

Loading in Dental Implantology

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ABSTRACT

Background: Dental Implantology has replaced the conventional techniques of tooth replacement drastically with time. They are even considered as the third dentition. For the longevity of the implant, an excellent implant-bone interface is required. Numerous factors affect implant longevity, out of which load is the most critical factor. Several protocols were advocated for loading. This article summarizes different protocols their advantages and disadvantages.

Keywords: Loading protocols, Progressive loading, Immediate loading.

INTRODUCTION

Prosthetic rehabilitation of missing structures in the oral and maxillofacial region in accordance with DeVan's principle of preservation has been the ultimate challenge to the prosthodontist. Over the years, traditional methods of tooth replacement are slowly and steadily being replaced by newer modalities like implants.¹ Implants have come a long way from cast cobalt-chromium tubes, pins, subperiosteal Vitallium implants, endosseous blade implants, ceramic implants to the modern-day root form implants made of titanium and its alloys. Various factors like bone strength, volume, density, the biocompatibility of implant materials, design of the implant, and forces or Loads acting on the implant play an essential role in establishing an excellent bone to implant interface. To load the implant immediately or not is indeed the question and the rationale and principles that go with the protocol warrant a discussion. Thus, this article gives a brief review of various loading protocols and their significance.

TYPES OF FORCES APPLIED TO DENTAL IMPLANT:-

Measurement of forces applied to dental implant or teeth is known as "Load".

Different types of loads include:

- Occlusal loads during the function.
- Passive loads like those applied to implants during the healing stage because of mandibular flexure, contact with first stage cover screw and/or the second stage- per mucosal extension.
- Horizontal loads like perioral forces of the tongue and oral musculature.
- Forces due to the application of non- passive prostheses to implant bodies.
- Forces due to parafunctional oral habits or tongue thrust.

Different protocols of implant loading include:-

1. Branemark's loading protocol

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2. Progressive loading protocol
3. Non-submerged single-stage protocol
4. Immediate functional loading
5. Immediate non-functional loading
6. Early loading
7. Delayed loading
8. Anticipated loading

1. BRANEMARK'S LOADING PROTOCOL

The surgical and prosthetic protocols for the development of a predictable direct bone-to-implant interface with root-form implants were developed and reported by *Branemark et al.* He and his co-workers proposed the concept of osseointegration through delayed loading protocol which showed that direct bone apposition at the implant surface was possible and lasting under loading at the condition that implants were left to heal in a submerged way for 4-6 months then only second-stage surgery should be performed.²

ADVANTAGES

- Minimal risk of infection
- Prevention of apical downward growth of mucosal epithelium
- Reduced risk of undue early loading

DISADVANTAGE

- Longer treatment duration

2. PROGRESSIVE LOADING PROTOCOL

It is also known as- "Gradual bone loading". This was proposed by CARL E. MISCH in the year 1980. According to him this concept of gradual bone loading was developed to decrease crestal bone loss, and early implant failure.³ The loading forces applied to the newly integrated implants are gradually increased through the use of provisional restorations and dietary modifications. The rate of increase is based on the bone density noted at the surgical site during implant placement. At each appointment, the provisional restoration is modified or replaced in an attempt to progressively increase the occlusal contact and to develop the desired occlusal scheme.⁴ The definitive prosthesis is then delivered.

ADVANTAGES

- Decreases crestal bone loss
- High success rate

DISADVANTAGES

- Longer treatment durations

3. NON SUBMERGED SINGLE STAGE PROTOCOL

The single-piece implants are used under this protocol. They can be simple pillars or the conical one. Here, the implant threads are anchored into the bone and conical part will be mucosa piercing the implant serves as a one-piece implant pillar. However, the success rate of the single piece implant is relatively low.

ADVANTAGES

- One stage surgical procedure – so less chair time, less pain, shorter healing period, reduction of the related treatment cost.
- No microgap at alveolar crest bone level – so less crestal bone resorption, during healing and following initiation of functional loading and more favourable crown-implant length ratio.

DISADVANTAGES

- Risk of trauma during the healing period
- Lower success rate

4. IMMEDIATE FUNCTIONAL LOADING

This technique of placing Implants in a single surgical step involves fitting the prosthesis in the same surgical session. According to some, it may be delayed by up to 3 days post-surgery. The Provisional restoration delivered is in full occlusal contact with the opposing dentition.⁵

ADVANTAGES

- The immediate fitting of the final prosthesis at the time of the surgery.
- Patient's failure to experience any functional and psychological discomfort associated with being edentulous (with or without removable prostheses).

DISADVANTAGE

- An immediate load may lead to implant failure.

5. IMMEDIATE NON-FUNCTIONAL LOADING

This technique brings together the advantages of one stage implants and quick loading. The provisional prostheses are not in occlusion and therefore serve an only aesthetic purpose.⁶ This idea can be used when all centric and lateral occlusal contacts are with natural teeth or well-integrated and healed implants.

ADVANTAGES

- Need for second stage surgery is eliminated
- Patients have a fixed esthetic tooth replacement.
- Good emergence profile can be developed by transitional prosthesis.⁷

DISADVANTAGES

- Cannot be given in patients with para-functional oral habits
- Usually useful in the anterior region only.

6. EARLY LOADING

Often presented as Immediate loading, in reality, according to this technique, the final prosthesis is fitted 3 weeks after surgery, i.e. it is not immediate.⁸ Some regard it as the delivery of a prosthetic implant suprastructure from 3 days up to 6 weeks post-surgery.

ADVANTAGES

- Lesser treatment duration.

DISADVANTAGES

- Denser cortical bone is required.
- A high percentage of the implant in contact with bone cortex is required.

7. DELAYED LOADING

According to some authors, implants subjected to loading after more than 6 weeks post-surgery are said to come under delayed loading, as per the standard protocol.⁹

ADVANTAGES

- Provide optimal time for implant healing.

DISADVANTAGE

- Longer treatment duration.

8. ANTICIPATED LOADING

Under this protocol, the provisional prosthesis is fitted about two months after surgery.

CONCLUSION

The patient demand for esthetics is increasing day by day, and the replacement of teeth immediately the following extraction is attaining popularity. In this respect, even the replacement of prosthetic teeth immediately following the implant placement has to be considered as a severe issue.¹⁰ But the health of the implant should not be compromised while completing the treatment procedure. Therefore it is very much essential to know the requirements and bone responses to the occlusal loading in the healing period. This will help us in planning the necessary modifications in the treatment plan to achieve the success of implant prosthetic rehabilitation.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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