Case report

Remote Anchorage Solutions for Atrophic Maxilla: Application of the PATZi Protocol in Patients at the Faculty of Dentistry, UFM – A Case Series

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Abstract

Maxillary bone atrophy, characterized by reduced bone density and diminished height and thickness, presents significant challenges during the surgical and restorative phases of dental implant treatment. Traditional rehabilitation with mucosa-supported complete dentures often leads to patient discomfort, limited prosthetic stability, and progressive alveolar bone resorption. In contrast, implant-supported prostheses have emerged as a superior solution, offering improved retention, stability, and masticatory function. However, bone volume deficiency and inadequate anterior-posterior spread often complicate implant placement in atrophic maxillas.

The PATZi protocol has been developed as a systematic approach to addressing these challenges, utilizing both conventional and remote anchorage dental implants to optimize prosthetic rehabilitation in atrophic maxillas. This protocol enables the immediate loading of provisional fixed prostheses through a structured algorithm that prioritizes implant placement based on anatomical suitability and primary stability.

The sequence begins with pterygoid implants (P1) and proceeds to anterior bicortical anchorage sites (A1 or A2), followed by conventional angled implants in the premolar region (T1 or T2). Zygomatic implants (Z1, Z2, Z3) serve as a last resort in cases of insufficient stability.

By establishing a clear surgical framework, the PATZi protocol ensures consistent outcomes and facilitates immediate prosthetic loading, with a recommended insertion torque of at least 30 Ncm per implant or a total of 120 Ncm. This innovative approach enhances patient satisfaction, prosthetic function, and long-term success in the rehabilitation of atrophic maxillas.

Key words : Alveolar bone resorption, Immediate loading, Bicortical anchorage, Pterygoid implants, Zygomatic implants, Transnasal implants, PATZi protocol, Remote anchorage implants, Insertion torque, Atrophic maxilla

Background:

Maxillary bone atrophy is defined as bone resorption that is clinically observed as a decrease in bone density and a reduction in height and thickness, complicating both the surgical and restorative phases of dental implant treatment.[1] The rehabilitation of these patients is challenging, as achieving prosthetic stability, proper phonetics, and stable masticatory function remains a major concern.[2]

Traditionally, treatment for these patients has relied on mucosa-supported complete dentures—acrylic devices designed to replace lost and/or atrophied soft and hard tissues. These removable prostheses are strictly supported by the maxillary mucosa.[1] However, complete dentures have notable disadvantages, including poor stability, inadequate support and retention, and patient discomfort, as they can cause soft tissue irritation.[3] Furthermore, their use can contribute to continuous alveolar bone atrophy, affecting both vertical and horizontal bone dimensions.[2]

The ideal solution for these patients is an implant-supported prosthesis, which offers superior retention, stability, and masticatory function, ultimately improving patient quality of life.[4] The All-on-4 configuration, introduced by P. Maló,[5] has been widely adopted for implant-supported prosthetic rehabilitation. However, one of the primary challenges in implantology remains insufficient bone volume and inadequate anterior-posterior spread.[6]

In this context, the PATZi protocol has emerged as a promising technique for prosthetic rehabilitation in atrophic maxillas. This systematic algorithm integrates conventional dental implants (angled, parallel) and remote anchorage dental implants (pterygoid, nasopalatine, nasal spine, transnasal, transsinusal, zygomatic) in a logical sequence, with the primary goal of enabling immediate loading of a provisional fixed prosthesis.[6]

The PATZi protocol provides a structured surgical sequence for implant placement in atrophic maxillas. It begins with the placement of pterygoid implants (P1) in the molar region of the maxilla. If adequate primary stability is not achieved, the implant is classified as failed (Px).[6,7]

The next step involves placing implants in the anterior region of the maxilla with bicortical anchorage. Anatomical sites such as the nasal spine, piriform bone, and lateral nasal wall are used (category A1). If these areas are contraindicated, transnasal implants are placed (category A2). If the required insertion torque is not achieved, the implant is classified as failed (Ax).[6,7]

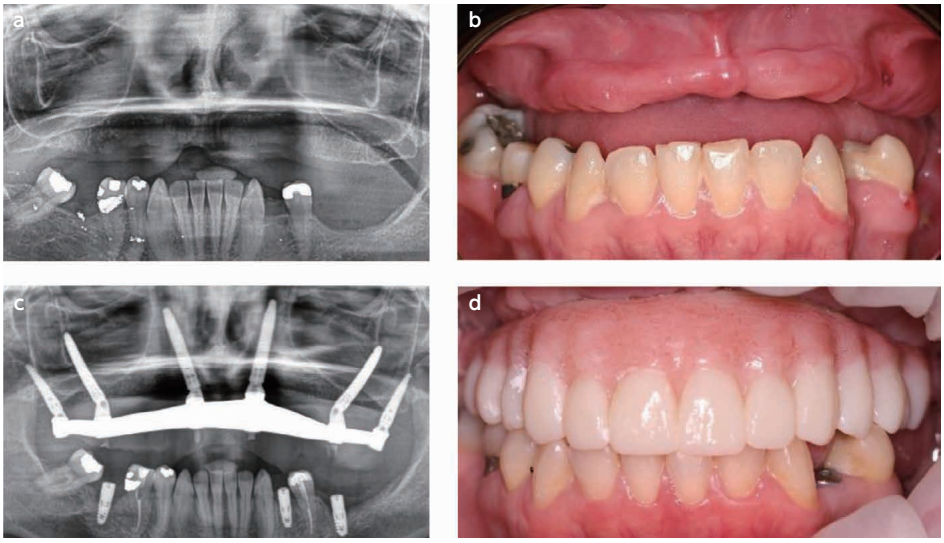
Conventional angled implants are then placed in the premolar region without bicortical anchorage (category T1). If this is not feasible, remote anchorage in the lateral nasal wall is used (category T2). If primary stability is not obtained, the implant is classified as failed (Tx).[6,7]

Finally, if any of the previous categories fail, zygomatic implants serve as a last resort. These can be placed in the premolar (Z1), molar (Z2), or anterior (Z3) region, depending on the implant emergence site.[6,7]

The PATZi protocol provides a systematic and structured framework for placing dental implants in atrophic maxillas, ensuring an optimal biomechanical configuration and facilitating the immediate loading of implant-supported prostheses. While no specific minimum insertion torque has been established, a minimum of 30 Ncm per implant or a total insertion torque of 120 Ncm is generally required for immediate loading.[6]

By following this protocol, surgeons can achieve consistent outcomes while effectively planning for any necessary future interventions.

The PATZi protocol applied:



(Fig.1)
a) Female patient, 44 years old, with bone loss due to periodontal disease and a traumatic injury.
b) Clinical situation of the patient, before the surgery.
c) Following the PATZi algorithm in this case, first pterygoid implants were placed bilaterally P1, attention was then directed to the anterior region, where bilateral intra alveolar implants don't achieve a primary stability, so extra alveolar implants that engaged the lateral nasal wall bone were achieved A2, traditional tilted implants and transsinus implants were attempt and don't show primary stability Tx. PATZi protocol demonstrates the indication for zygomatic implants, so Z1 configuration zygomatic implants were placed satisfactorily.
d) Clinical photography, after delivery of the final prothesis, rehabilitation with hybrid prothesis after 6 months.

Objective:

The purpose of this case series is to contribute to documentation by presenting the application of the PATZi protocol in atrophic maxilla.

Materials and Methods

A total of 15 patients with atrophic maxillae were treated at the Faculty of Dentistry, Francisco Marroquín University between January 2023 and October 2023. Surgical procedures were performed using the PATZi protocol by the O.R.C.A.A. surgical team.

Implant Placement Summary

A total of 112 dental implants were placed, including:

30 pterygoid (P) implants
30 anterior (A) implants
30 tilted (T) implants

Due to insufficient primary stability (≥35N) for immediate prosthesis loading and to enhance anteroposterior distribution, an additional 22 zygomatic implants (Zi) were placed as follows:

10 implants emerging in the premolar region (Z1)
8 implants emerging in the molar region (Z2)
4 implants emerging in the anterior region (Z3)

Data Collection & Evaluation

Preoperative demographic data were recorded.
Primary stability of immediate implants was assessed.
Immediate loading feasibility after surgery was evaluated (Table 1).

(Table 1) Demographics, primary stability of implant and prosthesis immediate load.

Case	Age	Gender	Petrygoid implant		Anterior implant		Tilted implant		Zygomatic implant		Immediate load
			R	L	R	L	R	L	R	L	
1	67	M	Px	P1	A1	A1	T1	T1	Z2	-	YES
2	53	F	P1	Px	A2	A2	T1	T1	Z2	Z1	YES
3	55	M	P1	P1	A1	A1	T1	T1	-	-	YES
4	49	F	P1	P1	A1	A1	Tx	Tx	Z2	Z2	YES
5	58	M	P1	P1	Ax	Ax	Tx	Tx	Z1,Z3	Z1, Z3	YES
6	46	F	P1	P1	A1	A1	T1	Tx	-	Z2	YES
7	69	M	P1	P1	A1	A1	T1	T1	-	-	YES
8	63	M	P1	P1	A1	A1	T1	T1	-	-	YES
9	44	F	P1	P1	A1	A1	T1	Tx	-	Z2	YES
10	73	M	P1	P1	A1	A1	Tx	Tx	Z2	Z2	YES
11	68	M	P1	P1	A2	A2	Tx	T2	Z1	-	YES
12	49	F	P1	P1	A2	A2	Tx	Tx	Z1	Z1	YES
13	62	M	P1	P1	A1	A1	T1	T1	-	-	YES
14	66	F	P1	P1	Ax	Ax	Tx	Tx	Z1,Z3	Z1,Z3	YES
15	58	F	P1	P1	A1	A1	Tx	Tx	Z1	Z1	YES

P= Pterygoid Implant A1= Intraalveolar Anterior Implant A2= Transnasal Anterior Implant T1= Tilted Implant Intraalveolar T2= Tilted Implant Extraalveolar Z1= Zygomatic Implant Premolar Region Z2= Zygomatic Implant Molar Region Z3= Zygomatic Implant Anterior Region

Results:

The 15 patients treated with the PATZi protocol, 7 were female and 8 were male, with an age range of 44 to 73 years. Of the 112 implants placed, 28/30 pterygoid implants, 26/30 anterior implants (20 intra-alveolar (A1), 6 transnasal (A2)), and 15/30 tilted implants showed primary stability. All patients received immediate loading of dental implants after the surgery.

Conclusions and clinical implications:

The PATZi protocol, in the hands of expert clinicians, incorporating both conventional and remote anchorage implants, resolves cases of severe maxillary atrophy and is a viable alternative to achieving primary stability and obtaining immediate loading of dental implants. In particular cases where primary stability for immediate loading and adequate anteroposterior distribution were not achieved, the placement of zygomatic implants is indicated.

However, the observation period in this study may be too short to assess the long-term success or failure of the protocol fully. Follow-up observations should include evaluating the longevity of the implants, assessing prosthetic stability, and monitoring potential complications such as implant failure, bone resorption, or prosthesis misfit. Regular post-surgical assessments, including radiographic analysis and clinical examinations at 6 months, 1 year, and annually thereafter, would provide a more comprehensive understanding of the protocol's long-term efficacy and safety. Future

studies with longer follow-up periods are essential to validate these findings and further refine the application of the PATZi protocol.

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