

Comparison Between Immediate and Delayed Laser-Treated Implants Surface With Switching Platform: A Clinical Retrospective Study

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The aim of the present study was to compare immediate (Im) versus delayed (De) placement of laser-treated implants surface with switching platform to confirm the predictability and performance of this type of implant. The implants were placed in pos exodontia and healed sites at the incisor, canine, premolar, and molar regions of the maxilla or the mandible. A protocol was prepared in which patient age, sex, implant length, diameter, and use of bone graft were recorded. The study included 44 GEASS Srl (Udine, Italy) implants with laser surface and morse taper connection, placed in 27 patients (mean age: 56 years; range: 25–80 years). The survival rates were 100% in the Im group and in the De group. The patients were followed for a minimum of 12 months. Implants with laser surface and morse connection presented when placed in fresh sockets showed similar results to implants placed in mature bone after 12 months of follow-up.

Key Words: *laser surface implants, morse taper connection, immediate versus delayed implants*

INTRODUCTION

A number of scientific works have shown the predictability of osseointegrated in implant dentistry that complies with the biologic principles proposed by Adell et al and others.^{1–3} Among these principles was the need for complete healing of the alveolar bone before placing an implant into a fresh extraction socket, a process that usually requires 6 to 12 months. However, implants placed postextraction have proven to be a successful, predictable treatment modality.^{4–14} Some authors have argued that many advantages can result from placing dental implants into a fresh extraction socket. For example, it is easier to position them because of existing reference points, possible to preserve the alveolar bone and contour of the ridge, and it offers advantages for the patient including a shorter treatment time, reduction

in the number of surgical appointments, and less morbidity.^{15,16}

Placement of an implant into a fresh alveolus will usually result in a gap between the occlusal part of the implant and the bone walls. To ensure osseointegration of the entire implant, synthetic bone substitutes, membranes, bone grafting, osteoconductive substances, or a combination of these have been used to achieve bone formation in such defects. Autogenous bone and a variety of xenogenic graft materials have been employed in conjunction with immediate implantation, with many of them showing successful results. Animal studies have indicated that osseointegration of immediately placed implants in extraction sockets can be achieved without bone augmentation procedures, and with a success rate comparable to that of delayed implant placement.^{17–19} There are certain disadvantages that could jeopardize the success of immediate implant procedures, such as lack of soft tissue closure over the extraction site.²⁰

Otherwise the literature presents different aspects in macro and micro morphology of implants with designs with the aim better performance. The

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new concept of switch platform is described by the modern literature as an important factor for soft tissue support and lending to good esthetic result.²¹⁻²³ Some authors demonstrated good results with morse taper connection and consider that this type of connection reduces the peri-implant potential and bone loss.²² Modification of the surface topography of titanium dental implants to increase roughness is well known, commercially exploited, and widely investigated at the basic and applied levels.²⁴ Sandblasting, plasma spraying, and acid etching are the three most common approaches used by producers to alter surface topography and increase the surface area of implants. Many articles describe the outcome of specific surface topography on implant performances, either *in vitro*, *in vivo*, or in clinical trials.²⁵ Recently implant manufacturers proposed the use of new technology to promote roughness in the implant surface, as in the laser irradiation system. The laser interacts with the titanium, taking it directly from its solid state to plasma, and the particular laser wave length allows for the implant surface to be microfabricated without any dangerous effects. One of the goals reached by this surface is the ability to produce a surface with thousands of hemispheric pores in less than a minute, thereby reducing time and costs in the decontamination of roughening devices traditionally used (eg, oxides, acids).

The aim of the present retrospective clinical study was to confirm the predictability of titanium dental implants with laser surface and morse connection with switch platform compared in two conditions: immediate implantation in fresh sockets versus delayed placement.

MATERIALS AND METHODS

The patients who were referred to the author's clinic and the UNIFESO clinic for tooth extractions and tooth implant treatment at the incisor, canine, premolar, and molar regions of the maxilla or the mandible were consecutively included in this study. The reasons for tooth extraction included root fractures, periodontally compromised teeth, endodontic failures, and advanced caries lesions. In addition to clinical examination, intraoral, panoramic, and computerized tomography scan were taken for the preoperative evaluation of the implant site. Once patients were identified, individual charts

were recorded: age, date implant placement, medical history, region implant placement, additional surgical procedures, implants dimension, and type of prostheses. The IRB approval was not obtained, because it is a retrospective study and all patient information was kept confidential.

The exclusion criteria for the study were:

1. The patient was not able to give his/her informed consent to participate.
2. Health conditions that did not permit the surgical procedure
3. Patients with systemic contraindications to surgery
4. Uncontrolled diabetes
5. Patients who were treated with bisphosphonates in a long-term period
6. Patients with abuse of alcohol or drugs
7. Patient health or psychiatric problems
8. Irradiated patients

The implants were allocated in two groups to the immediate (Im) and healed sites (He), and a consistent surgical protocol was followed. Local anesthesia was achieved using lidocaine with 1:100 000 epinephrine (Abbott Laboratories, Abbott Park, Ill). In the immediate group a sulcus incision with a vertical releasing incision, mesial or distal to the extraction site was performed, and a mucoperiosteal flap was elevated. The teeth were luxated with an elevator and extracted carefully with forceps (attempting to preserve the bone of the alveolus) and sockets were debrided. After removal of granulation tissue from the socket, an implant with appropriate dimensions, determined on the basis of the presurgical radiographs, as well as the clinical evaluation of the recipient site at surgery, was placed. In the delayed group a supracrestal incision connected to a vertical releasing distal or mesial was performed and after flap detachment, the implants were placed. (Figures 1A-1C)

The site preparation and implant installation were performed with drill sequence and surgical protocol recommended by the manufacturer. Implant placement varied by area and position of the remaining bone. Immediate implants in esthetic zone were placed slightly to the palatal especially in incisors, canines, and premolar areas. In the maxillary and mandibular molar areas the implants were placed in the interradicular bone. When sinus lift was performed, either of the lateral

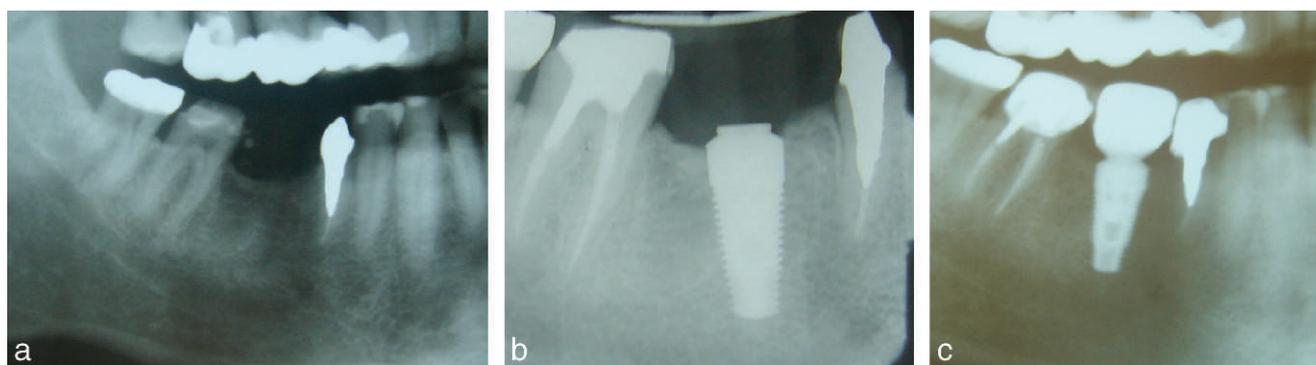


FIGURE 1. (a) Preoperative treatment. (b) Postoperative treatment with 5.5 Syntegra implant placed. (c) Prostheses rehabilitation treatment after 4 months.

windows was opened, and the osteotome was used to complete the implant preparation. The implants were placed leaving the platform 2 mm apical to most coronal height of the remaining crest. In cases of dehiscences, fenestrations and gaps between implant and alveolar walls at this operation, biomaterial (Binnovations, Biomedical, USA) or autogenous bone chips were grafted to defects (Figures 2A–2I).

Primary closure of the wound was achieved with 5-0 mononylon sutures, and Rehrman-plasty (periosteal incision) was used as the routine technique to seal the extraction after implant placement. In association with implant surgery, amoxicillin tablets (500 mg, 3 times daily for 7 days) were systemically administered, and pain control was achieved by tenoxycan tablets (20 mg, 2 times daily for 3 days). Medication was started 1 hour before surgery. The patients rinsed their mouth with chlorhexidine digluconate, 0.1% solution, for 1 minute twice a day for 7 days following implant surgery. All implants were placed by the same surgeon.

The week after surgery, sutures were removed and dental prophylaxis was introduced as appropriate. The patients were then seen once a week for the next 3 weeks for prophylaxis, instruction in oral hygiene, and monitoring of the healing process. During this time patients were restricted from using removable provisional partial dentures to avoid traumatizing the treated area, since the dentures were not esthetically required.

Subsequently, patients received postsurgical therapy once a month (mandibular implant patients for 3 months; maxillary implant patients for 5 months).

After a period of 4 months to mandible and 6

months to maxilla, second-stage surgery was performed for implant exposure, and periapical radiographs were obtained to document healing status. In the second stage the apically repositioned flap was used at healing abutment connection. The abutments, impressions were made for a fixed prosthetic restoration manufacturing. The implants of esthetic zone were used provisional crown to performed a soft tissue manipulation and promote a natural emergence profile. All implants were rehabilitated with fixed and cemented prostheses. The Implant survival criteria were defined by Albrektsson et al² and Buser et al.²⁵

RESULTS

Between July 2008 to June 2009 there were 27 patients (18 women, 9 men) with mean age of 56 years (range: 25–80 years) who were submitted to implant surgery. A total of 44 Way Syntegra implants (GEASS, Udine, Italy) were placed (27 in the maxilla, 17 in the mandible). The diameters of implants installed were 3.8 mm, 4.5 mm, and 5.5 mm with lengths of 10 mm, 11 mm, and 13 mm (Tables 1 and 2). The implants were allocated to the immediate (Im) group (24 implants) or the healed sites (He) group (20 implants). Five implants were placed in the anterior region: incisors 3 and canine 2 (4 Im, 1 He), 15 implants were placed in the premolar region: 12 in the maxilla and 3 in the mandible (8 Im, 7 He) and 24 implants in the molar region: 10 in the maxilla and 14 in the mandible. One implant was submitted to immediate load and four implants to sinus lift surgery (1 osteotome, 3 with lateral window). All patients were rehabilitated with fixed cemented prostheses installed after 4 and



FIGURE 2. (a) Postextraction site. (b) Syntegra 3.8 implant placed. (c) Autogenous bone chips. (d) Graft placed over defect. (e) Primary closure and flap suture. (f) Postoperative treatment. (g) Occlusal view of prostheses. (h) Final prostheses. (i) Final treatment.

6 months, for mandible and maxilla respectively. At the end of the healing period, during implant exposure, no implants showed visible signs of mobility, peri-implant infection, or bone loss. The patients were followed up for a minimum of 12 months and none of the implants failed, resulting in a survive success rate of 100%. One patient with

two implants in the molar area presented during radiographic control with bone loss in the collar after 1 year of prostheses installation. It was confirmed occlusal overload and the implants did not present peri-implantitis or signs of infection. After occlusal adjustment and good hygiene control the bone loss stabilized.

Implant No.	Patient Sex	Tooth Number	Diameter	Length	Final Followup
1	M	25	5.5	13	36 mo
2	F	36	5.5	13	36 mo
3	F	14	4.5	13	36 mo
4	F	21	5.5	13	35 mo
5	F	23	5.5	13	35 mo
6	F	24	3.8	13	35 mo
7	F	22	3.8	13	35 mo
8	F	36	5.5	13	35 mo
9	F	24	3.8	13	35 mo
10	F	16	5.5	13	32 mo
11	F	47	5.5	10	32 mo
12	F	46	5.5	10	32 mo
13	M	37	5.5	10	32 mo
14	F	17	5.5	13	31 mo
15	M	26	5.5	13	30 mo
16	F	26	5.5	13	30 mo
17	M	13	4.5	13	29 mo
18	F	26	5.5	11	29 mo
19	F	27	4.5	13	29 mo
20	F	25	4.5	11	29 mo
21	F	15	4.5	11	29 mo
22	F	35	3.8	13	26 mo
23	M	24	3.8	13	26 mo
24	M	15	3.8	13	25 mo

Implant No.	Patient Sex	Tooth Number	Diameter	Length	Followup
1	F	15	3.8	13	36 mo
2	F	12	3.8	13	36 mo
3	F	36	5.5	10	36 mo
4	F	37	5.5	10	36 mo
5	M	24	4.5	13	36 mo
6	M	14	4.5	13	36 mo
7	M	45	4.5	13	36 mo
8	F	25	5.5	13	36 mo
9	M	16	5.5	10	35 mo
10	F	47	5.5	10	32 mo
11	M	36	5.5	10	32 mo
12	F	26	5.5	13	32 mo
13	M	36	5.5	13	31 mo
14	M	46	5.5	13	30 mo
15	F	34	4.5	13	30 mo
16	F	36	5.5	10	30 mo
17	F	46	5.5	13	30 mo
18	F	36	5.5	13	30 mo
19	F	25	3.8	10	25 mo
20	F	26	3.8	10	25 mo

DISCUSSION

The main aim of this investigation was to evaluate the osseointegration success of implants with laser surface when placed into fresh extraction sockets in combination with particulated grafts or healed sites.

This clinical study compared the implant survival rates and did not present significant differences between the two treatment groups. This study corroborated with literature that immediate implants are associated with a high level of predictability, comparable to of implants placed in healed sites.⁴⁻¹⁴ Some authors assert that a better preservation of the marginal bone at the extraction site can also be achieved with an immediate postextraction implant placement.^{15,16} Otherwise some authors consider that implants with surface treatment offer a risk of contamination when placed in postextraction sites. However the literature presents a 97% success rate in clinical reports using implants with roughness of surface placed in fresh sockets.²⁴ In the present study we demonstrated that the micromorphology offered good results in healed or immediate implants, confirming that laser can promote a roughness of surface without leaving

residues and substances foreign to the implant itself.²⁴ The switching platform is another important aspect that must be considered in immediate implants in preserving of alveolar ridge that occur following tooth extraction. How the implant system used in this study presented switch platform and morse connection, was possible associated these two aspects and corroborated the results of soft tissue behavior presented in the literature.²¹⁻²³

CONCLUSION

Within the limitations of this study titanium dental implants with morse taper connection and laser surface demonstrated high survival and success rates with a good clinical performance and predictability when installed in fresh extraction sockets or healed sites.

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