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Case Report

A Predictable Approach for Immediate Full-Arch Rehabilitation: A Case Report

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Abstract

The rehabilitation of the completely edentulous patients with resorbed ridges has always been a challenge for the daily practitioner. Treatment of edentulism utilizing dental implants, instead of conventional dentures, represents an established therapy and has been shown to ameliorate patient satisfaction, masticatory efficiency, and oral health-related quality of life. The immediate implant placement and immediate loading protocol have become more and more popular because of the increasing demands of a shortened treatment time. This case report describes the steps of a predictable and reliable technique, used to rehabilitate an edentulous and resorbed maxillary arch by using the immediate loading protocol combined with bone augmentation.

Keywords: Immediate loading, dental implants, number of implants, bone augmentation, full-arch prosthesis, implant stability.

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INTRODUCTION

Using implants to support fixed prostheses in totally edentulous patients, Is an efficient practice to maintain an acceptable level of quality of life, avoiding psychological and functional issues. It allows practitioners to overcome complete denture limitations which are instability, discomfort and, decreased masticatory efficiency. When planning such cases, the questions that arise in the practitioners mind are: how many implants should we use and can we do an immediate load over the implants?

Bränemark *et al*. in the 1980s suggested the use of a minimum of 6 to 8 implants in the mandible and up to 14 implants in the maxilla for each complete-arch rehabilitation [25-14].

Whereas Agliardi *et al*. noteced a predictable result with a fixed restoration over six implants which is cost an effective option for the treatment of edentulous maxilla [6].

Studies with a follow-up period of between 5 and 15 years have shown that the number of implants did not influence implant survival rate, prosthesis survival rate, prosthesis complications, or marginal bone loss [5].

Cochran *et al*. published their recommendations on loading protocols based on literature. As regards the immediate loading, the restoration is placed within 48 hours of implant placement and is functionally restored in occlusal contact with the opposing dentition.

This protocol has been reported with increasing frequency and it has several advantages such as a reduction in overall treatment time, reduction in alveolar ridge resorption, the psychological benefit resulting in increased patient acceptance, reduced surgical trauma and, quicker return of function.

A predictable protocol for long-term success and aesthetic outcomes has been proposed which

includes atraumatic extraction, palatal implant placement, sub-crestal placement, six smaller implants diameter, platform switch design, and buccal soft tissue augmentation [24-17-8-20].

Besides, concomitant grafting of the buccal gap and immediate provisionalization, has a positive impact on the crestal bone and soft tissue profile, according to a study by Tarnow *et al*. in 2015.10.

Despite the excellent outcome, immediate implant placement still has some drawbacks. Bone remodeling after extraction will occur regardless of the immediate placement of a dental implant. Preservation of gingival morphology and ridge dimension is possible only when additional hard and soft tissue procedures are applied to compensate for labial bone modeling post-extraction [16-10-26-22].

This article aims to report a case of full arch maxillary rehabilitation using immediately loaded implants with guided bone regeneration.

CASE REPORT

A 65-year-old male was referred to the Clinic of Dental Medicine of Monastir for prosthetic rehabilitation of the maxilla. The medical history did not reveal any systemic diseases. Intraoral examination revealed insufficient oral hygiene, in the maxilla; porcelain fused to metal bridge supported by teeth number 13,11,21,22,23,25 with a non-satisfying aesthetic result caused by a deviation of the maxillary midline, too long dental crowns, and a grade 2 mobility of all the supporting teeth. The edentulous area shows a thick and adherent fibro mucosa, the crest is quite high and wide (fig 2, 3).

At the mandible, a ceramic-metallic bridge is supported by the 43 and 34 with a poor aesthetic rendering. A periodontal examination reveals thick periodontitis with insufficient hygiene and dental-prosthetic joints not hermetic. The patient had two partial removable prostheses that he refused to wear.

Fig-1: High gummy smile

Fig-2: Intra oral view

Fig-3: Upper arch

Fig-4: Lower arch

The radiological examination (Cone-beam computerized tomography) reveals, in the maxilla, horizontal bone resorption reaching the apical zone on all the remaining teeth with a periodontal enlargement.

The patient asked to rehabilitate the upper jaw with a fixed implant-supported prosthesis, with the extraction of the residual maxillary teeth since they can no longer provide anchorage to his old metal-ceramic fixed prosthesis. The CBCT (Cone-beam computerized tomography) was performed to better evaluate the case.

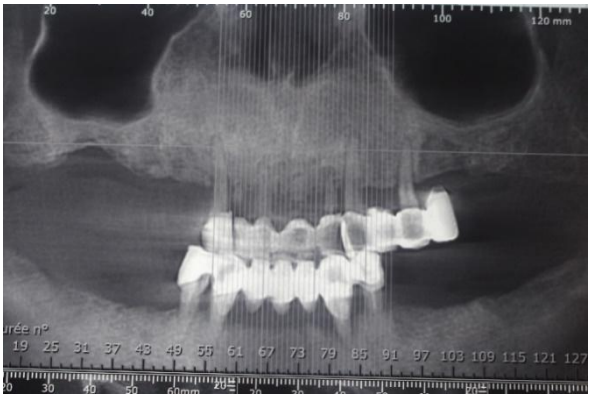


Fig-5: CBCT: panoramic reconstruction axial views in the anterior region

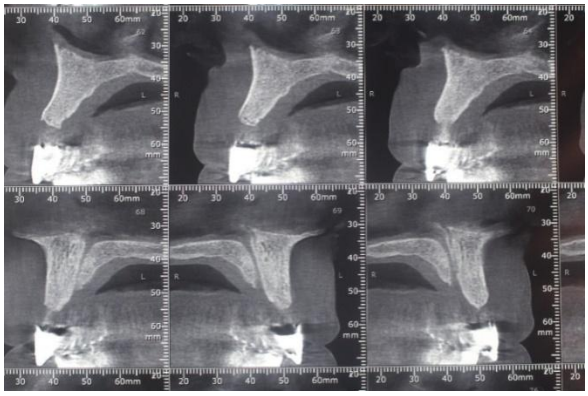


Fig-6, a: CBCT parasagittal

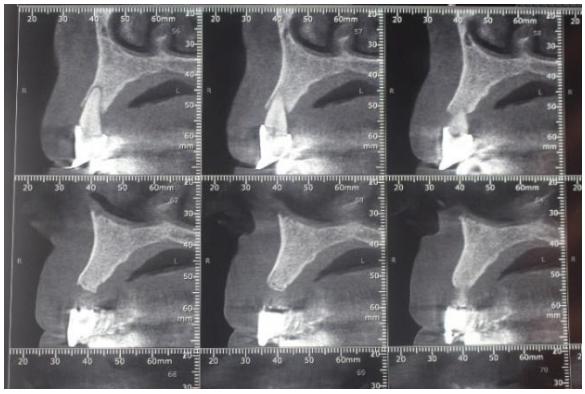


Fig-6, b: CBCT parasagittal axial views in the premolar region

The CBCT enables observation of a crest with a width greater than 6mm and a height greater than 1cm at the level of the anterior region and a reduction of its height opposite to the maxillary sinuses.

A type 2 bones at the anterior level and a type 3 bones at the posterior region. It was proposed a treatment plan which provided the simultaneous and immediate placement of six implants in the edentulous maxilla forward the maxillary sinus followed by a buccal bone grafting procedure to augment missing bone and prevent further bone resorption following tooth extraction.

We decided to use Intra Lock™ conical Implants with the same length and diameter, which were respectively 11.5 mm and 4mm.

The case would be finalized by a systematic apposition graft using a xenograft bovine bone covered by a resorbable collagenic membrane and provisional fixed restorations as recommended. The patient gave his informed consent for therapies.

Clinical Procedure

After scaling, root planing, and oral hygiene motivation, an antimicrobial treatment was administered with amoxicillin Clavulanate for 7 days, beginning 2 days before the surgery. We started with an initial rinse using Chlorhexidine digluconate 0.2% for two minutes to disinfect the mouth, and then local anesthesia was performed.

The residual maxillary teeth were carefully extracted, curettage has been carried out, and the bony area was exposed through a reflection of a crestal mucoperiosteal flap. Then the incisive vascular nerve bundle was isolated.

Fig-7: Teeth extraction

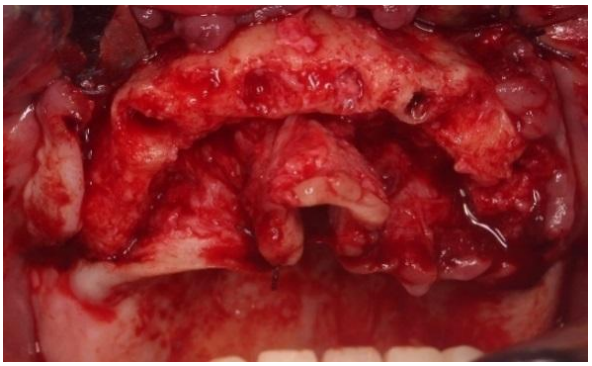


Fig-8: Mucoperiostal flap release

When single teeth are replaced by immediate implant placement in their natural position, it was found that buccal mucosal recession was often encountered with implant threads being often exposed. For this reason, a more palatal approach to implant placement is a crucial key factor for long-term stability.

One of the most natural ways to plan the ideal axis of implant placement is to follow the nasopalatal foramen that's why we placed a parallel pin into the foramen to better guide axial inclinations during implant drilling. All implants can be placed with the same axis and with the same result, guaranteeing symmetry and ideal aesthetics [1-3-15].

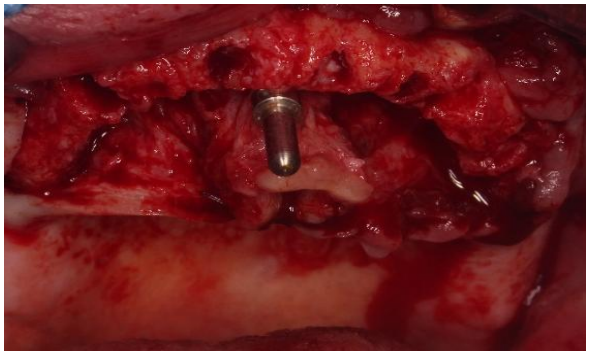


Fig-9: Parallel pins into Nasopalatal foramen

By following the axis visualized by the parallel pin, the drilling of the implants was carried out by choosing a palatal position, the drill was placed perpendicularly to the bony crest and then inclined gradually in the palatal position.

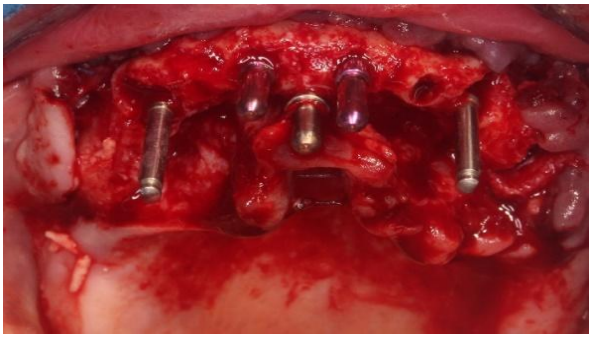


Fig-10: Implant drilling guided by parallel pins axis

A lengthwise over drilling was required to position the 2mm crestal underside implants to prevent post-extraction bone lysis.

Fig-11: Implants placement

The conical implants have been inserted with a torque of 35 Newtons per centimeter guaranteeing primary stability that allows immediate loading.

Conical abutments of 2mm transgingival height were attached to the implants with a torque of 15 newtons and subsequently, the implant abutment transfers were placed.

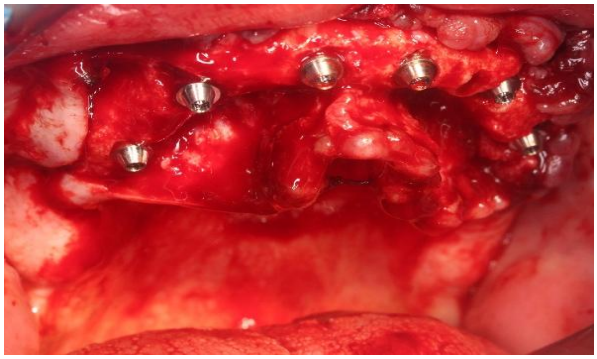


Fig-12: Conical abutment in place

To prevent bone dehiscence of the vestibular cortical, we performed guided bone regeneration using bovine-derived bone and resorbable collagen membranes.

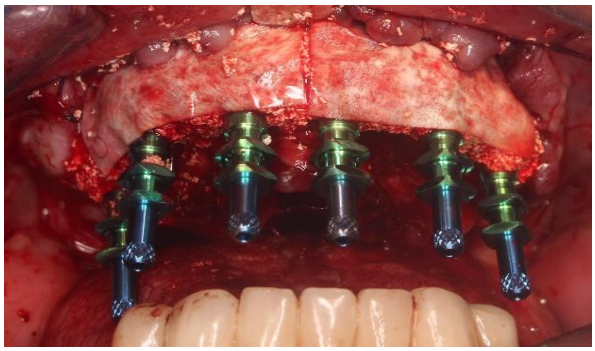


Fig-13: Guided bone regeneration

Once its membranes were in place, a partial-thickness incision was made, to be able to pull the flap coronally and cover the membranes.

U-stitches were made to cover the membranes and O-ones were used to close the surgical site.

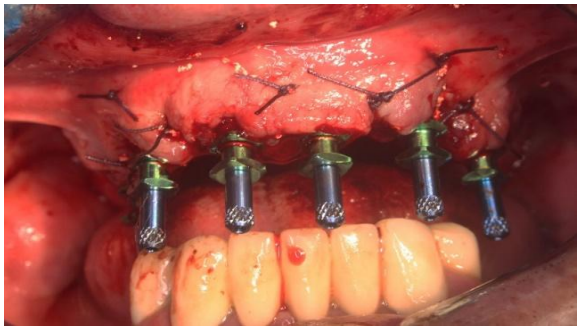


Fig-14: Stabilasing the membranes using U stiches

The transfers are solidarized using a self-curing and burn-out resin then the impression was made using silicone A according to the technique of simultaneous double mixing.

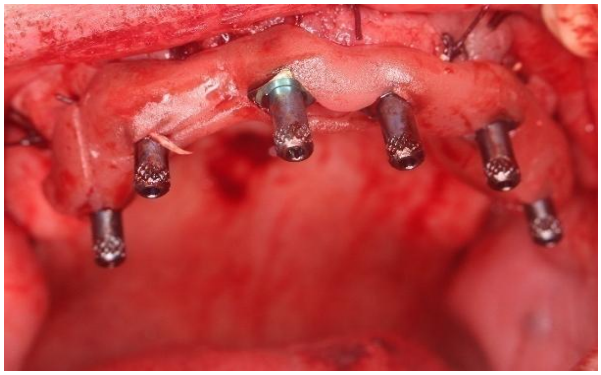


Fig-15: Solidarisation of tranfers using self-curing resin and adjustment of impression tray

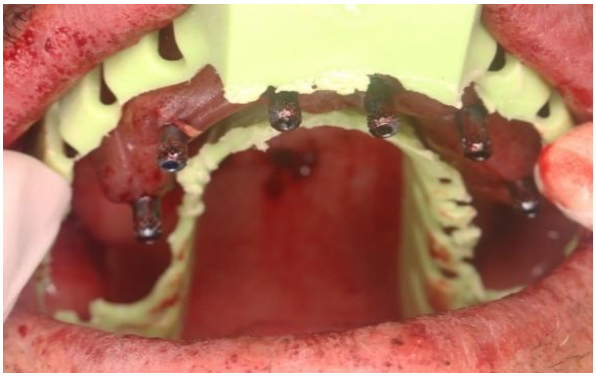


Fig-16: Final Pick-up impression using polyvinyl siloxane

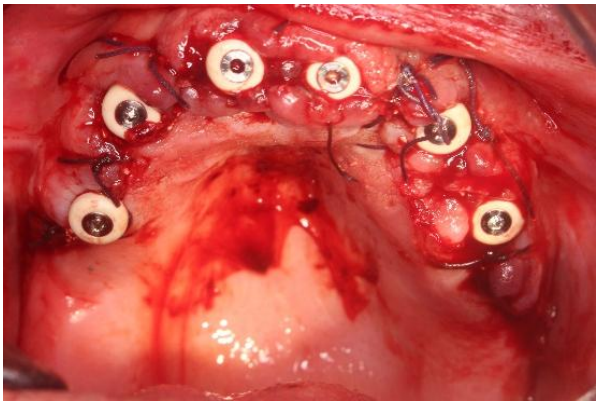


Fig-17: Healing screws in place

Finally, the healing screws were placed on the conical abutments. A preliminary impression with irreversible hydrocolloid was taken for the lower arch.

The Occlusion recording was performed with an excess silicone placed on the healing screws. The prosthesis' temporization was made in the laboratory with acrylic resin reinforced by a metal wire of a diameter of 0.9mm.

Fig-18: Bridge's temporization in place

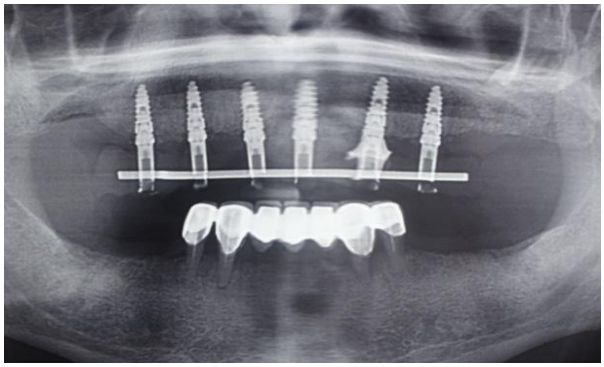


Fig-19: Panoramic X view showing good axis of implants placements

This prosthesis was developed in 48 hours and screwed on the implants with a torque of 15 Newtons. A Panoramic control radiograph was requested to verify the parallelism of the implant axes and the prosthesis adaptation on the implant abutments. The patient should adopt a soft diet for two months with monitoring visits every 15 days.

DISCUSSION

The Immediate loading technique consists of solidarizing implants on the day of their placement (or in the days that follow) by a fixed prosthesis that will play the role of an external fixator.

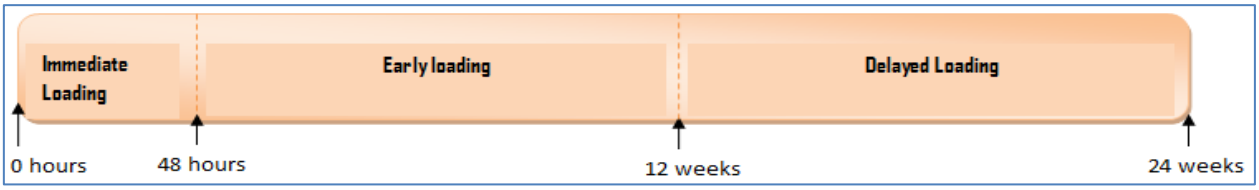
There is no consensus definition of immediate release, as the views of the authors diverge. Some consider that immediate loading can only be considered if the prosthesis is applied at the same session (COOPER *et al*. 2002).

Others believe that it can be done on the same day (APARICIO *et al*. 2002), within 48 hours

(COCHRAN *et al*. 2004), within 78 hours (SZMUKLER-MONCLER al. 1998), or during the first week (GLAUSER *et al*. 2001).

For the time being, according to the Statement/ Del Fabro consensus of 2006, it is necessary to respect a deadline of 1 to 72 hours to talk about immediate loading.

The immediate loading is to be distinguished from the delayed loading, where the prosthetic restoration is placed in a second time after a period of osseointegration of 3 to 6 months, and early loading where the restoration is implemented within 48 hours to 3 months after implant placement.



A/Advantages of immediate loading

Compared to conventional loading protocols, Immediate loading has many advantages such as:

- Reduction in overall treatment time.
- Reduction in alveolar ridge resorption.
- Esthetically acceptable and pleasing restorative solution.
- Psychological benefit resulting in increased patient acceptance.
- Quicker return of function.
- Avoidance of a removable prosthesis that may interfere with healing or simultaneous bone grafting or may need additional maintenance during the healing period.
- Potentially superior soft tissue profile when accompanying immediate dental implant placement.
- Reduced surgical trauma and ease of surgery.
- Use of fewer implants to support a prosthesis because immediate loading can potentially permit the placement of longer implants, thus providing greater support [27].
- Conservation of bony structures and soft tissue aesthetics [23].
- Higher patient comfort and satisfaction.
- High implant and restorations survival rates [13].

B/Disadvantages

- Financial disadvantage due to the cost of the temporary prosthesis.
- Taking the delicate intermaxillary relationship in anesthetized patients in the morning, often under sedation, which can lead to small errors in recording intermaxillary relationships.
- Semi-liquid feed for two months.
- A high-risk treatment.
- It requires experienced surgeons able to pinpoint suitable conditions and either exclude the patient from this treatment option. For example, in a Cochrane review, it was concluded that immediate loading could prove to be successful only in selected patients[7].
- Other authors found more crestal bone loss in the loaded 1-stage implant group when compared to the 2-stage unloaded control group. It was speculated that the early occlusal loading during healing may account for this observation since early loading may interfere with the ability of new bone being formed to restore the necrotic bone at the implant/ bone interface usually occurring from surgical trauma [9].
- The success of this treatment modality is depending on several factors such as: Bone quality and quantity should be appropriate
- Atraumatic extractions
- Initial implant stability is crucial
- Implant placement has to be prosthodontically driven
- All parafunctional habits should be avoided
- Infected extraction sockets could not be chosen as implant sites
- Balanced occlusion against natural teeth or prosthesis should be ensured

C/Conditions for immediate loading

1-Primary implant stability

Defined as a "sufficiently strong initial bone-implant fixation", has long been acknowledged as important for implant success and has been identified as a crucial factor with immediately loaded implants.

By ensuring primary stability, we aim at limiting excessive micromovements which are influenced by the implant-to-bone relationship and by the prosthodontic design.

The insertion torque has been cited as an indicator of micromovement of an implant in the bone and it is interesting to note that higher torque values do not always have beneficial effects on osseointegration.

Even when very high torque values can be achieved, it is deemed sensible to opt for torque values that have shown predictable results in immediately

loaded cases rather than striving for the highest possible torque [12].

2-Bone quality and quantity

These two parameters will significantly influence the primary stability. Comparing to mandible bone, maxillary one can be particularly challenging for immediate implant placement because it has lesser bone density, a thin cortical plate, and proximity to the maxillary sinus.

Referring to the Classification of LEKHOLM and ZARB, the best primary stability is obtained with type 1 bone but it is noted that this bone is poorly vascularized which is not favorable to a good osseointegration.

Quality 2 and 3 bones provide primary stability compatible with the requirements of setting immediate loading. However, it is difficult to conceive it with a quality 4 bone. Following bone quality analysis, only the most appropriate sites are selected for implant placement.

Understanding the quality and type of bone and preserving it by undergoing atraumatic extractions are necessary for guaranteeing Osseo-integration when immediately loading implants. Some authors describe a technique called osseodensification to enhance bone density and to augment implant stability but Current literature evidence is inadequate to draw any concrete conclusions, and more studies are recommended in this field.

3-Implant design and number

Regarding the size of implants, the ideal is to choose ling implants (more than 10 mm) and having a diameter of at least 4mm.

However, the residual bone volume is not always sufficient to fit this type of implant and it is sometimes advisable to place shorter implants, with a smaller diameter to avoid using a bone graft.

The shape of the implant is, for its part, an essential factor for osseointegration because it optimizes the primary stability. Studies published by SULLIVAN *et al*. in 2003, comparing the stability o cylindrical implants and conical implants made it possible to make the following conclusion: conical implants have better primary stability than standard implants.

Another essential criterion to consider in the choice of the implant is the implant surface. It is now clearly recognized that rough surfaces are preferable to 'machined' surfaces.

The latter has a good ability of osseointegration but does not allow the blood clot to adhere to the implant, through its fibrin network.

To overcome this problem, the implant surfaces have been modified to give them a roughness allowing preosteoblast cells to adhere to the implant.

The number of implants utilized to support a complete-arch prosthesis is one of the first topics discussed since the beginning of implant dentistry. However, a systematic review found a lack of high-quality evidence publications dealing with the number of implants to be placed to support a complete-arch fixed prosthesis. [30]

The use of at least 5 implants in the mandible and 6 in the maxilla could be indicated for immediate complete-arch prostheses. A study reports no impairment of rehabilitation in situations with at least 5 implants in the mandible and 6 in the maxilla [5].

CONCLUSION

Appropriate patient selection, primary implant stability, good bone quality and the expertise of practitioners are clearly important for the prognosis of immediately loaded implants and their restorations.

Conflicts of interest

The authors declare no conflicts of interest.

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