Immediate loading or immediate function of the implants?
Introduction

For dental practitioners, immediate loading of dental implants has been a topic of great interest for a long time: treatment duration is shorter and it may avoid the patient from withstanding uncomfortable temporary prosthetic solution.

Immediate loading is becoming a common practice thanks to improved protocols, the knowledge of biomechanical principles, and the enhancement of implant shape and surface treatments. Classical healing time (from 3 to 6 months without mechanical stress, as suggested by Brånemark and coll. more than 25 years ago) is no more considered as an absolute condition for implant osseointegration.

Several studies have shown that osseointegration is possible under controlled conditions, even in cases of immediate loading of the implant.

Reports show average implant survival rates of 96.4% for 10,491 implants after a 13-year follow-up.

Success of this procedure is mainly due to the development of rough surfaces, compared with machined surfaces without any post-treatment.

Total mandibular reconstruction is the most commonly documented treatment.

Immediate loading or immediate function

A distinction must first be made between loading and function. Even when embedded, an implant is subjected to forces through the gingival mucosa due to chewing of the still solid food bolus and to adjacent prostheses. Excepted when the implant is protected by a fixed supra-mucosal bridge, loading is inevitable.

An implant can be functional for aesthetics or for masticatory purposes:

→ Aesthetic function: this is often achieved when an implant is placed after the extraction of an anterior tooth and allows immediate tooth replacement while preserving the gingival contour and the papillae.

It is essential to place the implant out of occlusion to prevent any maximal intercuspation forces or eccentric mandibular movements from disrupting the initial healing phase which is necessary for osseointegration.

→ Masticatory function: this is required during the manufacturing of the final implant-supported prosthesis and is conventionally made during delayed loading (3 to 6 months after implant insertion).

→ Immediate loading (immediate masticatory function): in certain conditions, this can now be achieved early (2 days to 3 months after implant surgery), and even immediate (same day as implant placement or 48 hours after) with an identical survival rate as a conventional implant placement protocol.
The control of micromovements

Direct bone apposition is possible when an implant remains fixed in the bone, even when functional loads are present.

Micromovements are particularly harmful to bone-implant interface because of the absence of ligament. This is mainly true during the first weeks after implant placement. Indeed, mesenchymal stem cells differentiation starts after 3 days.

According to Smuchler-Moncler and coll. (1998), “osseointegration is not determined by the absence of immediate functional loading but rather by the absence of excessive micromovements at the bone-implant interface”.

Considering this, it is advisable to determine the limit of micromovements that can be endured before a fibrous interposition appears at the interface. This critical limit is estimated at around 100 µm according to Brunski (1993), if micromovements appear and remain at this amplitude.

This is the physiological base of immediate loading of implants.

This way, several implants with a high primary stability, i.e. placed in a dense or a normal bone, and connected together with a permanent and fixed prosthetic element, may endure micromovements that are compatible with osseointegration.

Implant shape and surface treatments

In the Bränemark conventional protocol, screwed implants showed higher success rates than cylindrical implants. The thread increases bone-implant contact surface, improves the resistance to shearing forces and the repartition of the forces in the bone tissue.

Skalak (1987) showed that threaded is the most appropriate implant design as it allows a regular distribution of loads on the surrounding bone tissue. This also offers the highest resistance to micromovements. Thus, as the transmission of micromovements is minimized, this implant increases the required primary stability after the immediate loading of implants.

It is confirmed that implant surface roughness has an influence on the proliferation, the differentiation and the protein synthesis of human osteoblasts. However, human and animal studies on immediate loading of implants do not point out any significant differences between success rates when comparing the different surface treatments in between them.
Conclusion

Analysing literature on the “evidence based dentistry” way, it is confirmed that the procedure which is the most supported and well-documented is the immediate loading of the edentulous mandible. This is “evidence based”.

This technique is also widely used for treatments in posterior upper jaw with low bone density. Although the average number of implants placed in the upper jaw is 8.18, it is possible to implement a protocol with 4-6 implants and get the same results as conventional protocols.

For both plural and single-tooth restorations, immediate implant loading is possible where there is adequate bone/soft tissue quantity and quality to support prosthesis and maintain gingival architecture.

Immediate functional loading enables patients to chew on the same day as the implant surgery; furthermore, implant and prosthetic success rate is equal to, and even higher, than the protocol developed by Professor Brånemark 40 years ago.

Bibliography


According to the last Consensus Statements, the definitions of terms regarding loading protocols are mentioned here below:

1. Immediate loading: the restoration is placed in occlusion with the opposing dentition within 48 hours after implant placement.
2. Conventional loading: the prosthesis is attached in a second procedure, after a healing period of 3 to 6 months.
3. Early loading: the restoration is in contact with the opposing dentition and is placed at least 48 hours after implant placement but not later than 3 months afterward.
4. Delayed loading: the prosthesis is attached in a second procedure that takes place some time later than the conventional healing period of 3 to 6 months.
Clinical case

Immediate aesthetic function of 2 implants in the upper jaw with flapless technique

(Agenesis of 12 and 22) - Pierre EYSSERIC, DDS

→ The patient:

Mrs FS, 26 years old, and healthy, consulted in July 2005 to have her bridge resealed (fixed bridge on 21-23). She presented agenesis of the two lateral incisors (12 and 22), and also had a second fixed bridge on 11 and 13. She asked if there was another alternative to replace the bridges; we suggested the placement of dental implants. In October 2007, she considered the possibility of an implant treatment, however, psychologically speaking, she was still not ready (she is against the fact of placing a partial removable prosthesis during the healing period).

She used to have a long-lasting orthodontic treatment, and she was not ready to endure discomfort again. She is also apprehensive about having an unaesthetic black gingival line.

Clinical situation before implants placement.

Notice the prosthetic emergence gap of 12 and 22.

→ Radiographic exam:

When reading the high-quality radiographs and using a calibrating film to measure, it is confirmed that placement of tapered implants Ø 3.5 mm x 10 mm length is possible.

Palatal view: 2 fixed bridges (11-13 and 21-23).

→ Therapeutic decision:

Small-diameter implants are frequently placed in the area of lateral incisors.

The following proposition was adopted: the 2 fixed bridges will be removed and 2 dental implants will be placed on 12 and 22 with an immediate aesthetic function. Flapless technique will be used during the surgery in order to preserve periodontal aesthetics.

Four metal-ceramic crowns with gold over-castable cylinders will be placed on 12 and 22 as well as on 11 and 21 which presented weakening and aesthetics problems.

Temporary prosthesis will be achieved and placed with a stabilizing system. It is a simple technique to implement, that respects the vestibu-lo-palatal axis. Also, resin polymerization is made without any superfluous movements.
Selection of the implant:
We chose Anthofit® tapered implants Ø 3.5 mm x 10 mm length (for 12 and 22) and 15° angulated abutments.

Surgical technique:

Premedication:
Clamoxyl® 1g, morning and evening during 6 days from the day before surgery; Solupred® 20mg, 2 tablets in the morning and 2 at noon for 4 days from the morning of the surgery; Di-antalvic®, 1 capsule in case of pain in addition to Solupred®.

NB: nowadays, the most widely used and validated protocol requires 1 dose of Clamoxyl® 3gr to be taken 1 hour before the surgery.

Before the surgery:
Serious caries lesions are detected on 11, 13, 21 and 23. Filtek™ P60 (3M ESPE) composite resin was used on palatal sides of these teeth (strong photopolymerizable composite resin).

Surgery:
The surgery was performed on November 26th, 2007 using flapless technique. Temporary prosthesis, 11 and 21 distal sides and preoperative radiographs allow planning the surgical axis. Considering the little space available, periapical radiographs are performed during drilling stage so as to maintain the right axis. Bone density is class 2 and according to Carl Misch classification, the available bone is division C-W (too little bone width), which is common in case of agenesis.

The major difficulty of this surgery is to choose the right axis of the future periodontal emergence in spite of the little interradicular space.

During drilling stage, periapical radiographs are performed with drills in place so as to check implant axis. Notice on the first drill an inclination that has to be retrieved.

Periapical radiograph is performed so as to verify good implant placement.
Temporary prosthesis:
Temporary prosthesis is made in static and dynamic non occlusion. It is an immediate aesthetic function of the implants.

Impression taking technique for the final prosthesis:
A two-step impression technique was made using the following materials: 3M Express™ Putty and 3M Express™ 2 light.

Results:
There is a good restructuring of interdental papilla. Note that the emergence profile of central and lateral incisors is in accordance with aesthetic standards.

Before
Fixed bridge into place (11, 12, 13, 21, 22, 23).

After
Definitive crowns into place (11, 12, 21, 22 - July 3rd, 2008).
Lateral view – patient's.
Front view – forced smile.
Lateral view – forced smile.
Conclusion

One year afterwards, results are stable. Control radiographs and photographs show a perfect adaptation of implants and crowns. The patient is satisfied and she regained self-confidence and her smile. Since the surgery, she did not complain of pain or discomfort. Periodontal state is very satisfying.