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Pterygoid implants for the immediate rehabilitation of the atrophic maxilla: A case report of a full arch on 4 implants

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ABSTRACT

Pterygoid implants are a valid and valuable resource for the rehabilitation of the posterior atrophic maxilla and have been detailed before in the literature. Nonetheless, the full arch rehabilitation with immediate loading of the upper jaw with 4 implants, where the 2 anterior ones are conventional implants and the 2 posterior ones are pterygoid implants has not been addressed in any paper according to the author's best knowledge. In this case report, the authors present this technique performed on a 68-year old woman with atrophic maxilla looking for a fast, non-invasive full-arch fixed solution. A screw-retained acrylic FP3 provisional was installed 6 hours after surgery and a titanium milled/acrylic prosthesis was installed 4 months later. The patient has been recalled for 1,5-years with successful follow-up both on implants and prothesis. The presented technique seems to be a valid solution for the full arch rehabilitation with immediate loading of the atrophic maxilla, avoiding more invasive and time-consuming procedures like the sinus lift, bone regeneration or zygomatic implants.

Introduction

Immediate function protocols are a valid solution for the full arch rehabilitation of the jaws [1,2]. However, implant placement in the posterior atrophic maxilla poses a challenge for the clinician for a number of different reasons. This limitations include the presence of the maxillary sinus, the low quality/quantity of bone available [3,4] and the inherent problem of accessibility to the surgical area [5]. To avoid these limitations, a number of solutions are available today. They include sinus lifts, bone grafts, short implants, tilted or zygomatic implants, and pterygoid implants [6,7]. The use of pterygoid implants was first described by Tulasne in 1989 [8]. Engaging three different bones, the maxillary tuberosity, the pyramidal process of the palatine bone and the pterygoid process of the sphenoid bone, high primary stability can be achieved without sinus lifts or bone grafts [9]. Recent studies show that pterygoid implants may represent an option for the immediate loading [10,11]. The purpose of this case report is to describe a new immediate function technique for the rehabilitation of the atrophic maxillae using only 4 implants: 2 conventional and 2 pterygoid implants.

Presentation of the case

A healthy 68-years old woman was searching for a fixed rehabilitation. After clinical and radiographic examination, several options were discussed to treat the atrophic maxilla: 2 anterior straight implants and 2 posterior zygomatic implants, bilateral sinus

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augmentation and traditional implant rehabilitation or 2 anterior straight implants and 2 pterygoid implants. The advantages and disadvantages of each technique were discussed with the patient and the last option was chosen. An informed consent was given to the patient.

Surgical procedure

After local anesthetics the remaining teeth were extracted and a full thickness flap extending to the posterior border of the tuberosity was performed. Small bone reduction was performed with a large head bone rongeur followed by a straight handpiece flame shape tungsten bur in order to: a) achieve an optimal plateau for implant placement, b) create a flat bone surface and c) create prosthetic space for the future screw-retained prosthesis.

A total of 4 implants (Full Osseotite Tapered Certain, Zimmer Biomet, Florida, USA), 15mm long and 4.0 mm in diameter were placed free-hand (Fig. 1a, b, 1c, 1d). 2 conventional straight implants were placed in the anterior maxilla and 2 pterygoid implants in the posterior area (Fig. 2a, b, 2c, 2d). Pterygoid implant positioning was planned with Blue Sky Plan software (Blue Sky Bio LLC) using a cone-beam computer tomography (cbct) scan of the patient. Careful planning is important as these implants require a buco-palatal and a medial-distal angulation. Clinically, the anatomy of the tuberosity, the length from the planned starting point to the end of the tuberosity and the relative position of the sinus were used as landmarks for the starting drill. Operator's experience and haptic awareness are extremely important in this step as the placement of pterygoid implants allows no direct vision to the ending point. Implant placement followed standard procedures but some techniques were used to increase primary stability, in particular: under-preparation, osseodensification and bi-corticalization. For the pterygoid implants, the implant bed preparation followed this sequence: The first needle-type drill and the second 2.0 mm diameter pilot drill from the standard implant kit were used clockwise, full length, until perforation of the pterygoid process was achieved, allowing the bi-corticalization of the implants. The three following drills used (2.3 mm, 3.0 mm, and 3.3 mm) were Densah Bur osseodensification drills (Versah, Jackson, MI, USA) with counterclockwise rotation, in order to increase bone density of the tuberosity. Together, these 2 techniques resulted in high primary stability in the pterygoid implants. For the anterior straight implants, the standard drills from the implant kit were used with an under-preparation technique, where each drill was used progressively less than the previous one, as the bone quality in the anterior maxilla did not require additional maneuvers to achieve an optimal primary stability. All implants anchored with 50 + N/cm torque. Remaining sockets were filled with autologous bone collected from the bone reduction phase. After implant placement, a multiunit-type abutment was placed in each implant (angled 17° abutment in the pterygoid implants and a straight abutment in the anterior implants) and the flap was sutured in place. A previous removable provisional denture was converted to a fixed, screw-retained full acrylic FP-3 prosthesis following the denture conversion technique described by Misch [12] and delivered 6 hours after the surgery.

Follow up

The patient was prescribed with antibiotics (Amoxicillin 1000 mg), a NSAID (Clonixin 300 mg), a glucocorticoid (Prednisolone 20 mg) and instructed to use a chlorohexidine (0,1%) based mouthwash while following a liquid diet for one week. After this period, the screw-retained provisional was removed for the suture removal and occlusion was checked again. At this point, the patient was instructed to use a water irrigation device daily. A follow up appointment was made 2 months later for clinical observation without removing the provisional prosthesis. The final titanium milled/acrylic prosthesis was installed 4 months after surgery. Patient has been recalled every 6 months for follow-up appointments and a final x-ray was taken at 1.5 years follow-up (Fig. 3).

All implants are successful following Buser et al. [13] clinical and radiologic criteria and no prosthetic complications occurred during this period, neither on the provisional nor on the final work (Figs. 4 and 5a-b).

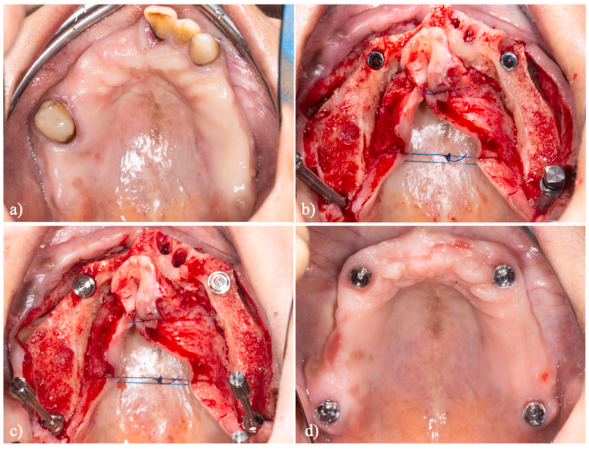

Fig. 1. a) Occlusal view – initial. b) Occlusal view – after implant placement. c) Occlusal view – after abutment placement. d) Occlusal view – 1.5-years follow-up.

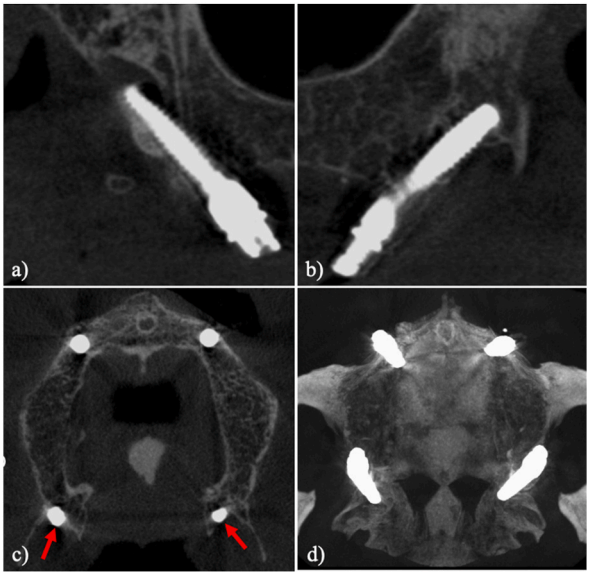

Fig. 2. a) CBCT scan – sagittal view of the right pterygoid implant. b) CBCT scan – sagittal view of the left pterygoid implant. c) CBCT scan – axial view. Red arrows detail the bicorticalization of the pterygoid implant on the pterygoid process of the sphenoid bone. d) CBCT scan – axial view 3D renderization.

Discussion

Pterygoid implants have received interest in recent years. The use of these implants may avoid sinus lifts, bone grafts or zygomatic implants, resulting in a lower overall treatment cost [14]. A simple surgical technique allows a faster surgery associated with less morbidity [14]. Due to the distal position of this implants, the prosthetic rehabilitation is a true full-arch prosthesis without cantilever [3]. It's important to mention that pterygoid implant placement requires surgical expertise and proper anatomy knowledge as all studies mention technical difficulty [14]. The greater palatine foramen may represent a major risk of intra oral bleeding [3]. Other common complications include trismus and pain, which can be easily managed [15]. Hemorrhage from the internal maxillary artery is extremely rare as it is located 25 mm from the lower end of the pterygomaxillary suture [6]. Reduced mouth opening, absence of tuberosity and impacted third molars are contraindications for this treatment. Most studies on pterygoid implants focus on delayed loading protocols. The scientific literature about pterygoid implants in a context of full arch immediate loading protocols, although existent, is still limited [10,11,14]. To author's best knowledge, this case report is the first manuscript describing the use of pterygoid implants as part of a 4-implant immediate loading protocol in the edentulous maxilla.

Conclusion

This case report suggests that the immediate loading of 2 anterior implants and 2 posterior pterygoid implants may be a valid treatment option for the rehabilitation of the atrophic maxilla. Long-term studies with larger samples and follow-up periods are required to validate this treatment option.

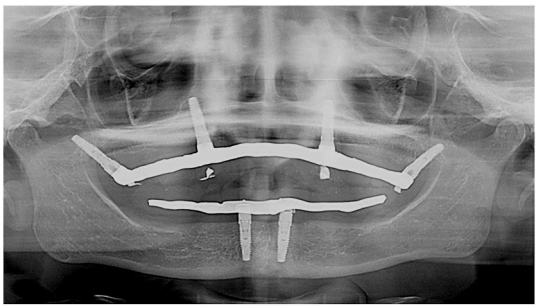

Fig. 3. Panoramic x-ray, 1.5-years post-op.

Fig. 4. Final prosthesis, 1.5-years post-op.

Fig. 5. a) Frontal smile – before treatment. b) Frontal smile – 1.5-years after treatment.

Consent

The present work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki). An informed consent has been obtained from the patient for the publication of this case report.

Author's contribution

Bernardo Luz Nunes de Sousa performed the surgery and prosthodontic procedures, data gathering and writing of the manuscript. Bruno Leitão de Almeida performed text editing and scientific revision.

Declaration of competing interest

The authors would like to declare no conflict of interest.

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