical session (Fig. 11). The patient was discharged with the immediate functional restoration of the edentulous region and the post-operative period was uncomplicated.

Some months later – the delay was due solely to the patient's unwillingness to proceed sooner – the "small titanium wall" was finished using composite material (Fig. 12) to fill in the spaces between the welded metal parts. We were then able to take a precise impression of the mesostructure thus created, and consequently to apply the definitive crowns (Fig. 13).



Figure 9 - The two screws and the two pins, soldered.

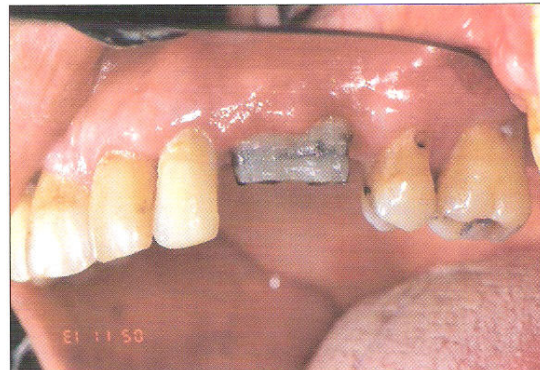


Figure 12 - The mesostructure finished with composite material.



Figure 10 - Orthopantomography of inserted implants.



Figure 13 - The definitive crowns (13 and 14).

Third clinical case

This patient was a 52-year-old female who had just completed prosthetic-implant rehabilitation in the left upper dental arch with submerged implants and was ready to proceed with restoration of masticatory function, a function lost years earlier in the right posterior region.

In this region the patient had an old, gold resin bridge on the upper arch, and at lower arch level a long-standing edentulous crest, with evidence of an involutional process that had involved both the oblique and vertical bone tissue depths (Fig.s 14, 15).

After discussing with the patient the different issues concerning the submerged implant method and the need, should this solution be chosen, first to carry out bone tissue regenerative operations, we together opted for pin implantation (Dal Carlo, 2001).

After carrying out infiltration anesthesia on the mucosal crest area (in order to obtain highly localized tissue anesthesia that would not include the lower alveolar nerve), the pins were introduced.

The pins were inserted deep into the mandibular bone tissue structure at different angles and, where possible, passing alongside the mandibular duct. The pins were inserted as far as they would go, i.e., until the presence of cortical bone prevented their being inserted further (Treves 1978 a, b).

The inserted pins, each one having a diameter of 1.2 mm or 1.3 mm, offered good primary stability. An orthopantomographic x-ray was performed (Fig. 16) before cut-

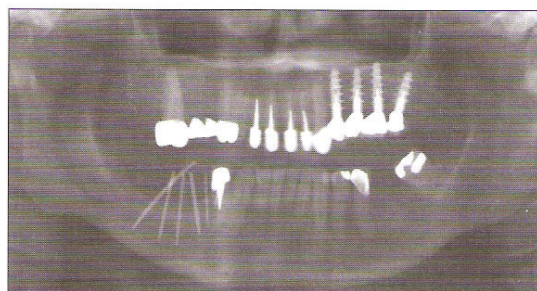


Figure 16 - The inserted pins.

ting the emerging parts of the pins at the target height (Fig. 17).

The whole operation was performed in perfect safety, thanks to the care taken to avoid a troncular anesthesia, which could mask surgical damage. We always check that the patient perceives the tactile stimulus produced by the point of a stylet on the labial and cutaneous region innervated by the right lower alveolar nerve.

After cutting, the pins were bent and welded together using small titanium bars (Fig. 18). Then, the structure obtained was finished with composite material (Fig.s 19, 20).

This procedure resulted in the creation of a mesostructure with regular and slightly diverging walls, which allowed the immediate application (Treves, 1978 c) of a previously prepared temporary crown (Fig. 21).

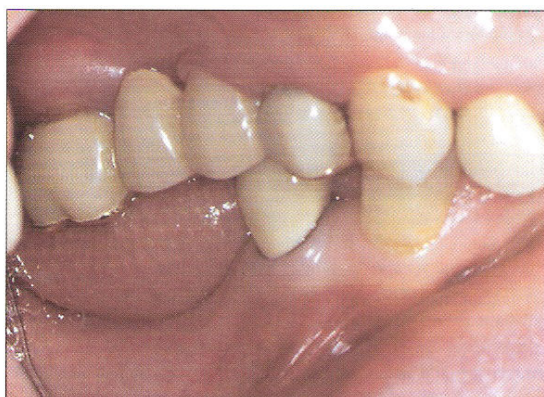


Figure 14 - Initial image.

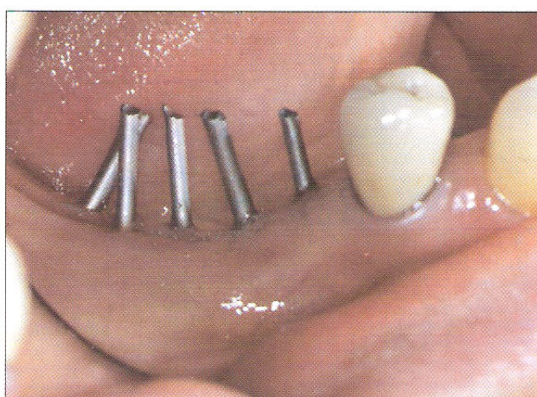


Figure 17 - The cut pins.

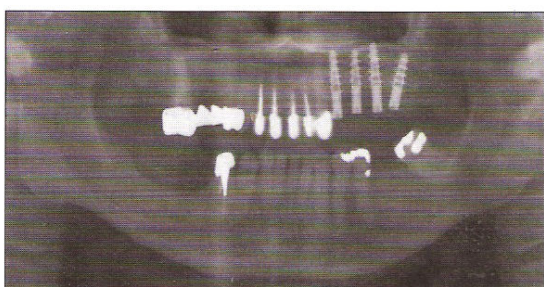


Figure 15 - Initial orthopantomography.



Figure 18 - The pins welded with titanium bars.

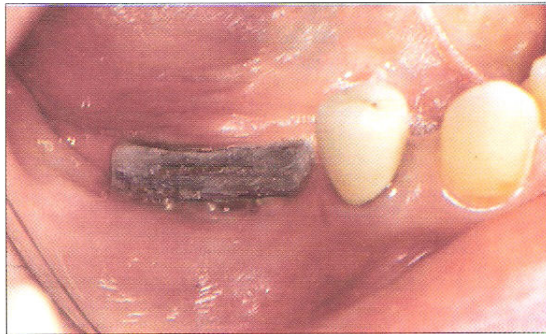


Figure 19 - The mesostructure finished with composite material.



Figure 20 - The mesostructure seen from above.



Figure 21 - The temporary crowns in occlusion.

The temporary crown was finished, care being taken to check its functioning (verifying the presence of correct mastication), and reducing its cervical region in such a way as to create a sufficient distance from the gingival area to allow correct oral hygiene.

The patient went home able to chew, and without feeling either pain or the effect of the anesthesia, thanks to the way in which the latter had been administered and managed.

Discussion and conclusions

It thus emerges clearly that the electro-soldered emerging implant technique offers remarkable opportunities. The first of these is the elimination of waiting times.

In fact, it is (now) possible to apply temporary crowns as soon as the implants are in place, and even immediately after the extraction of teeth.

The great advantage lies in the fact that immediate application of functional implants reduces considerably the otherwise unavoidable loss of alveolar bone tissue. Moreover, this technique favors the biocompatibility of the implant, i.e., the achievement of a stable functional balance between the artificial structure and the bone sustaining it (Bianchi, 1999, 1994), this biocompatibility being expressed in terms of secondary stability persisting over time and in conditions of loading.

Added to this, there are important aesthetic, functional and psychological advantages for the patient, who is not faced with protracted and debilitating delays, during which he/she must rely on movable dentures, which reduce his/her quality of life, particularly in cases in which the masticatory function and/or oral aesthetics are involved. Another great advantage is the remarkable reduction of biological costs, due to reduction of the surgical trauma even in cases of a complete prosthetic implant rehabilitation.

The result is a surgical approach that takes fully into account the patient's wellbeing, both psychological and biological: an approach that allows the restoration of correct and complete stomatognathic function, adapting the implant to the existing tissues, rather than forcing nature to adapt to our intervention (Brusati, 1977).

All this is entirely in accordance with the current, increasingly patient-oriented approach to medicine (in which the patient's wellbeing is a primary consideration, right from the very start of the therapeutic course) and with the trend, in surgery, towards less traumatic and less invasive treatments.

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