IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 15, Issue 6 Ver. X (June 2016), PP 89-96
www.iosrjournals.org

Locators - Dual Retention Attachments– A Boon for Implant Supported Overdentures

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Abstract*: The classical treatment plan for the edentulous patient is the fabrication of complete removable maxillary and mandibular denture. This treatment, though inexpensive, has several drawbacks. The rate of residual ridge resorption in edentulous patients in mandible is fourfold greater than maxilla.This resorption can render the current prosthesis inadequate in terms of both function and esthetics and can lead to the necessity of fabricating a new denture an uphill task.Manyoptions are available for retention of the prosthesis, including magnets, clips, bars, and balls. But all these attachment systems carry along several disadvantages including hygiene problems, increased restorative space (>3mm) and ineffectiveness with divergent implants (>25mm).Locator attachment is a simple stud attachment that can be used when there is minimum vertical space (less than 2mm) and when resilience and retention are desired. It consists of a single-piece male stud and single unit female processed within the denture and comes with easy chair side procedure. With dual retention mechanism, this can be used when inter- implant divergence is greater than 40 degrees.*
Keywords*: locator , dual retention , greater implant divergence , less restorative space*

I. Introduction

Implant-supported prosthesis is stable, retentive and better adjusted than a conventional prosthesis. Patients and even dentists face more problems with conventional complete mandibular dentures. The problem becomes severe when the mandibular ridge is greatly resorbed. Continued bone loss in these patients causes a compromise in esthetics, function, and health.[1]

The classical treatment plan for the edentulous patient is the fabrication of complete removable maxillary and mandibular denture. This treatment, though inexpensive, has several drawbacks. The rate of residual ridge resorption in edentulous patients in mandible is fourfold greater than maxilla. This resorption can render the current prosthesis inadequate in terms of both function and esthetics and can lead to the necessity of fabricating a new denture an uphill task.[2]

One of the highest goals in the treatment of the edentulous patient is patient's satisfaction.[3] The implant-supported denture is one solution to this common problem.

Manyoptions are available for retention of the prosthesis, including magnets, clips, bars, and balls. But all these attachment systems carry along several disadvantages including hygiene problems, increased restorative space (>3mm) and ineffectiveness with divergent implants (>25mm).[4]

Locator attachment is a simple stud attachment that can be used when there is minimum vertical space (less than 2mm) and when resilience and retention are desired. It consists of a single-piece male stud and single unit female processed within the denture and comes with easy chair side procedure.[5] With dual retention mechanism, this can be used when inter- implant divergence is greater than 40 degrees.

II. Case Report

A 60-year-old male reported to the Department of Prosthodontics of Subharti Dental College, Meerut with chief complaint of masticatory inefficiency because of absence of all teeth and wanted replacement for the same. The patient had no significant medical or dental history. Thorough intraoral examination revealed well-formed U-shaped edentulous maxillary arch. Mandibular ridge was irregular with sufficient ridge height and width between the mental foramen and also with normal labial, buccal mucosa and floor of the mouth. No hyperplastic or flabby tissue was found. [Fig 1,2]

For radiographic investigations Orthopantomogram (OPG) was done which showed good bone height in the interforamina region of the anterior mandible [Fig 3]. In lieu of compromised retention and masticatory efficiency with existing clinical situation, it was intended to construct conventional maxillary complete denture and mandibular overdenture supported by implants. All pros and cons of the treatment procedure including the cost and the required healing time for the same were explained to the patient. A radiographic stent was prepared for the CBCT investigation. This included fabricating a denture base with 2 points marked which coincided with the mental foramen (derived from a line passing through landmarks- supraorbital and infraorbital notch,

infraorbital foramen). Holes were made on the corresponding points and were filled with Gutta-Percha [Fig 4]. CBCT was done with the stent in place. The CBCT report showed good height of the bone (25.6mm wrt 43 and 28.2mm wrt 33). The width of the bone was also adequate (7.6mm wrt 43 and 6.1mm wrt 33) (Fig 5). Keeping the former in mind, a 13*4.2mm implant (DFI , Alpha- Biocare)was selected for region 43 and a 11*3.75mm implant (DFI, Alpha- Biocare) was selected for region 33.

After completion of examination and investigations, complete denture for maxillary and mandibular arch was fabricated in conventional manner (fig 7). Post insertion issues were addressed favourably and patient was recalled after 15 days for implant surgery.

III. Procedure

3.1 First stage surgery

At the time of surgery, soft and hard tissue height was re-evaluated clinically and compared with radiographic diagnostic image. Bilateral mandibular block was administered to the patient (Lidocaine 2% with 1:200,000 Adrenaline). Crestal incision was made with B.P handle with blade no. 15 and flap was reflected with Periosteal elevator. The field was exposed and made ready for the drilling procedure. The stent was modified – GuttaPercha was removed and used a surgical stent.

Pilot drill of diameter 2.2mm was used as a starter drill with a speed set at 2500rpm with copious irrigation with normal saline (15ml per minute). Then force direction indicator (parallel pin) of 2.2mm diameter was placed in prepared hole and angulation was checked to aid in parallel implant site preparation. After checking parallelism, the depth drills of diameter Ø 2.8mm, Ø 3.2mm, Ø 3.65mm and Ø 4.1mm were used. Two implants were placed in the mandible between the anterior interforaminal regions i.e. one each on predetermined site (Fig 8). Flap was closed with interrupted sutures.

Post-operative OPG was taken to verify the position of the implants which showed satisfactory results (Fig 9). Patient was advised a healing time of 3 months for proper osseointegration.

3.2 Second stage surgery and loading protocol

After twelve weeks postoperatively, osseointegration was evaluated clinically as well as radiographically andimplants were found rigidly fixed with an adequatezone of healthy, keratinized gingiva without any sign of crestal bone loss and the implants were ready to receive the prosthesis. Stage-II surgery was performed, the surgical site was exposed and healing abutments were placed and site was sutured. Suture was removed after 7 days (Fig 10). Since the height of the mandibular rim was 11mm as measured at the time of jaw relation, the kerator attachments were planned for this patient as they have a uniform height of 1.48mm needing lesser space as compared to other attachments.

3.3 Prosthetic phase

For its placement, healing abutments were removed using hex driver. (0.05inch, 1.27mm).The abutment was engaged into the implant using a carrier (Fig 11).The abutment was then tightened by hand torque housing and torque wrench. A White Block-out Spacer was placed over the head of each KERATOR abutment (Fig 12).

The metal housing with black cap was inserted onto the spacer (Fig 13). The marks were transferred to the intaglio surface of the denture using an articulating paper. A recess was prepared in the denture and a vent hole was made on the lingual aspect to express the extra resin (Fig 14, 15). Self cure resin was mixed and a small amount was placed in the recess of the denture and the denture was inserted into position.After the resin had cured, the denture wasremoved and the white spacer was discarded (Fig 16). The black cap from the Metal Housing was removed using KERATOR Magic Tool (Fig 17). The final colored cap was chosen from the given set of caps depending upon the desired fit of the denture. The final cap (blue in this case) using KERATOR Magic Toolwas chosen and placed (Fig 18) The denture was inserted and checked for the final fit and was polished and given to the patient (Fig 19). Post-insertion instructions were given.

IV. Discussion

In conventional dentures, there is an increase in bone loss and soft tissue abrasion due to horizontal movement of prosthesis under lateral loads. Mandibular jaw movement and action of muscles may lift the denture off the soft tissue causing difficulty in function and speech.[6] To overcome these problems implant-supported over dentures are indicated. Some of the advantages over conventional dentures are decrease in bone loss, improved retention, support, stability, improved chewing efficiency and force (chewing efficiency increases by 20%, high bite forces are seen with implants), and improved speech.[7]

Locator attachments have gained popularity because of their excellent fit and retention thereby, improving the patient's satisfaction. These attachments provide female components in different colors which are chosen according to the desired retention. These are inserted using a special tool provided by the manufacturer.

This attachment offers the following advantages[8]:-

- Lowest height among all the available attachments
  Locator – 1.48mm
  Ball - 3.3 – 3.7mm
  O- ring - 5mm
- Minimum height of mandibular occlusal rim – 12mm- reduced restorative space.
- Dual Retention(Outside and inside retention locking mechanism)
- Maximum retention values after use.
- Easy insertion using self- locating design.
- Resilient attachment with superior mobility.
- Can be used in cases with non- parallel abutments with difference in angulation even greater than 40 degrees.

Several studies published supporting the success of locator attachments have been summarized in table 1.

V. Conclusion

Locator is a simple, cost-effective, non-invasive and more retentive attachment system for overdenture treatment plan for an atrophic mandible. This requires minimum restorative space and provides better retention values as compared to the conventional systems. Also, it prevents further resorption of residual alveolar ridge and requires less clinical time. Above all, it delivers greater patient satisfaction by giving a comfortable and stable prosthesis that provides better function. This particular attachment system is relatively new as compared to the bar, ball and magnetic attachments. Further long-term prospective studies will certainly be required to confirm the encouraging results from this clinical case.

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Table 1- Studies on retention of locator systems in implant overdenture

Author , year	Study	Results	Reference
Zou D et al (2013)	A 3-year prospective clinical study of telescopic crown, bar, and locator attachments for removable four implant-supported maxillary overdentures.	Locator system produced superior clinical results compared with the TC and bar attachments in terms of peri-implant hygiene parameters, the frequency of prosthodontic maintenance measures, cost, and ease of denture preparation	[4]
Türk PE et al (2014)	In vitro comparison of the retentive properties of ball and locator attachments for implant overdentures.	Locator attachments showed better retentive properties than ball attachments after 5,000 insertion-separation cycles,	[5]
Stephens GJ (2014)	The influence of interimplant divergence on the retention characteristics of locator attachments, a laboratory study.	Retention of Locator pairs was not impaired by interimplant divergence of up to 20°	[6]
Mahrous AI et al (2015)	To evaluate the effect of two different attachments (locator attachment and ball and socket [B&S] attachment) on implants and natural abutments supporting structures	Locator attachment showed better marginal bone height effects	[7]
Yang X (2015)	Influence of attachment type on stress distribution of implant-supported	Locator attachment could improve stability of the denture dramatically	[8]

	removable partial dentures	and had a stronger effect on defending horizontal movement of the denture.	

Figures with legends

Fig 1- Well formed maxillary ridge

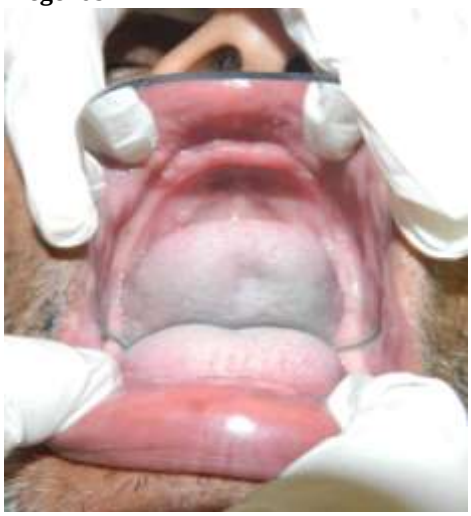

Fig 2- Irregular mandibular ridge.

Fig 3- Pre-operative OPG showing good bone height in the interforamina region in the mandible.

Fig 4- Radiographic stent with gutta percha in place

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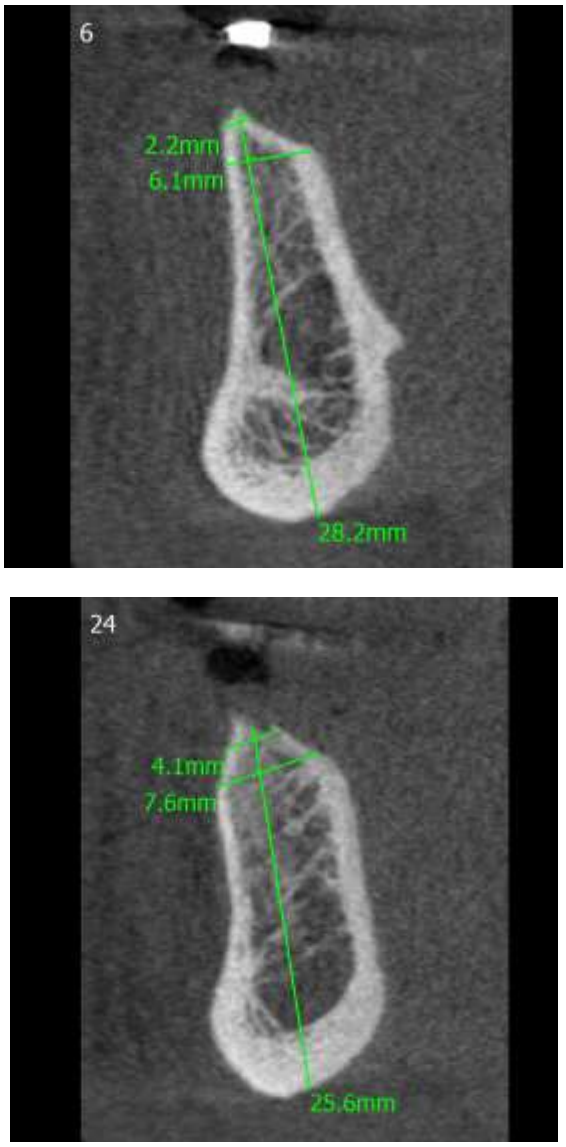

Fig 5,6- CBCT wrt region 33 and 43

Fig 7- Maxillary and mandibular complete dentures

Fig 8- Surgical placement of implants

Fig 9- Post-operative OPG

Fig 10- Healing abutments placed in mouth.

Fig 11- Kerator abutments in mouth

Fig 12- White block-out spacer placed in mouth

Fig 13- Metal housings over the abutments

Fig 14- Marks with the recess prepared

Fig 15- Vent in the lingual surface

Fig 16- Metal housing and the blockout spacer in the denture

Fig 17- Metal housing without the black cap

Fig 18- Blue caps inserted in the metal housing

Fig 19- Final denture insertion