

Evaluation of Retention of Two Different Attachment Systems Used with Mandibular Implant -Retained Overdenture Clinical Case Report

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Abstract

Dentists have a significant role in improving their patients' oral health and quality of life with the help of the overdentures that support the implant. An atrophic mandible significantly impedes the successful oral rehabilitation with dental implants. An implant supported mandibular overdenture fabricated in this case report utilizes two implants placed in interforamina region and a dual retentive, resilient, self-locating locator and ball abutment attachment mechanism. Utilising locators and a ball abutment as the attachment, the dentist can rapidly and satisfactorily meet the patient's functional, economic, and social needs.

1. Introduction

Edentulism, a common condition occurring in the elderly age group is thought to have an impact on people's quality of life and health outcomes. The denture must be successfully integrated with the patient's oral functions in addition to their psychological acceptance of the dentures in order for comprehensive denture therapy to produce optimistic results.

Numerous studies have shown that conventional mandibular dentures cannot reestablish masticatory function or enhance patient satisfaction and quality of life. Oral and masticatory functions are impacted by retention and stability concerns with the mandibular complete denture. For resolving these problems, implant-retained overdentures are a great option for prosthetic management. When more implants cannot be placed for financial reasons, rehabilitation with mandibular implant-tissue supported overdentures utilizing two implants may be the best treatment choice. Based on the statement from McGill and York, the two implant-tissue supported mandibular OVD is

regarded as the bare minimum standard of care for edentulous patients, taking into consideration performance, satisfaction among patients, cost, and clinical time. An overdenture supported by two interforaminal implants can offer edentulous people long-term neuromuscular support. With implant overdentures, a variety of attachments can be used because they're known to increase retention, stability, and support, which in turn lengthens their lifespan. Some of the crucial factors in choosing the most suitable overdenture attachment type are cost effectiveness, desired level of retention, expected level of oral hygiene, available bone, parallelism of implants, maxillomandibular relationship, interimplant distance and patient's expectations. Magnets, Ball/O-ring, bars/clips, and locator attachments are some of the attachments available.

The ball and socket attachment system is the most widely used attachment for un-splinted implants due to its ease of use, low cost, practicality, effectiveness, removal of a superstructure bar, wide range of motion, and high patient satisfaction. Contrarily, it has some limitations like it slowly loses retention with time, the

requirement that the ball attachments should be almost parallel to one another and it needs to be replaced time to time .

The locator attachment system has an inner and outer dual-retention attachment mechanism with self-aligning functionality. There are three different colour options for locator attachments—white, pink, and blue—each with a different level of retention. Other benefits include rotational action, built-in guide planes for exact insertion, the ability to utilise it in non-parallel circumstances, and reduced inter-arch spaces. Additionally, its repair and replacement is quick and simple

This case report details the step-by-step process used by a team to meet the patients' expectations for an implant retained mandibular overdenture that is both highly functional and aesthetically appealing.

CASE-REPORT-1

A seventy-year-old male patient presented to the Department of Prosthodontics with chief complaint of loose lower complete denture prosthesis. The patient was a denture wearer since last fifteen years and was facing an issue of loose mandibular denture for the past five years. On intraoral examination it was found that mandibular ridge was severely resorbed (Atwood class 5)

Figure 1 – Severely resorbed mandibular ridge

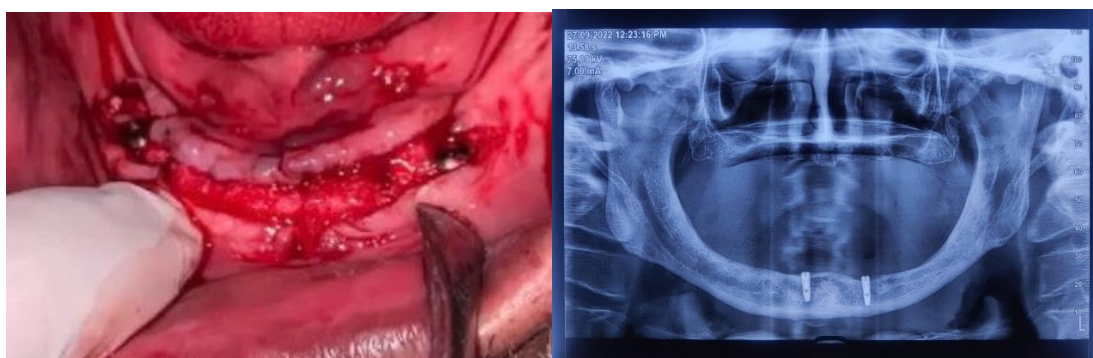


Maxillary and mandibular diagnostic casts were made. An orthopantomogram (OPG) was done to evaluate the bone for selection of implant sizes. TwoDentium

(superline) implants; size 3.5 mm × 13 mm were placed by surgically raising flap in inter-foramina region (Figures 2&3).

Figure 2 – Implants placed in Inter-foramina region

Figure 3 – Post Operative OPG



The typical post-surgical protocol was followed, and the patient was instructed to refrain from using their lower denture for three weeks. Lower denture was locally relined with soft liner (GC Japan) after three weeks. After three months of the osseointegration

period, prosthetic phase was started. The cover screws of implants were exposed followed by placement of healing abutments/gingival formers to form mucosal seal (Figure 4).

Figure 4 – Healing abutments/Gingival formers placed



After one week, the healing abutments were removed, and using a depth gauge device, measurements were made from the implant platforms to the most coronal

part of the surrounding gingival levels. In this case, locator abutments of 2 mm gingival height were placed with the help of an abutment driver (Figure 5).

Figure 5 –Placement of Locator abutments



Abutments were tightened up to 25-30 N using a torque wrench .The plastic resilient male cap with the metal housing was fitted over the abutment (Figure 6)

Figure 6 – The plastic resilient male cap with the metal housing was placed over the abutment



It was directly picked chair sidewith pattern resin (EZ pattern resin), which allows denture to be snapped into the locator abutments. (Figure 7)

Figure 7 – Intaglio surface with metal housing



Final denture insertion was done. Patient was satisfied with aesthetics (Figure-8)

Figure 8 – Post denture insertion



By switching to higher retentive caps, the retention can be gradually raised in accordance with each patient's usage and demands. The locator core tool can be used to replace these plastic resilient caps chairside during the follow-up consultation.

CASE REPORT -2

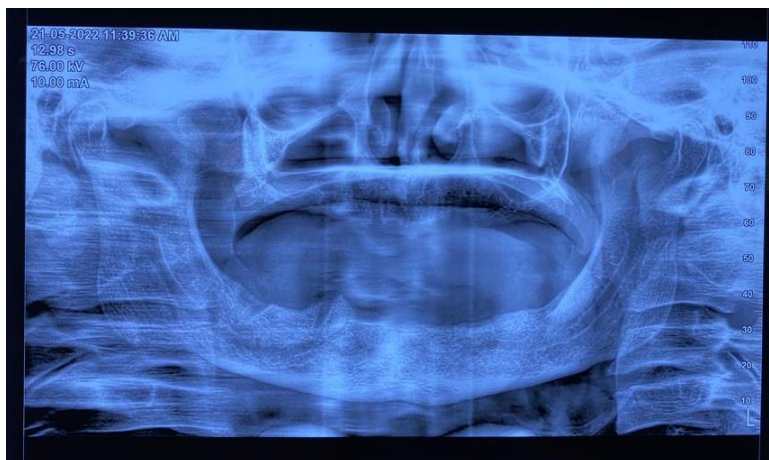
A 63-year-old male patient came to our Prosthodontics department with the chief complaint of loose fitting lower denture along with difficulty in mastication and speech. On intra oral examination it was observed that patient had resorbed mandibular alveolar ridge (Atwood class 5) (Figure 9) which was the reason for inadequate retention of the lower denture prosthesis. Patient was a previous denture wearer since 1 year.

Figure 9 –Resorbed alveolar ridge



The Orthopantomograph showed the presence of sufficient bone height and width for implant placement (Figure 10). Thus, an implant supported overdenture was planned out with ball type attachments.

Figure 10 – Pre-Operative OPG



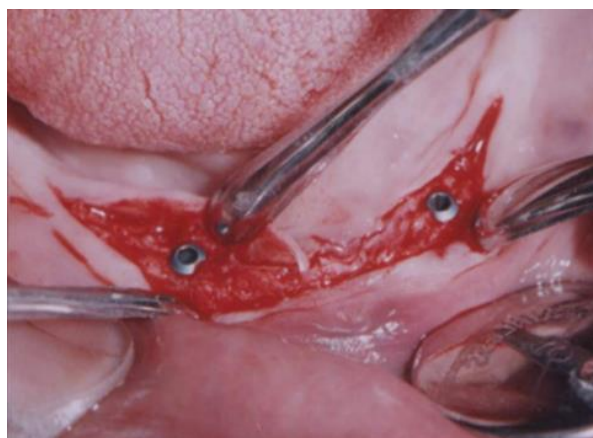
Blood tests were performed and informed consent was obtained after the patient and the doctor discussed the treatment plan. An impression was made using Irreversible hydrocolloid e and pre-surgical diagnostic casts were prepared. To measure the inter-arch distance, a tentative jaw connection was recorded.

Surgical Phase- In accordance with conventional aseptic protocol and antibiotic prophylaxis, the patient was prepared by having the mandibular anterior segment anaesthetized with an inferior alveolar nerve block using local anaesthetic consisting of 2%

lignocaine and 1:80,000 adrenaline. Following local anaesthesia, a full thickness crestal incision was made from the first premolar on the right side to the first premolar on the left side using a surgical blade number 15. Bone was seen through the raised mucoperiosteal flap. Two osteotomy sites were prepared into the bone with a pilot drill

.Two surgical implants (3.3 x 13 mm) [Dentium (superline)] were placed (Figure11) using motor driver at 35 rpm.

Figure 11 – Implant placement in Inter-foramina region



Cover screws were placed after the implant had reached the proper depth. Later flaps were approximated, and 3-0 Vicryl suture material was used for the suturing. After giving the usual post-operative

instructions, the patient was called back for suture removal one week later.

Osseointegration was assessed clinically and radiographically 3 months after surgery (Figure 12)

Figure 12 – Post operative OPG



Cover screws were removed during the second stage of surgery, and healing abutments/gingival formers were inserted.(Figure-13).

Figure 13 – Healing abutments/Gingival formers placed



The healing of the peri-implant soft tissue was assessed after one week and the present denture was relined after being relieved at the abutment site. To remove the healing abutment, 1.25 mm hex driver was used. To make sure that the implant's interior surface is clear of debris and soft tissue, it is irrigated and

dried. The gingival cuff height at the right and left canine implant sites was measured using a periodontal probe. With the use of a 1.25 mm hex driver and a 30 Ncm torque wrench, selected ball abutments were placed onto each implant (Figure 14).

Figure 14 – Placement of Ball abutments



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An indelible pencil was used to make a transferable mark on top of each ball abutment in order to best designate the location for attachment housings. The

intaglio surface of the denture was next prepared by cutting outrecesses for the housings (Fig. 15).

Figure 15 – Preparation of recesses in the denture to accommodate housings



With a no. 6 round bur, lingual vent holes were created to allow excess acrylic to escape. The

attachment housing was seated onto each ball abutment (Figure 16).

Figure 16 – Both abutments with placement of attachment housings along with the processing insert



In order to stop pattern resin from locking the denture to the abutment, undercuts were blocked out underneath the housing and soft tissue. The pattern resin was applied into the recessed area and around titanium housings for proper bonding of the housings to denture. After placing the lower denture, the patient

was instructed to close their mouth in centric relation until the patten resin was set. The denture was then taken off. Around the housings and lingual vent hole, excess acrylic was removed and afterwards it was polished (Figure 17).

Figure 17 –Intaglio surface with metal housing



The overdenture was positioned over the ball abutment (Figure 18). Proper instructions on how to apply and remove the prosthesis were given to the

patient. At follow-up appointments scheduled for 1, 3, 6, and 12 months, the patient was recalled back.

Figure 18 – Post denture insertion



EVALUATION OF RETENTION

Both groups [Group I: Dentium (superline) Locator attachment system, Group II: Dentium (superline) Ball attachment system] were evaluated for retention at three times (T): T0 –before the insertion of overdenture, T1 – at the time of insertion of implant supported mandibular overdenture, and T3 – retention was evaluated after 3 months of insertion of implant supported mandibular overdenture. The retention of the mandibular total implant supported overdenture was measured using a digital force metre device (Parsi company). A metal hook was fixed on the

lingual surface of mandibular denture flange. Cold-curing acrylic resin was used to attach a 0.9 mm orthodontic wire lingual to the first premolar. This was done in order to apply a vertical displacement force to the denture in order to test its retention using a digital force metre device. The force metre device's shaft held the hook attachment, and the hook connected to the centre of the wire loop there. The pull end of the force meter device was attached to the hook. The denture was tugged vertically with the force metre until the denture came off, and the force reading in Newtons was recorded. An average of 3 readings were taken during each time interval (Figure 20).

Figure 20 – (A) Digital force gauge

(B) Orthodontic wire attached to force gauge for measuring retention

(C) and (D) Patient's retention measured using digital force gauge



(A)

(B)



(C)

(D)

Table 1: Retention values in the two groups

	T0	T1	T3
Group I	2.54	8.46	8.35
Group II	2.3	7.26	7.11

Group I: Dentium (superline) Locator attachment system, Group II: Dentium (superline) Ball attachment system, T0: Before overdenture insertion, T1: At time of overdenture insertion, T3: 3 months after overdenture insertion.

2. Results

The retention values (R) in the two groups at different observation times are shown in Table 1. There was no clinically significant difference between Group I and Group II before overdenture insertion (T0) while there was clinically significant difference between them at the time of loading (T1) and after 3 months (T3) with Group I being higher mean values than Group II.

3. Discussion

The majority of edentulous patients find it challenging to adapt to a traditional complete mandibular denture. Both tooth and implant supported overdenture are considered to be better treatment options than conventional denture because of increased retention, stability and preservation of residual ridge. Implant overdentures may be the best choice for patients with complete edentulism who are unable to choose fixed implant prostheses because of low bone quality, anatomical limitations, greater treatment expenses, or systemic medical disorders. The choice of attachment type is impacted by a number of variables, including bone height and width, inter-arch space, needed degree of retention, patient expectations for prosthetics, patient economic situation, and doctor preference. For prosthetic rehabilitation, there should be a minimum distance of 13-14 mm between the

mandibular incisal edge to mucosa for bar attachment, for ball attachment the distance should be 10-12mm, for both locator and magnet attachment the distance should be 8.5mm. Ball attachments are capable of accepting an angulation of 10 degree or less between the implants. Whereas angulations upto 40 degree are balanced using locator attachment. The mandibular overdenture made with locator attachments has the maximum retention and stability, according to Sadig, followed by the ball and lastly the magnets. Hao-Sheng Chang conducted a 20-year retrospective study on the long-term survival rate of implant-supported overdentures with different attachments. It was found that implants with locator attachment have a lower failure rate than implants with ball and bar attachment. In their study, Evtimovska et al. showed that the locator can be used when there is a less interridge distance, that it has self-aligning capabilities, dual retention with different degrees of retention caps, and a durable connection to the prosthesis. Retentive caps of locator attachment come in different colours and have varying levels of retention. Corado et al. looked at the locator and bar retention systems in their study and discovered that patient satisfaction was comparable for both. Additionally, they found that compared to bar attachment, locator attachment generated less soft tissue contact. For situations with a less inter-ridge distance, the locator's reduced vertical height makes it a better treatment alternative than the ball attachment. In this case report retention was assessed using digital forcemeter in Newton. Retention was assessed thrice i.e., before the insertion of overdenture (T0), at the time of overdenture insertion (T1), and three months after the insertion of overdenture (T3). Each time 3 readings with 1-minute rest between each reading, were noted and their average was taken for each patient. According to the retention values obtained in this study, there was no clinically significant difference between Group I and Group II prior to the placement of the overdenture (T0), but there was a clinically significant difference between the groups at the time of insertion (T1) and three months after insertion (T3), with higher mean values for Group I than Group II.

4. Conclusion

In this case report, an edentulous patient was successfully managed with implant-supported overdentures with the ball and locator attachments.

This procedure requires less clinical time and aids in preventing further loss of the remaining alveolar ridge. Additionally, it increases patient satisfaction by providing a sturdy, comfortable, and functional prosthesis. The locator attachment system is relatively new in contrast to ball attachment. Both locator and ball attachments provided clinically significant retention. Further, the cost-effectiveness of a ball attachment versus a locator attachment largely depends on how frequently problems arise and how frequently maintenance visits are necessary to address them.

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