

## Immediate Implant Loading : Current Concepts : A Case Report

Dr. Seema Munjal \* Dr. Sumit Munjal\*\*

### Abstract:

With the advent of immediate single stage implant placement and immediate prosthesis fabrication, the edentulous patients can today walk out with "Teeth in a day". Moreover, the refinement of clinical protocols, the application of sound biomechanical principles, improvements in implant design, and the development of new implant surfaces have resulted in the increased use of this procedure. The primary disadvantage, however is the risk of implant failure or greater crestal bone loss around the healing implants. The majority of clinical reports, nonetheless reveal similar survival rates between immediately loaded and two-stage unloaded healing approaches. This review article throws a light on advantages, disadvantages and success criteria for immediate implant loading. A case with single tooth immediate implant rehabilitation is reported.

**Key Words:** Implant, immediate loading, loading time, success criteria, single tooth.

### Introduction:

Implantology has become a widely used technique that has revolutionized the practice of dentistry. Concepts of prognosis and treatment planning are being revised, with the new option of implant placement appearing often as more reasonable and safe than the heroic attempts to save teeth with severe endodontic or periodontal problems.

Predictable formation of a direct bone to-implant interface is a consistent treatment goal in implant dentistry for totally<sup>1</sup> or partially<sup>2</sup> edentulous patients. However, the waiting period (4-6 months) for osseointegration and the prosthesis fabrication following a two stage surgery were the biggest disadvantages. With the advent of immediate single stage implant placement and immediate prosthesis fabrication, the edentulous patients can receive the replacement in the same surgical visit. Moreover, the refinement of clinical protocols, the application of sound biomechanical principles, improvements in implant design, and the development of new implant surfaces have resulted in the increased use of this procedure.

### Prerequisites Of Branemark's Surgical Protocol:

The abovementioned approach also called the one stage or non-submerged implant procedure contradicts the surgical protocol established by **Branemark et al.**<sup>3</sup> to accomplish osseointegration

\* Reader, department of Prosthodontics & Oral implantology, Dental College, Azamgarh, UP, \*\* Reader, department of Periodontics & Oral implantology, Dental College, Azamgarh, UP

### Corresponding Address:

Dr. Seema Munjal  
C-125, GOLF VIEW APARTMENTS,  
SAKET, NEW DELHI-110017  
Email: ssmunjal@yahoo.co.in  
Contact: +919910259040

with the following pre-requisites:

- 1) Countersinking the implant below the crestal bone,
- 2) Obtaining and maintaining a soft tissue covering over the implant for 3 to 6 months ; and
- 3) Maintaining a nonloaded implant environment for 3 to 6 months.

The primary reasons cited for the submerged, countersunk, surgical approach were to reduce and minimize the risk of bacterial infection, to prevent apical migration of the oral epithelium along the body of the implant, and to reduce and minimize the risk of early implant loading during bone remodeling.

Eventually, a second-stage surgery is necessary to uncover these implants and place a prosthetic abutment. In contrast, many experimental and clinical studies have demonstrated that implants may integrate under controlled conditions even when they are loaded the same day as they are placed.<sup>4,5,6</sup> More importantly from the patients point of view it can have positive social and psychological affects.

### Immediate Loading:

Immediate loading of dental implants not only includes a nonsubmerged one-stage surgery, but actually loads the implant with a provisional restoration at the same appointment. Immediate loading of the implants was initially suggested on implants of reduced surface area to encourage a soft-tissue (periodontal ligament-like) interface between the implant and bone.<sup>6</sup> These implants gave a wide range of clinical survival. On occasion, a direct bone interface could be developed, maintaining this condition for more than 20 years.<sup>7</sup> In one study, **Tarnow**<sup>8</sup> reported on immediate loading with a fixed prosthesis with threaded implants in 10

consecutive cases over 5 years. Sixty-seven of 69 implants were integrated in 6 mandibular and 4 maxillary completely edentulous arches using a total of 10 to 13 implants for each arch for the final prosthesis. The clinical indications for the technique are the partially edentulous patients with centric occlusal contacts and excursions on natural teeth (and/or healed implants); and D1, D2, and D3 bone in regions of implants. Screw-shaped implant bodies, 4 mm or more in diameter, with increased surface area and designs<sup>6</sup> to decrease crestal stresses are most suited. Uncontrolled systemic conditions, patients with oral parafunctional habits and heavy smoking history, however are absolute contraindications. A very recent evaluation in 23 periodontally compromised patients suggested that immediate loading presents itself as a predictable technique with a 100% cumulative survival rate for provisional and definitive prosthetic rehabilitations.<sup>9</sup>

### Loading Time:

Currently, a precise definition for "immediate loading" does not exist, and this has caused considerable confusion in the dental implant literature.<sup>10</sup> In some cases, immediate loading may refer to a period of a few hours, whereas in other, it refers to the first 3 days after implant placement and after the dental restoration has been placed. Some clinicians recommend that a restoration be inserted after a period of 3 weeks following implant placement surgery.

In some clinical studies (primary, 2-stage), submerged implants are placed along with non submerged (secondary) implants on the same day. The non submerged implants are used to support a temporary restoration. After healing, the secondary implants are splinted with submerged healed (primary) implants. These secondary implants are overloaded and cannot be compared with immediately, loaded implants. Whether or not immediately-loaded implants per definition should have occlusal contacts within the same day or a few days after surgery (immediate functional loading), or whether they should remain without occlusal contacts (immediate nonfunctional loading),<sup>11</sup> is controversial. In a recent study, the implants were loaded following an immediate functional loading protocol at one side in the mandible, whereas the other side was loaded following an immediate progressive loading protocol. Radiographic evaluation was carried out using dental computed tomography at intervals of 0, 4, 9, and 24 months after implant surgery. Statistical analysis showed a more favorable bone reaction in the

crestal bone height ( $P = 0.011$ ) and in the crestal periimplant bone density ( $P = 0.009$ ) in the immediate progressive loading group. It was concluded that the latter yields a more predictable prognosis than the immediate functional loading protocol; supporting the idea that gradual loading or stimulation will allow bone to mature and grow denser.<sup>12</sup>

### Advantages of Immediate Loading:

The unequivocal data obtained from the recent studies in literature suggest the following advantages in the approach.

**Table I: Advantages of the technique :**

<input type="checkbox"/>	No second-stage surgery (eliminates discomfort for the patient and decreases overhead).
<input type="checkbox"/>	Countersinking the implant below the crestal bone is eliminated, which reduces early crestal bone loss. <sup>13</sup>
<input type="checkbox"/>	The soft-tissue hemidesmosome attachment on the implant body below the microgap connection may heal with an improved interface. <sup>4</sup>
<input type="checkbox"/>	The soft-tissue emergence can be developed with the transitional prosthesis and the tissue allowed to mature during the bone-healing process.
<input type="checkbox"/>	Implants are splinted during initial healing for biomechanical advantage.

### Disadvantages of Immediate Loading:

However there are certain disadvantages as being listed down in table III:

**Table II: Disadvantages of the technique :**

<input type="checkbox"/>	Micromovement of implant, which can cause implant failure, is greater than with submerged two-stage approach.
<input type="checkbox"/>	Less likely to reflect the tissue at the second stage and directly evaluate implant crestal bone.
<input type="checkbox"/>	Parafunction from tongue or foreign habits (pen biting) may cause trauma and crestal bone loss or implant failure.
<input type="checkbox"/>	Impression material for acrylic may become trapped under tissue or between implant and crestal bone. (This is greatly reduced if the crest module of the implant is larger in diameter than the implant body).

### Case Report:

A male patient 22 years of age reported with a history of extracted 12 six months back. Following a thorough medical history to rule out systemic contraindications, the clinical and radiographic evaluation was performed at the initial visit. He was informed of all the viable options to replace his missing right lateral incisor and a detailed written description of the risks and benefits of the proposed treatment followed by a written consent-to-treat agreement. The investigations included an intraoral periapical radiograph, orthopantomograph ( Fig. 1) routine complete haemogram and computed tomography. The CT scan revealed the bucco-lingual

**CRITERIA FOR SUCCESS (Salama et al. 14)**



1. Good bone quality in the area of the implant (anterior area of the mandible)
2. The use of implants with rough surfaces (e.g. TPS-coating, microstructuring / microinterlock)
3. If possible bi-cortical fixation of the inserted implants for improved stabilization
4. Avoidance or reduction of extensions in the case of provisional restorations
5. An occlusion concept for axial loading as far as possible.



Fig 1 : Pre-operative orthopantomograph.



Fig 2 : CT scan ; distance from contiguous tooth and cortical bone width

cortical bone width as 5 mm ( Fig. 2). The mean bone density at the proposed site was evaluated as D3 bone in Hounsfield units as per Misch’s criteria.(Fig. 3) On the day of surgery, patient was made to rinse with 10 ml. of 0.2% Chlorhexidine gluconate solution followed by extraoral scrubbing with 5% Povidine iodine. Under the right infraorbital nerve block, a midcrestal combined

with crevicular incisions were given on the implant site to elevate a mucoperiosteal flap. The osteotomy was started with the initial pilot drill and sequentially deepened with 2.0 and 2.5 mm diameter drills having stops at 9 and 12 mm.( Fig. 4) The speed was adjusted to approx. 1300 rpm at the initial drill with an intermittent pressure of 1 second on the bone and 1 to 2 seconds off the bone, under copious sterile saline irrigation.



Fig 3 : CT scan ; bone density assessment.

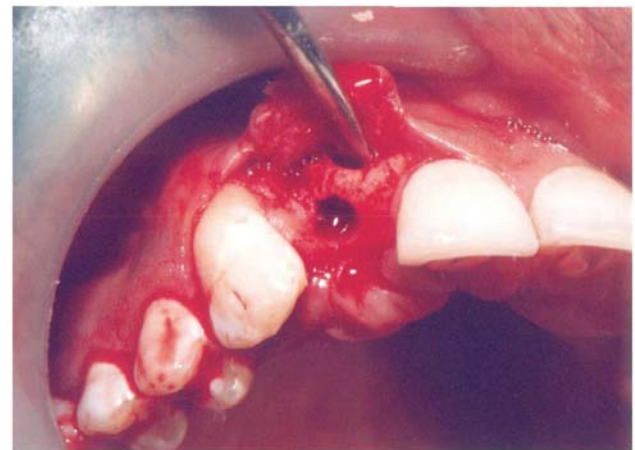


Fig 4 : Implant osteotomy on final width increasing drill.

The square threaded, external hex fixture from Biohorizons™ was chosen with 3.5 x 12 mm dimension, removed from the sterile vial and installed at a speed of 25 rpm such that no thread was visible outside the bone crest.( Fig. 5) After confirming the primary stability with the hex driver engaged onto the abutment screw, 4.0 Ethicon resorbable sutures were used for primary flap closure. The abutment was milled at this stage and tightened onto the implant. ( Fig. 6) A prefabricated polycarbonate crown of the selected





Fig 5 : Implant inserted

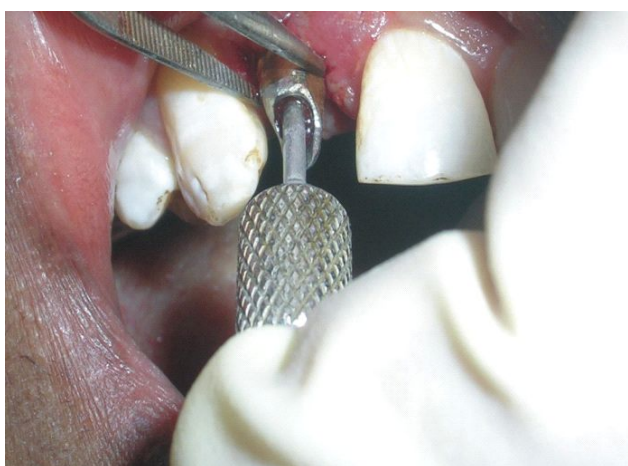


Fig 6 : Milled abutment tightened on the fixture



Fig 7 : Provisional prosthesis cemented.

shade was used as the provisional prosthesis, which was confirmed to a non-functional occlusion till the delivery of final crown 2 months later ( Fig. 7). This was followed by a prescription of Diclofenac sodium 100 mg bid and Amoxicillin 500 mg bid for 5 days. The chair-side post-operative IOPAR view was taken to assess the stability radiographically ( Fig. 8).

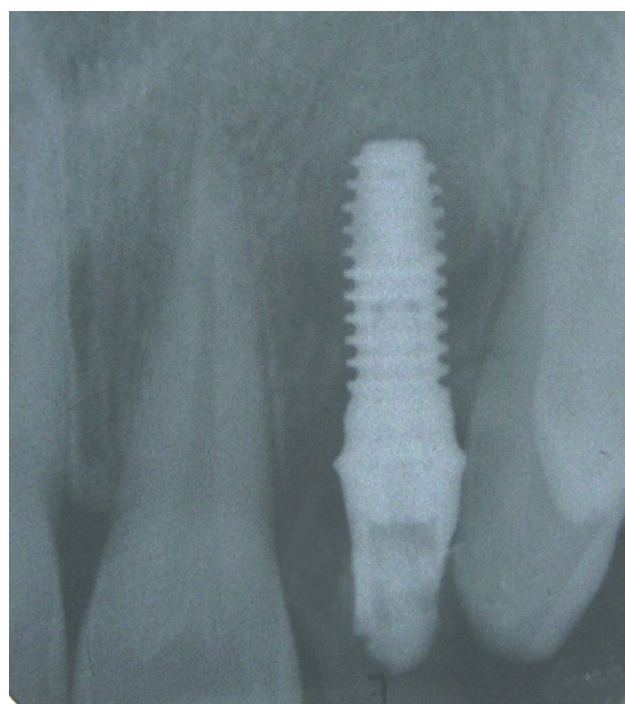


Fig 8 : IOPAR at implant placement

### Discussion

The concept of immediate functional occlusal loading with dental implants, although is more predictable than before,<sup>6, 10</sup> but it is associated with the risk of greater crestal bone loss around the healing implants.<sup>15</sup> The early loading was speculated to interfere with the ability of necrotic bone (created by the surgical trauma) to be replaced by newly formed bone. Hence successful implants with greater than 5-mm soft tissue pockets may be more often a result of immediate loading. The non-functional immediate transitional restoration provided in the above case reduces the biomechanical risk of overload. The square threaded fixture was chosen as it is reported to have an increased functional area at bone-to- implant interface.<sup>16</sup> Ideally, the bone density should be D1, D2, or D3 so the strength, bone contact, and modulus of elasticity are great enough to accept the initial load.<sup>6, 14, 17</sup> The use of computerized tomography for bone assessments, modifications in implant design and progressive loading time span are crucial for long term function.<sup>18</sup> The majority of clinical reports, nonetheless reveal similar survival rates between immediately loaded and two-stage unloaded healing approaches.<sup>12,19, 20</sup> However, these findings do not imply that a submerged surgical approach is no longer necessary or prudent in many cases.

**Conclusion:**

In the early years of treating patients with osseointegrated dental implants, we underestimated the importance of biomechanics and the limitations of the systems that were available. A thorough biomechanical planning not only would confirm the suitability of the treatment, but also prove beneficial in avoiding the litigious risk. The fact that the patient may need to wear a removable prosthesis and may be subjected to several additional surgeries and appointments in case of unfavorable outcome, cannot be denied.

**References :**

1. Adell R, Lekholm U, Rockler B et al. A 15-year study of osseointegrated implants in the treatment of the edentulous jaw. *Int J Oral Surg* 1981;10: 387-416.
2. Ganeles J, Wismeijer D. Early and immediately restored and loaded dental implants for single-tooth and partial-arch applications. *Int J Oral Maxillofac Implants*. 2004;19 Suppl:92-102.
3. Branemark PI, Hansson BO, Adell R. Osseointegrated implants in the treatment of edentulous jaw: experience from a 10 year period. *Scand J Plast Reconstr Surg* 1977;(2 suppl 10):1-132.
4. Gotfredson K, Hjorting-Hansen E. Histologic and histomorphometric evaluation of submerged and non submerged titanium implants. In : Laney WR, Tolman DE (eds): *Tissue integration. Oral, Orthopedic and Maxillofacial Reconstruction*. Chicago, Quintessence 1990; 31-40.
5. Babbush CA, Kent JN, Misick DJ. Titanium plasma spray (TPS) screw implants for the reconstruction of the edentulous mandible. *J Oral Maxillofac Surg* 1986;44: 274-282.
6. Misch CE. Non-functional immediate teeth in partially edentulous patients : A pilot study of 10 consecutive cases using the Maestro™ Dental Implant system. *Compendium* 1998. (spl. Issue); 19:25-36.
7. Linkow LI, Donath K, Lemons JE. Retrieval analysis of a blade implant after 231 months of clinical function. *Implant Dent* 1992;1: 37-43.
8. Tarnow DP, Emitiag S, Classi A. Immediate loading of threaded implants at stage one surgery in edentulous arches. Ten consecutive case reports with 1 to 5 year data. *Int J Oral Maxillofac Implants* 1997;12: 319-324.
9. Alves CC, Correia AR. Immediate Implants and Immediate Loading in Periodontally Compromised Patients—A 3-Year Prospective Clinical Study-*Int J Periodontics Restorative Dent* 2010;30:447–455
10. Fabbro MD, Testori T, Francetti L et al. Systematic review of survival rates for immediately loaded dental implants. *Int J Periodontics Restorative Dent* 2006;16: 249-263.
11. Misch CE. Non functional immediate teeth. *Dent Today* 1998;7: 88-91.
12. Khorshid HE, Hamed HA, Aziz EA. The effect of two different immediate loading protocols in implant-supported screw-retained prostheses. *Implant Dent* 2011;20: 157-166.
13. Weber HP, Buser D, Fiorellini JP. Radiographic evaluation of crestal bone levels adjacent to non submerged titanium implants. *Clin Oral Implants Res* 1992;3: 181-188.
14. Salama H, Rose LF, Salama M et al. Immediate loading of bilaterally splinted titanium root form implants in fixed prosthodontics. A technique re-examined : two case reports. *Int J Periodontics Restorative Dent* 1995;15: 344-361.
15. Chang TL, Raoumanas ED, Klokkevold PR, Beumer J. Biomechanics, Treatment planning and prosthetic considerations. In Newman MG, Takei HH, Klokkevold PR, Carranza FA (eds). *Clinical Periodontology*. Saunders, Louis 10<sup>th</sup> edition 2006 p.1167-1181.
16. Misch C.E. A bone quality-based implant system: first year of prosthetic loading. *J Oral Implantol* 1999; 25: 185-197.
17. Misch CE, Degidi M. Immediate loading implants with fixed prosthesis in the completely edentulous patient. *J Clin Implant Res* 2003;5:100-203.
18. Schenk RK, Buser D. Osseointegration : a reality. *Periodontol* 2000. 1998; 17:22-35.
19. Nkenke E, Lehner B, Fenner M, Roman FS. Immediate versus delayed loading of dental implants in the maxillae of minipigs: follow-up of implant stability and implant failures. *Int J Oral Maxillofac Implants*. 2005; 20: 39-47
20. Cannizzaro G, Leone M. Restoration of partially edentulous patients using dental implants with a microtextured surface: a prospective comparison of delayed and immediate full occlusal loading. *Int J Oral Maxillofac Implants*. 2003;18:512-522.