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Pterygoid Implant for Atrophic Posterior Maxilla – A Case Report

[1]Dr. Santosh Dixit, Head of Department, Department of Prosthodontics, Crown & Bridge, Pandit Deendayal Upadhyay Dental College & Hospital, Solapur, Maharashtra.

[2]Dr. Satishkumar Yadav, Post Graduate Student, Department of Prosthodontics, Crown & Bridge, Pandit Deendayal Upadhyay Dental College & Hospital, Solapur, Maharashtra.

[3]Dr. Varun Deshpande, Professor, Department of Prosthodontics, Crown & Bridge, Pandit Deendayal Upadhyay Dental College & Hospital, Solapur, Maharashtra.

[4]Dr. Vikram Rathod, Reader, Department of Prosthodontics, Crown & Bridge, Pandit Deendayal Upadhyay Dental College & Hospital, Solapur, Maharashtra.

[5]Dr. Nikita Mehta, Senior Lecturer, Department of Prosthodontics, Crown & Bridge, Pandit Deendayal Upadhyay Dental College & Hospital, Solapur, Maharashtra.

[6]Dr. Priyanka Jeve, Post Graduate student, Department of Prosthodontics and Crown & Bridge, Pandit Deendayal Upadhyay Dental College & Hospital, Solapur, Maharashtra.

[7]Dr. Shraddha Jambhe, Post Graduate student, Department of Prosthodontics, Crown & Bridge, Pandit Deendayal Upadhyay Dental College & Hospital, Solapur, Maharashtra

Corresponding Author: Dr. Satishkumar Yadav, Post Graduate Student, Department of Prosthodontics, Crown & Bridge, Pandit Deendayal Upadhyay Dental College & Hospital, Solapur, Maharashtra.

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Abstract

A severely atrophied maxilla has significant limitations for conventional implant placement. Replacing missing teeth in the posterior maxilla poses challenges for implant surgeons due to factors such as consistency, quantity, maxillary sinus anatomy, and inaccessibility. Surgical options for resolving these defects include sinus lift, bone augmentation, tilted implants, short implants, and zygomatic implants. The pterygomaxillary area is an ideal location for implant placement and posterior maxilla recovery, given the limitations of other procedures.

Keywords: Pterygoid Implant, Tilted Implant, Angulated Implants, Angled Implants, Maxillary

Atrophy, Graft less Solutions, Petrygomaxillary Implants, Posterior Maxilla.

Introduction

Since Prof. P. I. Branemark's successful presentation of the osseointegration idea in the early 1960s, implant dentistry has advanced significantly. Researchers discovered that restoring missing teeth in the maxillary anterior region was relatively simpler than restoring missing teeth in the maxillary posterior section.[1] The posterior maxilla has been described in detail by Albrektsson et al. in their literature as being a highly challenging location to be recovered. The anatomy of the maxilla due to the existence of the maxillary antrum, poor bone quality, and decreased bone quantity are the main causes of difficulty in the rehabilitation of the posterior maxilla.

Sinus lift techniques, GBR grafting using both autogenous and allogenous materials, tilted implants [all on four concepts], and zygomatic implants were all introduced to tackle these issues.

However, there are certain risks involved with these treatments, including the possibility of tearing the sinus membrane, rejection of bone grafts, skewed implant screw loosening, and patient morbidity when general anesthesia is used for zygomatic implants.

The posterior portion of the maxilla, close to the tuberosity, and the area beyond the maxillary sinus can be used for implant implantation to avoid these issues. The pterygoid or pterygomaxillary region refers to this region. Pterygoid or pterygomaxillary implants are those that are inserted through the maxillary tuberosity and into the pterygoid plate. Tulasne was the first person to presented it in 1992. [1]The placement of the pterygoid implants is in the tuberosity region, and the implants are placed in an oblique mesiocranial orientation, moving posteriorly towards the pyramidal process. It then moves upward in between the pterygoid process of the sphenoid bone's two wings.

The purpose of this case report is to describe the implant's insertion in the pterygomaxillary region and its potential usage in the future to restore the atrophic posterior maxilla with prosthetics. [1]

Classification of Sinus [6]

The maxillary sinus may be classified based on the residual alveolar height into 4 categories:

1. SA1: It has an adequate vertical bone for implants, that is, 12 mm. No manipulation of the sinus is required.
2. SA2: It has 0-2 mm less than the ideal height of bone and may require surgical correction. 10-12mm
3. SA3: It has just 5-10 mm of bone below the sinus.
4. SA4: It has less than 5 mm of bone below the sinus

The pterygoid implants are indicated in SA4 situation.

Case Report

A 53-year-old patient was referred to the Department of Prosthodontics with a chief complaint of inability to chew food properly due to missing teeth in the upper and lower back region of the jaw since 4 years and wanted to be replaced by a fixed prosthesis. A detailed case history was recorded followed by a thorough extraoral and intraoral examination with missing teeth 15, 16 & 17 in the upper arch and 35, 36, 37, 46, & 47 in the lower arch [Fig1, 2, 3]

The patient was advised to undergo routine blood investigation, OPG [Fig 4], and CBCT scan to execute a treatment plan. They reported back with normal blood work findings. The implant site and size were selected according to the CBCT scan. Since there was severe atrophy of the right posterior maxilla, the patient was given a choice of two implants, one in the premolar area and another in the pterygoid region, and one immediate implant was planned in the lateral incisor region as it was non salvageable. In the mandibular region 2

implants were planned with premolar and molar regions in the III quadrant and in the IV quadrant 2 implants were planned in the molar region. Diagnostic impressions were made in irreversible hydrocolloid impression (Zhermack Neocolloid, Italy) material a diagnostic cast was fabricated (Kalabhai Dental Stone Class 3, Germany) and tentative jaw relation was recorded and teeth arrangement was done to fabricate a surgical stent [Fig 5].

Fig. 1: Pre-operative frontal view

Fig. 2: Maxillary occlusal view

Fig. 3: Mandibular occlusal view

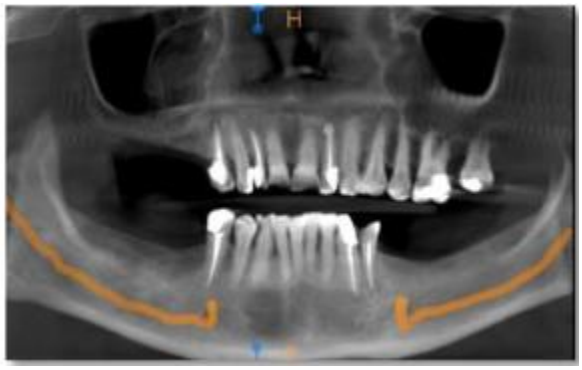

Fig. 4: Pre-operative OPG

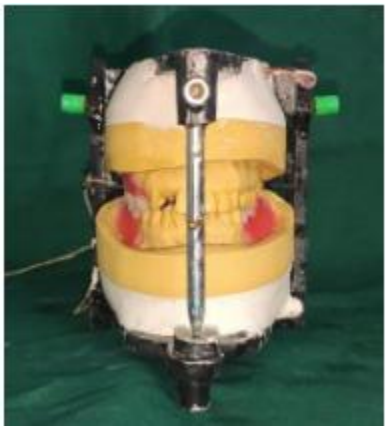

Fig. 5: Diagnostic mounting

Surgical Phase

After obtaining consent from the patient, implant surgery was planned for the 12,14, and right pterygoid region. Surgical site preparation was done [Fig 6]. For the maxilla, the posterior superior alveolar and infraorbital nerve block was given. The implant sites were marked with the help of a surgical stent and a full-thickness flap was raised [Fig 7]. The drill entry point is typically located 3-4 mm in front of the posterior region of the tuberosity. The drill axis runs with the palate at 20-30° in the horizontal plane and 45° from the maxillary plane. Drill with a pilot drill until reaching thepterygopalatine-tuberosity suture, which serves as the anchor for a pterygoid implant.[Fig 8,9].

Preparation is done manually or in an underprepared mode with a speed of 600 rpm. The implant isinserted manually using a bone condensation technique due to its self-tapping and compressive properties. The implant is

anchored to the pterygoid plate of the sphenoid bone. Implant placement in the pterygomaxillary region was done at an angulation of 45°–60° relative to the maxillary plane as described in the literature.1 Pterygoid implant (Bioline implant series, Berlin, Germany) of dimension 3.3 X16mm was placed and the multi-unit abutment was tightened. [Fig 10,11]

A post-operative IOPA was taken to confirm the position of the implant [Fig 13]. A tilted implant of dimensions 3.75X16mm was placed in the premolar region to bypass the maxillary sinus.

Immediate implant was placed in 12 region of dimension 3.5X13mm. (Adin Dental Implants, AlonTavor, Israel) After one week two implants were placed in the third quadrant of dimension 3.75X10mm (Adin Dental Implants, Alon Tavor, Israel) and two implants of dimension 3.75X10mm (Adin Dental Implants, Alon Tavor, Israel) were placed in the fourth quadrant and interrupted sutures were placed [Fig 14]. Post-operative OPG was made to verify implant angulations [Fig 15] Postoperative instructions were given.

Fig. 6: Surgical site preparation

Fig.7: Mid crestal incision done

Fig. 8: Pilot drilling

Fig 9: Drilling for pterygoid implant at angulation of 45 -60

Fig 10: Pterygoid implant with 3.3 x 16 mm

Fig 11: Pterygoid implant placemen

Fig. 12: Multi-unit abutment placed

Fig. 13: Post-operative IOPA

Fig. 14: Suture Placed

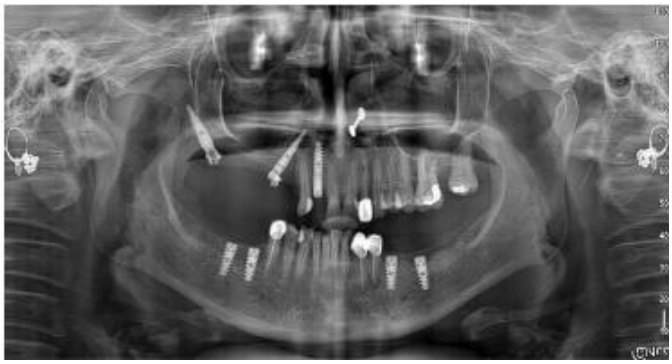

Fig. 15: Post-Operative OPG

After three months, the patient was recalled to be evaluated for osseointegration. Second-stage surgery for mandibular implants was planned following successful osseointegration. Custom trays were fabricated for the maxillary and mandibular arches. For maxilla, an open tray technique with the splinted impression post using pattern resin (DPI, Bombay Bumrah Trading Corporation Ltd Mumbai), followed by sectioning of resin material and resplinting was performed for the impression [Fig 16]. The resin jig was used to verify both intra-orally and radiographically for the marginal discrepancy. Impression coping was placed on the implant in 12 regions. Impression was recorded with the help of polyether impression material (3M ESPE Monophase Impression Material, Australia) [Fig 17].

For the mandibular arch, after screwing the impression post to all four implants, the impression was recorded the same as that for the maxillary arch. Interocclusal record was made in the patient's mouth at the desired vertical dimension and a facebow record (Louisville, KY 40217 USA) was taken and mounted on semi adjustable articulator (Whip Mix Corporation 361 Farmington Avenue Louisville, KY USA) [Fig18] Following verification of metal coping trial, after selecting a shade, the ceramic was built up. The bisque trial was done, and occlusal corrections were made [Fig 19, 20, 21].

Following glazing, the final prosthesis was screwed into place [Fig 22,23, 24] A canine-guided occlusal scheme

that was planned and executed in the final prosthesis after removing all occlusal interferences. A final radiograph was taken along with the prosthesis at the end of the prosthetic phase [Fig 25] Patient was instructed to regularly perform oral hygiene measures. The patient was asked to return for regular follow-ups which were every 3 months during first year, and then every six months.

Fig. 16: Jig trial

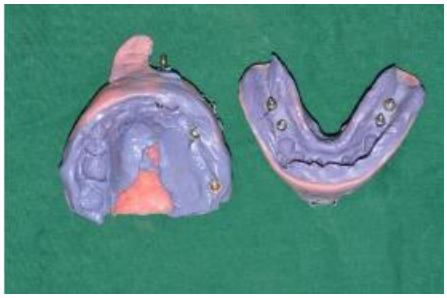

Fig. 17: Final impression

Fig. 18: Face bow transfer

Fig. 19: Metal coping trial

Fig. 20: Metal coping trial in situ

Fig. 21: Right lateral view

Fig. 22: Final prosthesis

Fig. 23: Final prosthesis

Fig. 24: Left lateral view

Fig. 25: Post-operative OPG with prosthesis

Fig. 26: Post-operative view

Discussion

The posterior atrophic maxilla has limitations such as poor bone quality and quantity, the presence of maxillary sinus, difficulty in accessibility, maintenance of proper oral hygiene, and in some cases, extreme occlusal loading in the molar regions are evident. To overcome these limitations and deficiencies, several procedures such as sinus lift with augmentation [direct and indirect], bone augmentation with autogenous grafts [both vertical and horizontal], tilted implants [all on 4], zygomatic implants have been reported widely in literature and our day to day practice. [1]

Due to the disadvantages such as tear of sinus membrane during sinus lift procedures, seepage of bone grafts into the sinus, loss of bone grafts due to resorption during bone augmentation procedures, high morbidity seen in zygomatic implants, screw loosening or breakage in tilted implants, a simple but effective method of replacing posterior maxilla is the placement of implants in the pterygomaxillary region [pterygoid implant]. [1]

Placement of implants into the pterygo maxillary region opens new vistas in rehabilitating the atrophic posterior maxilla. Strong cortical anchoring is provided in the maxilla by pterygoid implants. It offers individuals with severely atrophied maxilla an alternate treatment option without requiring extensive augmentation surgeries. [2]

The implant's utilization is encouraged by the presence of dense cortical bone for engagement. The size and condition of the tuberosity determine where the posterior implant should be placed. The angle of the posterior wall of the sinus and its proximity to the posterior wall of the tuberosity determine the mesiodistal angulation of the implant.

The bone segments that are intended to be engaged determine the bucco-palatal angulation of the implant. Pterygoid implants have a high rate of success, minimal problems, and patient acceptance compared to conventional implants. Bone loss is also comparable. In the literature, the pterygoid process and the pterygomaxillary region can be identified as two

anatomic sites where implants are positioned in the retromolar area. [2]

However, a thorough knowledge of various augmentation procedures, materials, and proper patient selection will result in effective long-term solutions in the management of the atrophied maxilla. [5]

Conclusion

Pterygoid implants are beneficial for posterior maxilla restoration because they are biomechanically stable and prevent pontic from cantilevering. This implant's success rate is comparable to that of implants placed in other maxillary regions. Without enhancing the maxillary sinus or requiring extra bone grafting, implants implanted in the pterygomaxillary region provide us with good posterior bone support. It is possible to conclude that pterygoid implants have a high success rate with few problems given the limitations of this case study.

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