

## Overdenture with immediate loading: a case report

**Abstract / Introduction:** The advent of Implantodontics has opened up the horizons in edentulous patients treatment. Osseointegrated implant-supported overdentures are one example of a successful treatment modality for complete edentulism. They are an attractive alternative due to being simple and of relatively low cost. They also have advantages over the use of complete dentures, especially with regard to masticatory efficiency and patient's comfort and satisfaction. **Objective:** To describe a case of overdenture with immediate loading to show an alternative approach for oral rehabilitation. **Methods:** The technique main advantages were presented. **Conclusion:** The study concluded that overdenture with immediate loading has some advantages, such as reduced treatment time, low cost, and improved patients's quality of life.

**Keywords:** Edentulism. Immediate loading. Denture. Dental implant.

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» Patients displayed in this article previously approved the use of their facial and intraoral photographs.

## INTRODUCTION

Total tooth loss is one of the worst situations encountered in Clinical Dentistry, as it leads to decreased masticatory ability and consequent interference in food digestion. Furthermore, it can impair phonation and esthetics, thereby worsening patient's quality of life and self-esteem.<sup>1</sup>

For over a century, the most widely used form of treatment to rehabilitate edentulous patients were mucosa-supported dentures. Denture retention and stability were influenced by several factors, such as unfavorable aspects of the mucosal anatomy and residual ridge, impaired motor movement and neuromuscular coordination, as well as patient's rejection to denture wearing.<sup>2</sup>

Osseointegrated implants have become a great treatment option for oral rehabilitation and planning, as they efficiently allow reestablishment of esthetics, speech and masticatory function, in addition to restoring patient's self-esteem.<sup>3</sup>

Implant protocol is among the those proposed to improve rehabilitation of complete edentulous patients. It consists of 4 to 6 implants placed between the foramina so as to support a full fixed denture. However, there are patients who cannot undergo this type of surgery due to its high costs or because of systemic conditions involved in such an extensive surgical procedure.<sup>4</sup>

Thus, the alternative use of overdentures on implants arose. They are accessible to the majority of the overall population due to involving low costs, as they require only two implants, and yielding good stability, retention, improved masticatory function, and excellent esthetics. Implant overdentures have greater acceptance in comparison to fixed denture in patients with significant bone loss.<sup>4</sup>

Overdentures are total dentures supported by the residual ridge and retained by remaining endodontically treated teeth or osseointegrated implants.

Human life span is rapidly increasing; therefore, the opportunity to preserve healthy teeth and gingiva has also increased due to current preventative measures. Should all efforts to maintain dental roots fail, Bioengineering is able to insert artificial roots threaded on a titanium metal post representing osseointegrated implants.<sup>4</sup>

Overdentures are more indicated than total fixed implant-supported dentures in cases with little vertical space between the arches. They are also recommended for patients with limited hygiene, those suffering from severe bruxism, cases with significant bone loss, and great maxillomandibular discrepancy. Financial reasons can also determine the choice for overdentures due to the reduced number of implants required and less surgical complexity, laboratory and prosthetic components.<sup>1</sup>

Immediate loading is a widely accepted treatment modality used in dental practice due to its large success rates among edentulous patients. Immediate loading has been reported to be beneficial for osseointegration. This process occurs through mechanical and biological stimulation resulting from existing physiological load which reshapes the bone surrounding the implant (Wolf's Law).<sup>5</sup>

The first attempts to test immediate loading on implant-supported overdentures were made by Ledermann in 1979 and 1983. However, sampled results were only published in 1997 by Chiapasco et al.<sup>6</sup>

Studies have encouraged reduction in healing and osseointegration periods, and immediate implant loading, especially in

mandibular implant-supported overdentures in favor of reduced prosthetic rehabilitation time and patient's satisfaction.<sup>7</sup>

Given that immediate loading treatment has been currently used as a solution to a number of dental problems, comprehending its impact on masticatory function, patient's satisfaction, nutritional status, and quality of life related to oral health, is paramount. This would allow such information, apart from potential success rate, to be passed on to patients at the time of planning.<sup>8</sup>

Thus, whenever possible, osseointegrated implant placement should be indicated to treat edentulous patients so as to improve complete denture mechanical performance, avoiding strictly mucosa-supported dentures, especially in the mandible.

## CASE REPORT

A male 80-year-old patient sought the ABCD Dental School in Florianópolis, Santa Catarina, Brazil to improve the efficiency of his lower complete denture. Initially, the patient was interviewed and a cone-beam computed tomographic examination of the mandible was requested. Two treatment options were proposed to the patient: 1) four lower implants placement with immediate loading; 2) overdenture with two implants placement and immediate loading. The patient opted for the second one.

CT scans revealed good bone ridge, enough to perform the first protocol; however, the patient opted for overdenture due to decreased surgical time, lower costs, and ease of cleansing.

Implant surgery was accomplished without further complications. Amoxicillin

and nonsteroidal anti-inflammatory drugs were prescribed in pre and postsurgical periods. Guidelines for postoperative care were also provided.

The implants used in this case study were Grip Porous Ø 3.75 x 10 mm, with external hexagon connection and a 60 N torque. Implants were placed in the canine region, so as to maintain a parallel plane.

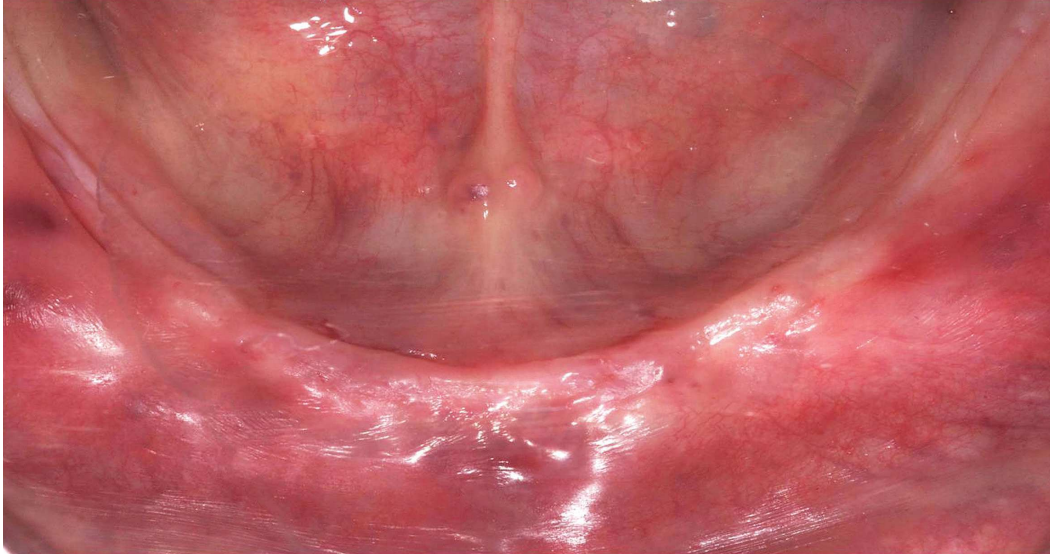
Incision was performed only in the canine region using a Solidor #15 C carbon steel scalpel blade (Figs 1 and 2). This option was made in order to avoid a less traumatic surgical procedure and provide the patient with a more rapid postoperative rehabilitation.

Implants were placed in parallel (Fig 3). According to the O-ring method, implants should be placed in this position so as to increase the life span of the system capsules and to render denture placement easy by the patient.

A surgical guide was created by duplicating the prosthesis. First of all, a new lower complete denture was prepared for the patient, which was then duplicated to be used as a surgical guide (Fig 4).

An O-ring clamp was used (Fig 5). Light-bond vinyl siloxane (Futura AD Regular, DFL) was used to help positioning the capsules and mark the prosthesis (Fig 6). Perforations were made according to the markings and by means of a tungsten cutting drill (Max Cut) (Fig 7).

A rubber dam (Madeitex, 13.5 cm x 13.5 cm) was used to transfer the capsule into the overdenture, thereby assuring resin polymerization only around the capsules (Fig 8). Colorless acrylic resin (Dencôr) was used to transfer the capsules.

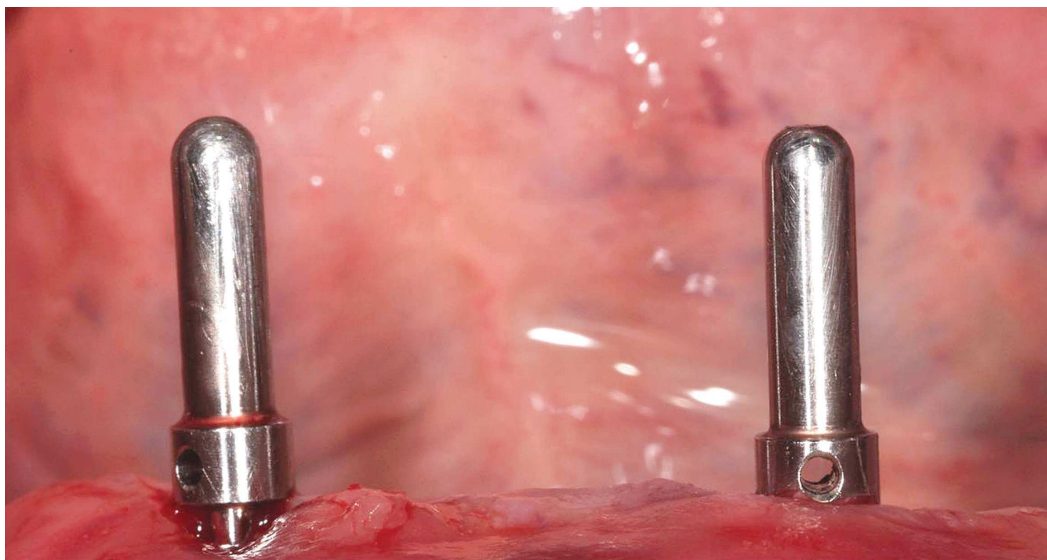


**Figure 1.** Region of canines where incisions were made.



**Figure 2.** Incision in the region of canines, only.





**Figure 3.** Implants installed in parallel.



**Figure 4.** Surgical guide.

After the capsules were captured, the overdenture was placed (Fig 9). The patient received recommendations regarding diet and oral hygiene. Suture (nylon 5-0 Shalon black suture, 2.0 cm needle) was removed after 7 days, when the area was examined. Normal healing was observed.

Figure 10 depicts the final outcomes of complete upper denture and lower overdenture.

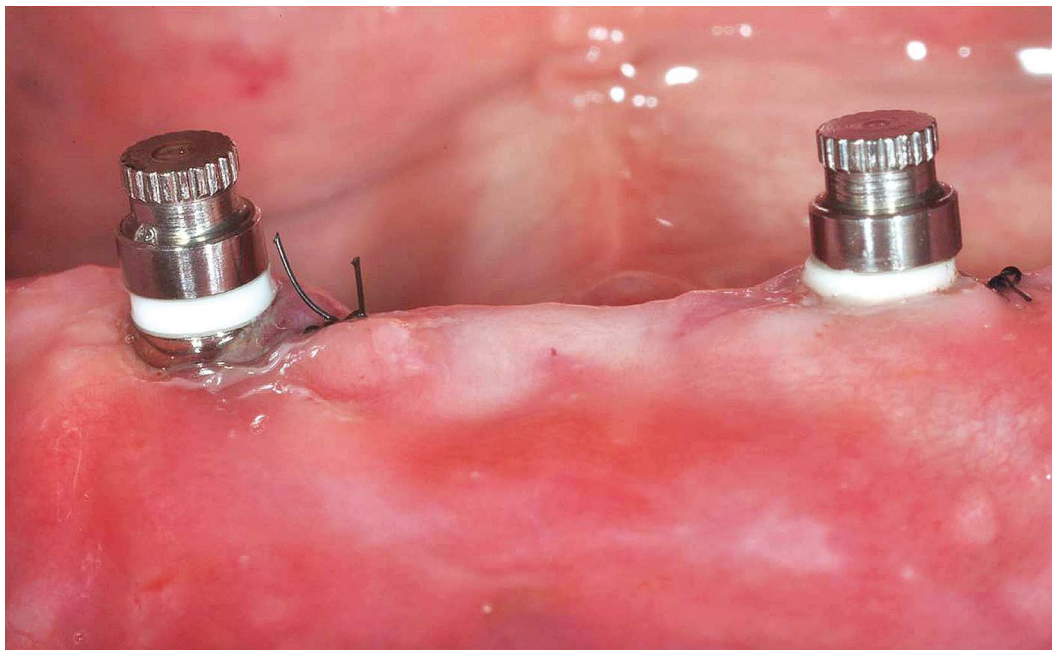
### LITERATURE REVIEW

Loading absence during the healing period is one of the prerequisites for osseointegration. For that to be achieved, a two-stage

surgical protocol has been developed. This protocol comprises implant placement below soft tissues for three (mandible) to six months (maxilla) and left to heal free of loading.<sup>9</sup>

However, this prerequisite has been questioned by several authors<sup>10-13</sup> reporting single-stage outcomes to be similar to those yielded by a two-stage procedure. These authors also show that bone loss around implants was approximately 1 mm in the first year, and it remained stable for a long period of time, whether the procedure was a one or two-stage protocol.<sup>9</sup>

The predictability of implant treatment led to the development of techniques



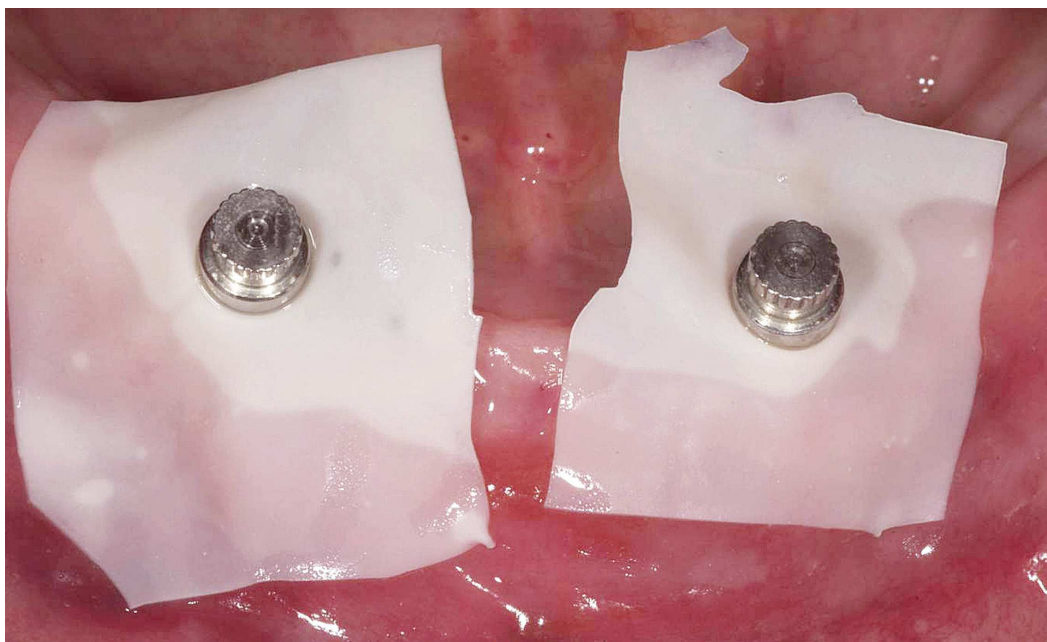
**Figure 5.** O-ring system.



**Figure 6.** Use of molding material to mark the capsules.



**Figure 7.** Perforations in the prosthesis according to markings previously made.

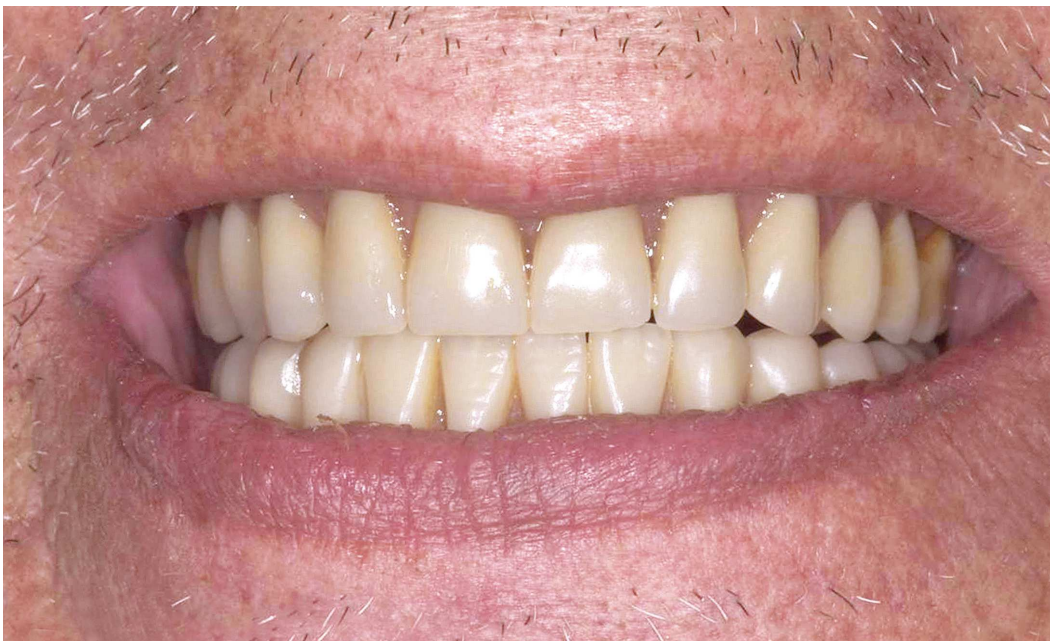


**Figure 8.** Use of rubber dam to ensure polymerization around capsules, only.





**Figure 9.** Overdenture installation.



**Figure 10.** End result.



with the aim of simplifying the procedure, reducing healing time and costs, and providing patients with greater comfort. This procedure is known as immediate loading, i.e., early implant placement in function via temporary or permanent fixed prosthesis, within a few hours, days or weeks after surgery. This technique is used when one wants to reduce the number of steps involved in prosthesis placement, and allows patients to resume masticatory functions in a practical and safe way.<sup>14,15,16</sup>

Babbush et al<sup>17</sup> installed titanium plasma-sprayed (TPS) implants to perform overdenture prostheses in edentulous mandibles with 3 to 4 bicortical implants placed in the anterior region. The implants were splinted within 2 to 3 days after surgery using a Dolder bar, and immediately loaded with a provisional prosthesis. The definite prosthesis was installed two weeks later. The authors analyzed 129 patients with 514 implants and a follow-up period of 5.5 years. Success rate was 96.1% with failures reported within the first year and mainly related to lack of adequate rigid fixation.

Gatti et al<sup>18</sup> conducted a prospective study on 21 patients who received implant-supported mandibular overdentures. Eighty-four ITI implants were placed in the mandibular interforaminal region. Each patient received four implants. Immediately after implants placement, they were connected by a titanium or gold U-shaped bar, and subjected to load as they would support the overdentures. Of the 21 patients treated, 19 were followed up between 25 and 60 months. Total implant failure rate was 4%; but all implants, bars, and prostheses remained in function. According to the authors, their results reveal that, after osseointegration, immediate loading

success was similar to that achieved with delayed loading.

Chiapasco et al<sup>19</sup> conducted a study to compare the results between delayed and immediate-loaded mandibular overdentures. Ten patients (test group) received 40 Brånemark system MKII implants, four per patient placed in the interforaminal region. Standard abutments were screwed to the implants connected by a rigid bar, and overdenture was immediately installed. Another group of 10 patients (control group) received the same type and number of implants placed in the same area, but left to heal submerged. Eight months later, standard abutments were screwed to the implants, and the same prosthetic procedure was applied. No significant differences were found between the two groups regarding plaque index, bleeding index, and marginal bone resorption. Implant success rate was 97.5% in both groups. The results of that study show that immediate-loaded implants connected with a rigid bar do not produce damaging effects on osseointegration.

A study by Stricker et al<sup>20</sup> presented preliminary results of immediate-loaded ITI implants sandblasted with coarse grained and acid-etched (SLA) with a bar-retained overdenture in edentulous mandibles. Ten edentulous patients aged between 48 and 74 years old received two SLA solid screw implants (ITI) loaded with a bar and overdenture one day after placement. The follow-up period was 24-36 months (mean 29.8 months) after implant loading. Twenty-four months after installation, none of the 20 implants failed. The mean marginal bone resorption around the implants was 0.71 mm after 12 months, and 92% of implant sites had zero bleeding index. Between 12 and 24 months, additional bone loss was 0.08 mm, on average. Results suggest

that immediate loading of two implants can be successful and support the use of roughened-surface implant on residual bone.

Ormianer et al<sup>21</sup> conducted a study with a 12 to 30-month follow-up and assessment of immediate loading in implant-supported overdentures with ball joint connected to the anterior mandible. Immediately after surgery, overdentures were connected with two ball joints. Cavities were filled with molding material (Impregum, 3M Espe) so as to improve retention and reduce forces in the initial loading phase. Of the 28 implants placed, only one failed, which represents a success rate of 96.4%. Marginal bone loss was 1 mm at the two sites, which represents a success rate of 92.8%.

Implant-supported overdenture is a very useful alternative for the rehabilitation of edentulous arches, as it is able to restore patient's masticatory function, speech, and esthetics, as well as lip muscles support. However, planning is essential to achieve clinical success and fulfill patient's needs and expectations.<sup>22</sup>

Despite not being the only alternative to treat edentulous mandibles, overdentures might be the best treatment option for many patients due to potential financial constraints, bone anatomy or fear to undergo more complex surgical procedures. In this context, it is the dentist's responsibility to suggest the most appropriate treatment option and have the skills to manufacture this type of prosthesis.<sup>1</sup>

The main restraint systems for implant-supported overdentures described in the literature encompass the following: bar-clip system, Locator, ball connection (O-ring type), ERA, and Magneto system.<sup>23</sup>

The O-ring system is indicated for cases of independent implant-supported

overdentures and consists of two parts: one of which is screwed to the implant while the other is secured to patient's prosthesis. This system requires perfect parallelism between implants, otherwise they will undergo excessive wear, thereby having function and effectiveness reduced.<sup>23</sup>

The advantage of the O-ring retainer is that it requires simple preparation while involving low costs, easy maintenance and plaque control, when compared to other types of retainers. However, from a biomechanical point of view, it is worth remembering that implant connection or splinting with a bar could theoretically provide greater stability and better distribution of occlusal loads between connected implants. In fact, no consensus has yet been reached on the best restraint for overdentures. The decision on which type of restraint to be used would depend on an analysis of the individual characteristics of each patient, which should include alveolar ridge anatomical shape, presence of natural teeth in the opposing arch overdenture, economic factors, etc.).<sup>23</sup>

The disadvantages of this type of restraint system include rebasing the overdenture base attached to all mucosa-supported prostheses; the need to reassess it at least once a year; the need to tighten central implant screws, a potential result of the characteristics of removable overdenture; and the regular exchange of elastic rings at the base of the overdenture, usually on an annual basis, depending on wear of each case.<sup>23</sup>

## DISCUSSION

Clinical experience has shown that micro O-rings provide effective retention and stabilization, in addition to proper support on the oral mucosa. Moreover, it provides patients with satisfaction

and self-esteem. These findings are in agreement with previous reports associating implant rehabilitation for edentulous patients to increased quality perception of dental work, substantially improving patients' quality of life.<sup>22,24</sup>

Based on the results of this study it is reasonable to assert that treatment of edentulous patients with mucosa and implant-supported overdentures with immediate loading was highly effective in terms of reduced complications of complete conventional dentures, especially with regard to retention and stability. Immediate loading reduces treatment time, thereby providing patients with greater satisfaction. However, for this treatment modality to be successful without early implant loss, good bone quality and primary stability are paramount.<sup>4</sup>

## CONCLUSION

On the basis of this literature review and case report, the following conclusions were drawn: Overdentures have considerable clinical advantages, such as fast treatment, low costs, improved quality of masticatory function, easy cleansing, enhanced patient's self-esteem, restraint, good cost-benefit relationship, and reduced surgical time when compared to conventional complete fixed dentures. No considerable disadvantages were found, except for the need to possibly rebase the prosthesis and change the O-ring connections.

Overdentures are an alternative to restore and fulfill biological, functional, esthetic and psychosocial parameters of edentulous patients.

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