

## Immediate Loading On Implants

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### **Abstract:**

Immediate loading of Implants gained popularity as successful outcome in implant dentistry as it allow for the placement of prosthesis immediately after the implant placement. This approach differs from conventional methods, which require a longer healing period and longer edentulousness. Advancements in implant technology with improved implant designs and surface treated implants had made immediate loading to achieve better primary stability, essential for osseointegration. Studies indicate that comparable to conventional techniques, immediate loading can improve success rates, with superior benefits such as reduced treatment time, improved patient comfort and satisfaction, and enhanced esthetic outcomes. However, careful patient selection is important as factors like bone density, implant positioning, and overall patient health significantly impact the success of the implant longevity. This review provides an overview of recent research, surgical protocols, essential clinical considerations, and future directions for immediate loading, thereby highlighting its importance in implantology

**Keywords:** Dental Implants, Immediate Loading, Osseointegration, Occlusal loading, Immediate function.

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### **I. Introduction:**

In dentistry, for patients with partial or total edentulism Implants has evolved as a reliable treatment option. Traditional implant protocols initially pioneered by Per-Ingvar Branemark, a 2-stage protocol which requires a healing period of 3 to 6 months before prosthetic loading as it allow for osseointegration. Advances in implant design and different surgical approaches have enabled succesful outcomes with immediate loading. Immediate loading (IL) of dental implants has gained popularity due to its ability to shorten treatment time and offer immediate functional and aesthetic benefits for patients. Studies suggest high success rates for Immediate Implantloading, provided that proper patient selection and procedural guidelines are followed.

### **Overview of loading protocols:**

Loading refers to the application of force or pressure on dental implants. There are different types of loading protocols, each with its own timeline for introducing functional or prosthetic components.

There are three distinct loading methods<sup>[1]</sup>(fig 1):

1. Immediate Loading
2. Early Loading
3. Delayed Loading

1. **Immediate loading** involves placing a prosthetic restoration on the dental implant shortly after its surgical placement, often within 24 to 48 hours.

2. **Early loading** refers to loading implants after a short healing period, typically within a few weeks to a few months after implant placement.

3. **Delayed loading** involves a more traditional approach, where implants are left undisturbed for a more extended period before attaching prosthetic components. This waiting period allows for complete osseointegration.

### Bone density classification

In 1988 Misch<sup>[2]</sup> classified bone density into (fig 1)<sup>[2]</sup>

- D 1 - Dense cortical bone.
- D 2 - Thick dense to porous cortical bone on crest and coarse trabecular bone within.
- D 3 - Thin porous cortical bone on crest and fine trabecular bone within.
- D 4 - Fine trabecular bone.
- D 5 - Immature, non-mineralised bone

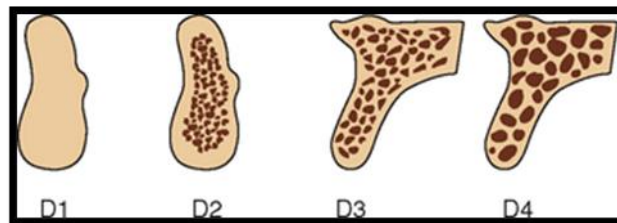


Fig 1: Bone Density Classification

The surgical protocol, healing, treatment plans, and progressive loading time spans are unique for each bone density type

### Clinical criteria for immediate loading:

#### 1. Bone quality:

Bone quality is one of the key determinants to ensure Primary Implant Stability, which is the key to a successful osseointegration.

Dense Bone (D1 & D2) is contributory to increased implant bone contact and thus primary stability<sup>[2]</sup>.

#### 2. Implant primary stability:

The insertion torque value of the implant is the most critical and accessible parameter for evaluating primary stability. Torque values typically ranging from 30 to 40 Ncm or higher are commonly used as benchmarks for immediate loading<sup>[3]</sup>.

Primary implant stability is influenced by many factors including local bone quality and quantity, implant macro-design and surgical technique.

### Immediate Functional Loading<sup>[4]</sup>:

After placement of Implants and achieving adequate primary stability of the endosseous implants—typically with an insertion torque of  $\geq 35$  Ncm, within 48 to 72 hours the provisional prosthesis is delivered or immediately in some cases meeting all clinical criteria. Based on a diagnostic wax-up interim restoration is pre-fabricated and mounted using a surgical guide to ensure optimal implant positioning and occlusal harmony. The provisional prosthesis is designed such that it should be in functional occlusion, with even centric contacts and to prevent excessive micromotion at the bone-implant interface elimination of eccentric interferences need to be checked. Passive fit of the superstructure is important to avoid undue stresses that may compromise osseointegration.

### Immediate Non-Functional Loading<sup>[5]</sup>:

In immediate non-functional loading protocols, a provisional restoration is placed within 48–72 hours following implant placement; however, it is intentionally relieved from occlusal and lateral contacts to prevent functional loading during the osseointegration phase. This idea can be used when all centric and lateral occlusal contacts are with natural teeth or well integrated and healed implants. As compared with immediate functional loading, this method has the advantages of reducing the risk of biomechanical functional overloading. This technique is especially useful in the anterior region

### Guidelines for immediate loading implants by TARNOW et al<sup>[6]</sup>:

The primary objective of an immediate-loaded implant or prosthesis system is to minimize the risk of occlusal overload, which can lead to an accelerated bone remodeling rate. One approach to reduce microstrain and the associated bone remodeling is to create conditions that enhance the functional surface area at the implant-bone interface.

- The implants should be at least 10mm long.
- The widest possible anterior-posterior distribution of the implants should be used.

- A diagnostic wax-up should be used for the template and the provisional restoration fabrication.
  - Use of rough surfaced implants, rather than smooth surfaced ones <sup>[7]</sup>. This increases the surface area for osseointegration.
  - Avoid tapping
  - Threaded implants <sup>[8]</sup> show a greater functional surface area effecting a better stress distribution at the implant bone interface.
  - Use of hydroxyapatite coated and plasma coated has shown predictable results for immediate loading of implants <sup>[8]</sup>
  - A screw retained provisional restoration should be used whenever possible.
  - If cemented, the provisional restoration should not be removed during the 4-6 month healing period.
  - A rigid metal casting should be used on the lingual aspect of the provisional restoration.
  - All implants should be evaluated with Periotest at Stage-I, and the implants that show the least mobility should be selected for the immediate loading.
  - Immediate loading should be attempted in dentulous arches only, to create cross-arch stability (Cantilevers should be avoided in the provisional restorations <sup>[7]</sup>).
  - Use of 30 degree teeth and lingualised occlusion. Decreasing cusp inclines, modifying occlusal anatomy to include 1.5mm fossae instead of occlusal grooves. Opposing cusps should be narrowed.
  - All these factors reduce the stresses on the implants and aid osseointegration.
  - Cautions in bruxers, smokers: While Bruxism and Smoking are deterring factors to osseointegration, they are not completely contraindicated for immediate loading but should be treated with caution <sup>[9]</sup>.
- Soft diet
- Use of Acrylic Resin Provisionals to minimize load transmission directly to implants.

#### **Indications <sup>[10]</sup>:**

Functional loading can be employed for:

- Single tooth replacement
- Partial edentulism
- Full edentulism

#### **Contraindications <sup>[10]</sup>:**

- Patients who are bruxers.
- Edentulous patients with a reduced bone quality and quantity.
- With not optimized biomechanically suprastructures.
- With short implant lengths.
- Active Infection or Inflammation
- Inability to achieve an adequate antero-posterior spread.
- Uncontrolled Systemic Conditions: Medical conditions such as uncontrolled diabetes, immune suppression, or osteoporosis can impair healing and increase the risk of implant failure

#### **Advantages:**

- 1) Immediate full function of the new tooth.
- 2) No second –stage surgery (eliminates discomfort of the patient and decreases overheat).
- 3) The soft tissue hemidesmosome attachment on the implant body below the microgap connection may heal with an improved interface.
- 4) The soft tissue emergence can be developed with the transitional prosthesis and the tissue allowed to mature during the bone healing process.
- 5) Implants can be splinted during initial healing for biomechanical advantage.
- 6) Long term edentulism can be eliminated.
- 7) No additional appointments are required.
- 8) Facilitates soft tissue shaping.

#### **Disadvantages:**

- 1) More chances of failure.
- 2) Peri-implant bone reaction is highest after surgical trauma due to immediate loading.
- 3) High chances of post-operative complications.
- 4) More patient co-operation is needed.
- 5) More bone loss compared to delayed loading.

- 6) Micro-movement of implant can cause crestal bone loss or implant failure is greater than two stage procedure.
- 7) Parafunction from tongue or foreign bodies may cause trauma and crestal bone loss.

**Complications:**

Overloading of implants is linked to various clinical complications, including screw loosening, screw fractures, prosthesis fractures, progressive marginal bone loss below the implant's first thread, implant fractures, and even implant failure<sup>[11]</sup>. To prevent these issues, it is essential to apply sound biomechanical principles.

This includes ensuring a passive fit of the prosthesis, narrowing the bucco-lingual/mesio-distal width of the implant prosthesis, reducing cantilever length, and keeping implant loads within the physiological limits specific to each patient's occlusion. Achieving these goals requires improved force direction, an increased support area, and reduced force magnification

**II. Conclusion:**

Immediate loading of dental implants has become an exciting advancement in implant dentistry, offering patients the advantage of restoring function, aesthetics, and self-confidence without delay. For successful outcomes, it's essential to understand and respect core biomechanical principles—like assessing bone quality, ensuring primary implant stability, and managing occlusal forces. Following proper protocols, this approach has shown high survival rates and enhanced responses in the surrounding tissues with successful outcomes. However, the success of Immediate loading Implants mainly depends on careful patient selection, thorough planning, and precise execution of surgical protocol and prosthetic phase. Patient satisfaction with immediate Implant loading is high, as there will be no long term edentulousness. Continued research and collaboration will further refine this approach, expanding its applicability and benefits in implant dentistry

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