CASE REPORT

Radiographic Stent for Simplified Placement of Implants in the Mandible

Nazia Majeed Zargar

ABSTRACT

This article aims to present a modified yet simple technique for the placement of implants between the mandibular foramina with the help of a radiographic stent. A radiographic stent was made on the patient's mandibular cast on which two metal balls were fixed at the premolar area and this was then used to determine the exact position of the mental foramina with the help of a panoramic X-ray. After visualization of the distance between the metal balls and mental foramina, the radiographic stent was used as a surgical guide to place implants in the mandible during surgery.

Keywords: Implants, Mandible, Overdenture, Radiographic stent, Surgical stent.

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INTRODUCTION

The rehabilitation of the atrophic edentulous jaws is still a real challenge.[1,2] The maxilla is more frequently edentulous than the mandible. It is, however, in the mandible that dentures cause problems and much unhappiness, resulting in a decreased quality of life.[3,4]

Tooth extraction is followed by a loss of bone width by 25% and a loss in bone height of 4 mm during the first year.[5] The loss of bone width occurs on the labial aspect of the alveolar ridge, resulting in the residual ridge being shifted to the lingual. With removable denture wearers, bone loss continues over the years. In long-term denture wearers, the bone loss may be extensive. After many years, the alveolar ridge is completely resorbed, leaving only the basal bone. The absence of the alveolar ridge compromises the retention and stability of the dentures. With advanced bone loss, the mandibular dentures become nonfunctional.[4]

The ability to restore the atrophic mandible with endosteal implants has revolutionized dentistry.[2] Attachment retained implant overdentures are functionally superior to conventional dentures and are effective and cost saving alternatives to fixed implant dental prostheses.[6] In the mandible, the two-implant overdenture is the least costly implant option,[7] it offers a significant increase in retention and stability over a complete denture,[8] and demonstrates a considerable improvement in quality of life.[9] For these reasons, the mandibular two-implant overdenture has been described as a standard of care for edentulous mandibles.[10-12]

The case as discussed below was planned so as to place two endosteal implants in the interforaminal area with the help of a radiographic stent. This stent was first used to determine the position of the mental foramina in a panoramic X-ray and then the same was used as a surgical template for the placement of implants.

CLINICAL CASE

The patient was a 53-year-old male patient reporting to the department, with chief complaint of an ill-fitting mandibular denture. Oral examination revealed U/L edentulous arches, with slightly more resorption in the mandibular arch. The patient had no significant medical history. The patient was not completely satisfied with his mandibular denture especially during function. Thus, a maxillary conventional denture and a mandibular removable implant overdenture were planned for the patient.

Fabrication of Radiographic Template

1. A diagnostic impression using alginate (Tropicalgin by Zhermack) was made of the edentulous mandibular ridge and poured.
2. Two metal balls were positioned on the premolar area bilaterally and fixed with the help of carding wax (Fig. 1).
3. A template was fabricated over the metal balls using clear autopolymerizing acrylic resin (DPI-RR Cold Cure) (Fig. 2).

Fig. 1: Metal balls attached to mandibular cast with carding wax

Fig. 2: Radiographic stent made with self-polymerizing acrylic resin

4. This template was then worn by the patient while taking the panoramic X-ray so that the distance of the mental foramina from the metal balls could be determined.

Panoramic X-ray

Location of the inferior alveolar nerve during its passage in the mandible is an important landmark that needs to be evaluated prior to implant placement. The exact location of the mental foramen and the presence or absence of an anterior loop needs to be determined.[13]

Panoramic radiographs are sufficiently reliable to evaluate the available bone height before inserting posterior mandibular implants[14] and are a widely used standard radiographic examination tool when planning an implant treatment because they impart a low radiation dose while giving the best radiographic survey.[15-18]

On visualization of the panoramic X-ray (Fig. 3), which was taken with the radiographic template in the patient's mouth, the findings were as follows:

1. The symphyseal height of the mandible was found to be 20 mm.
2. The right metal ball is close to the right mental foramen.
3. There is space between the left metal ball and the left mental foramen.

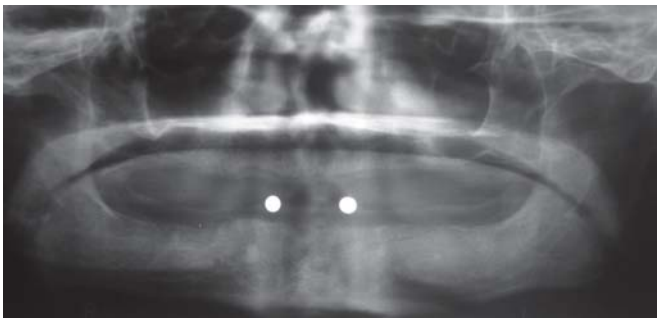

Fig. 3: OPG with metal balls

From these findings, it was planned that the implant site be selected as between the mental foramina as there was optimum symphyseal height and that this region usually presents the optimal density of bone for implant support.[19] The number of implants at first was decided upon four, two between the mental foramina and two in the posterior region, but due to the financial restraints of the patient it was planned to place only two.

Finally, the right implant would be placed at the place of the right metal ball as its distance from the mental foramina was optimum but the left implant would be placed 2 to 3 mm left to where the metal ball is present.

Surgical Implant Placement

The diagnostic template was transformed into a surgical template for implant surgery. Both the metal balls were removed from the template. A hole, 4 mm in diameter, was drilled where the right ball was previously placed as its location from the mental foramina was optimum. Another hole, 4 mm in diameter, was drilled which was 2 to 3 mm left to where the left ball was placed. The surgical template helped to identify the position for implant placement in the mandible. The symphyseal height in this mandible was 20 mm. The buccolingual width, which was measured with the help of a bone gauge, was 7 mm. This led to the choice of implants of a narrow platform and 16 mm in length.

The patient was premedicated with antibiotics (Novamox Cipla 1 gm, 1 hour before surgery). Surgery was performed under local anesthesia. The template was placed in the mouth and a mark was placed with a BP blade (Fig. 4). Supracrestal incisions were made and buccal and lingual full thickness mucoperiosteal flaps were raised. Using the surgical template, Nobel Biocare Replace® Select Tapered TiU implants 3.5 ×16 mm^2 were placed at tooth #34 and #44 locations (Fig. 5). Surgical cover screws were

Fig. 4: Mark placed with BP blade, with the template on

placed, and the flaps were approximated with primary closure (Figs 6 and 7).

The patient was instructed to discontinue the use of the lower denture for 2 weeks following surgery. The sutures were removed in 2 weeks and the denture was soft relined. This allowed the patient to wear the removable prosthesis during the period of osseointegration without transmitting excessive forces to the surgical sites.

Second Stage/Uncovery Surgery

The second stage surgery was done after 4 months according to the Brånemark surgical protocol that states that dental implants are to be submerged beneath the soft tissue at the time of placement, and allowed to heal for a minimum of 3 months in the mandible.[2] At this stage, the implants were exposed, the surgical cover screws were removed and the sites were irrigated with sterile normal saline. Healing collars were placed, and the gingival tissues were allowed to mature for 1 month for soft tissue healing.[2]

Fig. 5: Using of direction indicator before implant placement

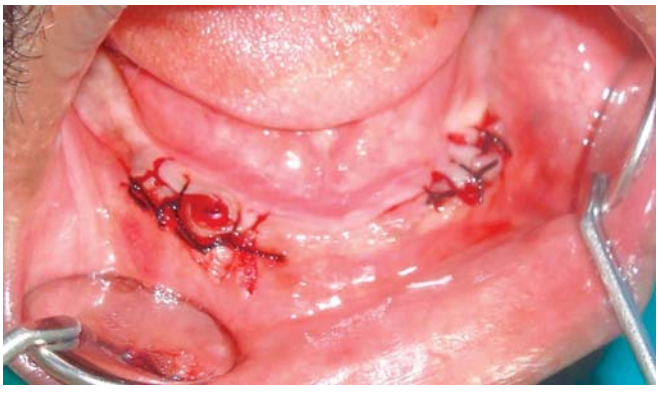

Fig. 6: Surgical cover screws placed

Fig. 7: OPG after implant surgery

Fabrication of Dentures and Placement of Ball Abutments

Both maxillary and mandibular dentures were fabricated beforehand. A month after the placement of the healing collars, they were removed and the ball abutments (Nobel Biocare) of collar height 0.5 mm were placed (Fig. 8). The gold caps were placed on their respective ball abutments and stabilized in the mouth with the help of putty (Reprosil by Dentsply) (Fig. 9).

Two holes were made on the tissue surface of the mandibular denture where gold caps would be attached. Autopolymerizing acrylic resin (DPI-RR Cold Cure) was placed into the holes in the mandibular denture and the

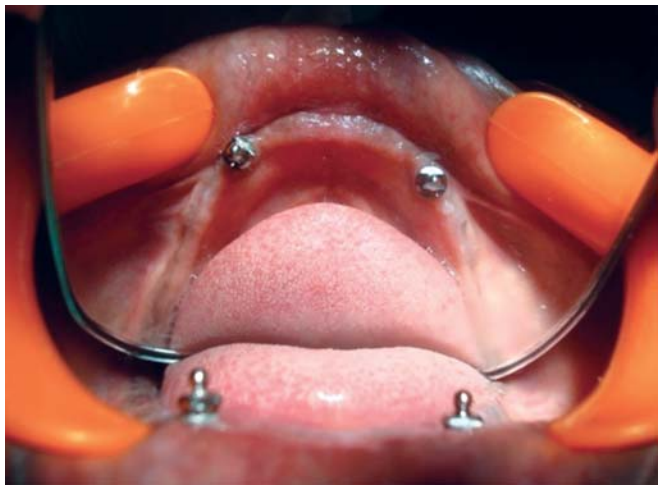

Fig. 8: Ball abutments (Nobel Biocare) of collar height 0.5 mm

Fig. 9: Ball abutments with gold caps stabilized with the help of putty

denture was placed in the mouth with the gold caps in place over the ball abutments. The autopolymerizing acrylic resin was allowed to set and then the denture was removed.

The gold caps were transferred to the tissue surface of the mandibular denture. Excess autopolymerizing resin was removed (Fig. 10). The gold caps were tightened using its activator, to the desired tightness.

The maxillary conventional denture and the mandibular implant overdenture were inserted (Fig. 11).

DISCUSSION

The evolution of the implant overdentures has obviously improved the clinical performance of the dentures in aspects of denture support, retention, stability and even chewing efficiency.[20] This patient was a conventional complete denture wearer but was not completely satisfied with it. Thus, he was given the option of a removable implant supported over denture.

Due to financial restraints of the patient it was decided that at the present date only two implants will be placed followed by two more at a later stage. As the symphyseal height of the mandible was 20 mm the implant location was selected as between the mental foramina.

Fig. 10: Gold caps transferred to mandibular denture

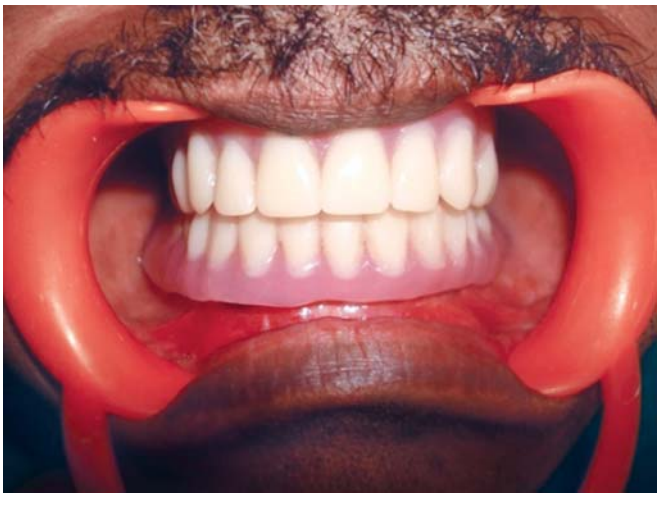

Fig. 11: Maxillary complete denture and maxillary implant overdenture

A radiographic template was made on the mandibular cast with two metal balls positioned at the premolar area on both the sides and a panoramic X-ray was taken to locate the positions of the metals balls in respect to the mental foramina. This is a valuable tool. This would enable locating the position of the mental foramen in relation to the metal balls for the precise placement of the implants in relation to the mental foramina. This is significant, because damage to the mental nerve could be avoided preventing paresthesia or dysesthesia.

The radiographic diagnostic template was converted to a surgical stent for implant surgery. The mandible was restored with two narrow platform implants. Using ball attachments, a mandibular overdenture was fabricated with good retention and stability. This improved the patient's quality of life.

CONCLUSION

For patients who are not satisfied with a conventional complete denture, a mandibular implant overdenture improves the quality of life. This report demonstrates the successful use of endosteal implants together with ball attachments in the mandibular symphyseal area. This improves retention and stability of the lower denture.

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ABOUT THE AUTHOR

Nazia Majeed Zargar

Registrar, Department of Prosthodontics, Government Dental College Srinagar, Jammu and Kashmir, India, e-mail: nmzargar@hotmail.com