USE OF PTERYGOID IMPLANTS IN THE REHABILITATION OF THE ATROPHIC MAXILLA: A CRITICAL STRUCTURED REVIEW FOR CLINICAL PRACTICE

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Keywords: *pterygoid implants; atrophic maxilla; posterior maxillary rehabilitation; graftless treatment; cone-beam computed tomography.*

Introduction

Rehabilitation of the posterior maxilla remains one of the most demanding tasks in implant dentistry because loss of teeth in this region is commonly followed by progressive alveolar resorption, sinus pneumatization, and reduced bone density. As a result, treatment planning often shifts toward sinus floor elevation, grafting procedures, short implants, tilted implants, zygomatic anchorage, or other complex alternatives. Pterygoid implants represent a graftless option that aims to move distal support posteriorly and to expand the prosthetic base without sinus augmentation in selected patients.

Aim

The aim of this extended conference abstract is to summarize the clinical rationale, available outcomes, anatomical limitations, and practical indications of pterygoid implants in patients with posterior maxillary atrophy, and to define the clinical scenarios in which this approach is justified.

Materials and Methods

This text is based on a structured narrative review derived from the uploaded source manuscript. The evidence pool included systematic reviews, retrospective and prospective clinical cohorts, anatomical studies, cone-beam computed tomography analyses, and publications addressing surgical or prosthetic implications of pterygoid implant placement. Because the available studies differ substantially in design, follow-up duration, endpoint definitions, and loading protocols, the evidence was interpreted qualitatively rather than pooled into a new meta-analysis. The review therefore focuses on clinically meaningful patterns rather than on artificial numerical precision.

Results and Discussion

The most stable aggregate data come from recent systematic reviews and large clinical series. Across the literature, reported implant survival or success outcomes usually fall within a high but heterogeneous range, most often around 92.5% to 98.3%. These figures support the feasibility of the method, yet they should not be interpreted as proof of universal superiority. Much of the evidence remains retrospective, and even favorable series frequently differ in patient selection, surgical protocol, implant macrodesign, and duration of observation.

The principal biomechanical advantage of pterygoid implants is distalization of support. By engaging the cortical structures of the pterygomaxillary region, the clinician may reduce distal cantilever length and improve the anterior-posterior spread of full-arch prostheses. This is particularly relevant in severely resorbed maxillae, where conventional distal axial implants are often impossible without sinus grafting. In selected full-arch cases, pterygoid implants may therefore simplify treatment and reduce morbidity when compared with staged augmentation approaches.

At the same time, the method is technically demanding and anatomically unforgiving. The pterygomaxillary region shows substantial three-dimensional variability in bone volume, angulation, and cortical targets. Published CBCT-

based studies consistently indicate that implant trajectory, restorative emergence, and available bone are highly patient-specific. For that reason, preoperative cone-beam computed tomography is not optional. Three-dimensional planning must evaluate not only whether an implant can be inserted, but whether it can be inserted along a prosthetically reasonable path with predictable cortical engagement and without compromising neighboring anatomical structures.

Another important point is that pterygoid implants should not be discussed in isolation from restorative design. Surgical placement that appears successful radiographically may still create prosthetic compromise if emergence is unfavorable or posterior support is poorly integrated into the planned reconstruction. The literature suggests that the value of pterygoid implants is greatest when surgery and prosthetics are planned as one system, especially in immediate or early full-arch rehabilitation.

The current evidence also argues for restraint. Pterygoid implants are not a blanket replacement for all alternative strategies. Short implants, sinus augmentation, tilted distal implants, and zygomatic implants may remain more appropriate in specific anatomical or restorative contexts. In other words, the relevant question is not whether pterygoid implants are the best method in general, but whether they represent the most rational low-morbidity option in a particular patient.

Available complications are usually related to angulation difficulties, limited access, prosthetic screw or component problems, sinus-adjacent anatomy, and operator inexperience. The literature repeatedly indicates that favorable outcomes are closely linked to case selection, surgical skill, and precise digital planning. Therefore, predictability depends less on the mere choice of implant site and more on disciplined execution of an anatomically and prosthetically coherent protocol.

Practical Implications

In clinical practice, pterygoid implants appear most justified in severe posterior maxillary atrophy when grafting would substantially increase treatment time, morbidity, cost, or patient burden. They are especially relevant in full-arch rehabilitation, where posterior support can improve prosthetic balance and reduce distal cantilever length. Their use should remain limited to operators who are comfortable with three-dimensional planning, CBCT interpretation, and the anatomy of the pterygomaxillary region.

Conclusion

Pterygoid implants should be regarded as a clinically sound graftless option for rehabilitation of the atrophic posterior maxilla in carefully selected patients. Their main advantages are posterior support, potential reduction of cantilever length, and the possibility of avoiding sinus augmentation in suitable cases. However, the available evidence remains heterogeneous and is dominated by retrospective studies. The method should therefore be recommended with clinical nuance rather than promotional certainty. The most defensible indication is severe posterior maxillary atrophy in patients for whom a graftless, prosthetically driven, and surgically precise solution is preferred. Accurate CBCT-based planning, understanding of pterygomaxillary anatomy, and coordination between surgical and prosthetic phases remain decisive conditions for success.

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