

PTERYGOID IMPLANTS: WAY BEYOND THE CREST

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Abstract: Implant rehabilitation has emerged as one of the most applicable and effective solutions for those who have lost their teeth by one or other reason. The conventional implantology poses the limitations in-cases where there are pneumatized sinuses, atrophied bone, size of maxillary antrum and poor accessibility thus, the newer technology has shown hopes for more definitive rehabilitation of such patients. Pterygoid implant is one such endowment which crosses the bridge of limitations and provides more imposing results. The pterygoid implants minimize the need of extra surgical procedures such as bone grafting and sinus lifting.

Keywords: Pterygo-maxillary implants, Graftless solutions, Edentulism.

Introduction

Rehabilitation of the atrophic maxilla is a challenge in dental practice. Patients with severe maxillary atrophy pose a challenge for successful treatment outcomes.¹The reason is largely due to anatomic factors like bone quality often type III or IV quality bone according to Lekholm and Zarb,² quantity, location of antrum and poor accessibility.³The sinus grafting technique is a popular method to restore the posterior atrophic maxilla. However, this technique requires a bone graft, and time for the graft to mature. Conventional techniques, such as longer posterior cantilevers, may lead to complications such as screw and prosthesis fracture, marginal bone loss, and loss of implant osseointegration.⁴To evade these limitations, the pillar of bone composed of the maxillary tuberosity, the pyramidal process of the palatine bone, and the pterygoid process of the sphenoid bone has been suggested by some authors⁴ in order to recuperate the posterior maxilla. The use of pterygoid implants was described by Tulasne in 1989⁴ and subsequently used by many other researchers. The best solution for cases with severe bone resorption in upper jaw is pterygoid implant. Pterygoid implants make it possible to avoid sinus elevation and restore the posterior area more quickly, with only 2 to 3 months needed for osseointegration of the implants.⁵Pterygoid implant as defined by the Glossary of Oral and Maxillofacial Implants (GOMI) is "implant placement through the maxillary tuberosity and into the pterygoid plate".⁴

Pros and Cons

- Allow anchorage in the posterior atrophied/ resorbed maxilla without sinus lifts or bone grafts, achieving stability and high rates of long-term success.
- In addition, posterior cantilevers can be eliminated and axial loading is improved.²
- Use of pterygoid implants in patients undergoing maxillectomy.⁶

Technique

- Pterygoid implants in general are placed through the maxillary tuberosity— pyramidal process of palatine bone—and subsequently engaged in pterygoid process of sphenoid bone.⁴ The pterygoid implant must enter at the level of the maxillary tuberosity and travel lengthwise through the palatine bone until it is inserted in the pterygoid apophysis.⁵ These implants

are positioned with an angulation of 30 to 60 degrees virtual to the maxillary plane.⁴

- Quite the reverse, tuberosity implants are inserted almost completely at the most distal segment of maxillary alveolar process (tuberosity region), which is chiefly composed of type 3 or 4 cancellous bone, and seldom with an angulation above 10 degrees.⁴
- Implant site is prepared using drills and osteotomes (Valeron and Valeron).²
- Implant bed preparation:
- Smallest straight osteotomes.
- Pilot drill (create path of implant axis).
- Cylindric osteotomes and drills.
- The implant site is carved with drills with increasingly larger diameters.²
- Some authors state that the pterygoid implant must be placed on the anteroposterior axis with a 45-degree angulation relative to Frankfort horizontal plane.⁵
- Another study found that the implant angulation was around 70 degrees relative to Frankfort plane.⁵
- According to the study by E. Lucas-Taul et al, they suggested placing a pterygoid implant with a length between 15 and 18 mm and an angulation of 70° in relation to the Frankfort plane.⁷
- The implant is anchored in the pterygoid plate of the sphenoid bone, through the maxillary and palatine bones and with distal angulation between 35° and 55°, depending on the maxillary sinus floor and the height of the bone of the tuberosity.²

Success rate

For implants placed in the pterygomaxillary region the success rate has ranged from 80% to 99%.⁴ Eugenia Candel, et al, Journal of Oral Implantology, vol xxxviii, 2012.- included thirteen studies in the review covering years 1992 to 2009. A whole of 1053 pterygoid implants in 676 patients were incorporated and the biased average success rate of pterygoid implants was approximately 90.7%.⁴

Bone loss

- Bone loss was assessed by the following researchers: Penarrocha and colleagues, Bahat, Ridell and colleagues, Balshi and colleagues, and Park and Cho.²

TABLE Clinical case series of pterygoid implants						
Study	No. of Patients	No. of Implants	Length and Diameter (Range in mm)	Surgical Technique	Success (%)	Follow-up Time (Months)
Bahat ⁸	45	72	7-18	Drills	93	12-37
Graves ¹³	49	64	-	Drills	89	-
Khayat and Nader ¹⁸	51	65	-	Drills	95	48
Balshi et al ³	44	51	10-15	Drills	86.3	1-63
Balshi et al ⁶	189	356	8.5-20 3.75	Drills	88.2	54
Krekmanov ¹⁴	22	14	-	Drills	85.8	12-123
Vrielinck et al ¹¹	29	14	-3.75	Drills	71	6-24
Balshi et al ¹⁰	82	164	10-18 3.75-4	Drills	96.3	6-54
Penarrocha et al ¹²	7	11	-	Drills	90.9	12-45
Valeron and Valeron ²	92	152	-	Osteotomes	94.7	120
Penarrocha et al ¹	45	68	16.4	Drills and Osteotomes	97.1	12-69
Ridell et al ⁵	21	22	13-22 3.75-4	Drills	100	144
Park and Cho ¹⁹	7	17	11.5-15 3.75-4	Drills	100	

- Penarrocha et al assessed bone loss in panoramic radiographs calibrated with ClinView (version 5.1, GE Healthcare Finland Oy, Tuusula, Finland) after surgery and a year following loading, which gives an average marginal bone loss of 0.71 mm.²
- Ridell et al calculated bone loss in periapical and panoramic radiographs, measuring the mesial and distal aspects of the implants, and found values between 0 and 3.5 mm in partially edentulous patients and from 0 to 4.5 mm in totally edentulous patients.²
- Balshi et al obtained a mean bone loss of 1.3 mm in the mesial and 1.1 mm in the distal, assessed radiographically at the time of the prosthesis delivery and after 6 to 12 months.²
- Marcos et al obtained mean bone loss around pterygoid implants at 36 months after loading was 1.21 mm.⁴

Complications

One of the major surgical risks that may occur during the surgery is bleeding, because of the proximity of the internal maxillary artery, which runs 1 cm above the pterygomaxillary suture.² Valero'n and Valero'n described a minor venous bleeding caused by the insertion of the drill a few millimeters into the retropterygoid area. It was resolved with local hemostatic methods.²

Satisfaction level

Patient satisfaction level was assessed in 3 studies. Penarrocha et al used a visual analog scale from 0 to 10 and obtained an 8.9 overall satisfaction; neither discomfort because of the distal extension of the prosthesis nor difficulties in speech or hygiene were reported.²

There was no loss of pterygoid implants as a result of plaque accumulation, tissue hyperplasia, or mucosal inflammation. Highly polished prosthesis can be fabricated for optimal plaque control and oral hygiene.⁴

Conclusion

Pterygoid implants encompass high success rates, comparable bone loss levels with those of conventional implants, negligible complications, and excellent approval by patients;² therefore, they are a substitute for rehabilitating patients with atrophic posterior maxilla. These implants provide excellent stabilization for bone-anchored prostheses in partially and completely edentulous patients.⁴

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