

Immediately loaded post-extraction implant

Case report and literature review



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BACKGROUND: Thanks to the recent scientific improvements, the insertion of immediately loaded post-extraction implants has become a routine, rather than elective, surgical treatment, which vaunts a success rate close to 100%.

AIM: The purpose of this study is to analyze the actual status regarding this field and to critically review the current available literature.

MATERIAL OF STUDY: A research was made in the Pubmed database, by using the keywords "immediate loading", "post-extraction", "dental implant", for studies published in the last 10 years. Sixty articles were selected in this review in order to investigate and define indications and counter-indications, benefits and disadvantages, pre-surgical evaluation and surgical technique, influential factors and available technologies for planning of this treatment.

RESULTS: The dental implants into fresh extraction sockets and their immediate loading is associated with a high success and survival rate, comparable with those obtained in case of conventional delayed loading. Many studies show the practicability and expectation of this procedure.

DISCUSSION: The immediate loading of dental implants reduces the risk for osteo fibro integration by inducing a more dense perimplant bone apposition. Factors that influence the success of this treatment are: patient selection, bone quality and density, micro- and macrostructure of the implant, surgical technique, control of occlusal forces, prosthesis guidelines and the achievement of primary stability.

CONCLUSIONS: It may be concluded that this surgical protocol, if well-managed, guarantees the desired implant-prosthetic outcome, shows a high aesthetic result and reduces treatment time, by ensuring the comfort and by making the patient satisfied.

KEY WORDS: Dental implant, Immediate loading, Post-extraction.

Introduction

In recent years, the attention of researchers has focused on the possibility of immediately loaded post-extraction

dental implants, reducing the number of visits and interventions (surgery), having an early function of the implant, with a high percentage of long-term success, equivalent to that obtainable in the case of early loading¹ and deferred loading². As well as in post-extraction sites, the immediate load implants can be placed in edentulous areas, as a result of complete bone healing, with good margins of success³. The predictability of the both result, clinical and radiographic, remains a considerable value also in case of implant insertion is accomplished without the creation of any flap, despite the dis-

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advantage due to the reduced visibility. The flapless technique decreases times and reduces intraoperative and postoperative pain and swelling, limiting the use of analgesics⁴⁻⁶; it is relatively simple, it can be used in a variety of clinical situations and it is generally preferred by patient⁷.

The indications of post-extractive immediate loading implant are^{8,9}:

- non-recoverable root fracture;
- not retractable endodontic lesions;
- intractable large root caries lesions;
- traumatic loss of dental element;
- avulsion of a deciduous tooth with agenesis of the permanent;
- root resorption;
- periodontal disease in which the bone quality and quantity is good enough to not require regenerative procedures¹⁰. According to other authors, to achieve predictable results, immediate loading should be avoided in sites with a history of periodontal disease, in which the success rate falls to 61%¹¹.

However, this surgical procedure is not universally applicable, but requires a careful patient selection, being contraindicated in the following cases¹²⁻¹⁴:

- residual alveolar cavities that require bone regeneration;
- absence of vestibular bone;
- bruxism and all overload occlusal situations^{15,16};
- smoking story (>10 cigarettes/day)¹⁷;
- in situ acute inflammation and chronic periapical lesions;
- poor oral hygiene;
- remarkable systemic diseases;
- inadequate primary implant stability. In this regard, Acocella¹⁸ and Cannizzaro¹⁹ recommend the immediately loading of implants whose insertion torque is equal to or greater than 40 N/cm; Heschl²⁰ proposes a torque value of at least 32 N/cm;
- the presence of a thin and scalloped periodontal biotype²¹. It is in fact known as the biotype often allows to achieve excellent surgical and prosthetic²² results, presenting a lower risk of recession and a better response by the peri-implant tissue^{23,24}.

Materials and methods

PREOPERATIVE EVALUATION

The possibility of proceeding to the immediate placement of a prosthesis stems from pre- and intra-operative clinical and radiographic evaluations, by virtue of which the load of the implants, even if planned before surgery, can be postponed during surgery itself. The choice of an immediately load is conditioned by the quality and quantity of the bone substrate, therefore, from the implant site²⁵. However, regardless of the surgical site, it is good practice to assess bone density by

preoperative computed tomography (CT); modern technology and equally valid is represented by Cone-Beam CT, which provides similar or even superior results to conventional CT.

Regarding radiographic examinations, the usual OPT may be replaced by an intraoral Rx that, thanks to the higher definition and resolution, ensures a more accurate planning of both the extraction and, after, the implant placement.

DENTAL AVULSION

The extraction of the tooth should be conducted in a completely atraumatic way, preferably with flapless technique (Fig. 1); when requesting a greater visibility of the operative field, you can set up a mucoperiosteal flap access, with release incisions about 2 mm from the papilla, in full respect of the soft tissues that will support the new implant²⁶.

The surgical technique will also be turned to the preservation of the vestibular bone structure, that, in the frontal region, with the highest aesthetic value, it is very thin. In this regard, once the extraction, a thorough review of the postextraction alveolous by spoon surgery will probe the residual bony walls to identify and assess any fenestrations or dehiscences that could easily lead to blemishes, or even worse, the failure of implant.

Finally, the extracted root enables us to confirm the length of the implant.



Fig. 1: Dental avulsion.

POSITIONING OF THE IMPLANT

According to Uribe et al. (2005) the favorable characteristics of the immediate loading are: conical shape, threaded macromorphology, rough surface, sandblasted and etched with acid, length of at least 10 mm²⁷.

Implant placement is the most critical phase of the entire surgical protocol and the key to success: it aims to achieve maximum primary stability especially at the apical level, prerequisite for carrying out immediate prosthetics. For this purpose, the diameter of the implant must be selected so as to ensure the most intimate relationship with the post-extractive bony walls. According to Qian et al., the use of reduced diameter implants, the shallow insertion in the bony ridge and the creation of an oblique load angle, are all factors that hinder the uniform distribution of the stress; on the contrary, the use of implants with appropriate diameter and with an optimized design of the neck, in combination with a suitable insertion, such that the thread of the neck is located well below the upper edge of the cortical bone – typically, 1 mm subcrestal (Fig. 2) – improves the biomechanical properties, significantly reduces the stresses and ensures an efficient and homogeneous distribution pattern of loads²⁸.

In the frontal area of the maxilla, because of the thinness of the vestibular bone, the major axis of the implant must be placed 1,5-2 mm more palatal than the imaginary line that connects the profile of vestibular bone of the adjacent teeth, in order to avert the risk of vertical bone resorption and inevitable soft tissue vestibular recession²⁹.

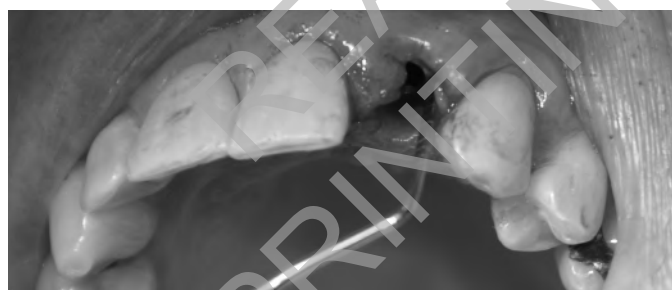


Fig. 2: Implant placement. The probing confirm the subcrestal insertion of the implant.



Fig. 3: X-ray control after surgery. The preservation of the alveolar lamina dura indicates that the dental avulsion was conducted in a completely atraumatic way. You have to note the appropriate depth of insertion of the implant.

The distance MD from the roots of adjacent teeth must not be less than 1,5 mm in order to avoid the physiological resorption of the interposed papilla, caused by reduced tropism and resorption of the interdental bony ridge. Already Tarnow (1992) had found that the presence of the papilla depends on the space existing between interproximal bony peak and contact point³⁰, observation still valid³¹. In particular, for distances ≤ 5 mm, the presence of the papilla is recorded in 98% of cases; this percentage is reduced to 51% when this distance increases to 6 mm, and to 27% for distances ≥ 7 mm, being able to detect an interproximal space not filled by the papilla, with the presence of the classical “black hole”³²; for which, during the implant-prosthetic rehabilitation in aesthetic areas, it is necessary to recreate the contact point more apically possible.

Once you have entered the implant, it is good to quantify the primary stability using insertion torque (IT), Periotest values (PTV), implant stability quotient (ISQ): the objective measurement of these indices provides a suitable algorithm for choosing of the appropriate treatment³³⁻³⁵.

On completion, an intraoral Rx will validate the correctness of the surgical procedure (Fig. 3).

PROVISIONAL RESTORATION

Following the implant placement, we proceed to the relining of a provisional prosthesis resin preformed around the abutment, paying attention to modeling the profile of the abutment for the proper management of the residual space between the extraction cavity and abutment itself (Fig. 4). It is good for this purpose to create a modeling of the profile in order to hold the soft tissues on the vestibular edge, while avoiding excessive compression that may induce shrinkage in the subsequent months of maturation. It is also necessary to maintain an adequate space to the papilla, recreating the contact point based on bone morphology and the state of the soft tissues of the site. In order to prevent any puffs of cement can affect the healing, it is preferred to use a provisional screwed implant. It should also perform a careful polishing of the provisional prosthesis, especially



Fig. 4: Provisional restoration. To note the proper closure, with a high respect of soft tissues.

at the level of the edge in contact with the mucosa, in order to abolish any irritative stimulus able to slow the healing.

In order to protect the implant from intense forces, it is recommended the adoption of a non-functional occlusal design, placing the provisional into sub-occlusion and neutralizing any contact with the dental antagonists elements, both in centric occlusion that in laterality and protrusion; it is understood that persist functional loads resulting from lips, tongue and food bolus.

RESIGNATION

The patient is resigned after presenting canonical post-operative recommendations:

- apply ice packs on the affected area for the next 3-4 hours;
- continue broad-spectrum antibiotic coverage up to 1 week of therapy;
- check for postoperative pain using NSAIDs (paracetamol, ibuprofen, diclofenac, nimesulide);
- avoid chewing on the implanted side, protecting it from any mechanical insult especially in the early days and up to the removal of any sutures, after about 7 days;
- do not brush the side, but clean with mouthwash chlorhexidine 0,2% three times/day.

Therefore, it will planned 4 weekly clinical monitoring during the first month and subsequent follow-up on a monthly basis until the fifth and sixth month (Fig. 5), when it will begin the final prosthetic phase.

PROSTHETIC FINALIZATION

After the usual healing period of 4-6 months we proceed to the final prosthesis.

It is good practice to evaluate the bone remodeling of the implant site by running a intraoral Rx; then you unscrew the components to verify healing and maturation of peri-implant soft tissues, induced by appropriate design of the temporary implant.

Following the ordinary procedures of taking the impression and testing structural components, you finalize the rehabilitation by positioning a titanium abutment (or zir-



Fig. 5: Clinical follow up to 6 months.



Fig. 6: X-ray control of the abutment and the crown in situ after prosthetic finalization.

conia for aesthetic sectors) and a metal ceramic or all-ceramic crown (Fig. 6).

The controls are programmed in a week, a month, six months, and progressively each year.

Results

The percentage of long-term success is considerable³⁶. The treatment of interforaminal region of the mandible boasts the highest percentage of success³⁷⁻³⁹, that after a period of 10 years is equal to 98.3%²⁰; even in the region of the lower molars, the results are encouraging: there are not significant differences in terms of success between immediate loading and delayed in these sites⁴⁰. Only the posterior region, being constituted by D4 bone type, is the most delicate area⁴¹, with a success rate that according to studies of Glauser et al. stood at 64%⁴².

Immediate loading of postextractive implant sites boasts a success rate of all comparable to that exhibited by implants placed after the period of bone alveolar healing¹⁻³.

Discussion

According to some studies, the immediate or early loading prevents the formation of fibrous tissue around the implant (encapsulation phenomenon)⁴³ and even seems to stimulate and accelerate the osseointegration process, improving the quality of the bone around the implant⁴⁴. A study by Barone et al. (2003) actually showed that the average profile of peri-implant densitometry, assessed by radiographic examination, is higher in the immediately loaded implants compared to traditional implants⁴⁵. Even at the level of the peri-implant soft tissues, it is possible to obtain results similar to those exhibited by conventionally loaded implants, both in terms of aesthetic and morphological functions⁴⁶.

Macro- and micro-mechanical retention of an implant is crucial for its immediate load⁴⁷; the success will depend on the following points: by obtaining adequate first stability⁴⁸⁻⁵¹, by the density of the bone in which they are positioned⁵²⁻⁵⁴ and by the absence of micromotion at the bone-implant^{55,56}, not only axial but especially oblique⁵⁷; in this regard it should be noted that the range of tolerable micromovements is between 40-50 and 150µ, beyond which it verifies the interposition of fibrous tissue and the failure^{58,59}.

As early as 1981, Albrektsson listed the six parameters essential for the achievement of osseointegration of an implant. It is now believed that: conditions of the receiving site (that is: state of the bone) and load conditions of the implant have significant preoperative diagnostic implications, while implant design, surgical technique and surface characteristics of the implant can positively or negatively affect the immediate load ⁶⁰.

Conclusions

This surgical procedure, properly managed, ensures the desired implant-prosthesis result and shows a remarkable aesthetic success, reducing the total time of treatment and ensuring comfort and satisfaction for the patient.

Riassunto

Grazie alle recenti acquisizioni scientifiche e all'affinamento della tecnica chirurgica, l'inserimento di impianti post-estrativi a carico dell'immediato è ormai intervento routinario anziché elettivo, che ostenta una percentuale di successo molto vicina al 100%. Oltre a ridurre il numero di sedute necessarie alla riabilitazione del sito edentulo e ad essere ben accolta dal paziente, tale tecnica è associata ad un minor rischio di osteofibrointegrazione, dal momento che il carico immediato indurrebbe un'aumentata deposizione di osso perimplantare, con una migliore profilo medio densitometrico. Le indicazioni a tale tipo di intervento sono rappresentate da ogni condizione in cui si richieda l'avulsione di uno o più elementi dentari, in assenza però di infezione del sito chirurgico, e riassorbimento osseo di gravità tale da richiedere una rigenerazione. La ritenzione macromeccanica e micromeccanica dell'impianto è fondamentale ai fini del suo carico immediato; il successo finale dipenderà dunque dall'ottenimento di un'adeguata stabilità primaria, dalla densità dell'osso in cui vengono posizionati e dall'assenza di micromovimenti all'interfaccia osso-impianto. Caratteristiche dell'impianto favorevoli al carico immediato sono: forma conica, macromorfologia filettata, superficie ruvida, sabbiata e mordenzata tramite acido, lunghezza di almeno 10 mm.

In conclusione, questa procedura chirurgica, opportunamente gestita, assicura il risultato impianto-proteico desiderato e attesta un pregevole successo estetico, riducendo il tempo totale di trattamento e garantendo comfort e soddisfazione al paziente.

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