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Case Report

Strategic Basal Implantology for Full-Arch Reconstruction in an Uncontrolled Diabetic Patient: Overcoming Systemic and Anatomical Challenges

Arjun MR[1], Rumana Nizar[2]*, Anil Melath[3], Subair K[4], Jilu Jessy Abraham[5] and Athul Kanmani[6]

[1]*Reader, Department of Periodontics, Mahe Institute of Dental Sciences and Hospital, Mahe, India*

[2]*2nd Year Postgraduate, Department of Periodontics, Mahe Institute of Dental Sciences and Hospital, Mahe, India*

[3]*Professor and H.O.D., Department of Periodontics, Mahe Institute of Dental Sciences and Hospital, Mahe, India*

[4]*Professor, Department of Periodontics, Mahe Institute of Dental Sciences and Hospital, Mahe, India*

[5]*Reader, Department of Periodontics, Mahe Institute of Dental Sciences and Hospital, Mahe, India*

[6]*3rd Year Postgraduate, Department of Periodontics, Mahe Institute of Dental Sciences and Hospital, Mahe, India*

***Corresponding Author:** Rumana Nizar, 2nd Year Postgraduate, Department of Periodontics, Mahe Institute of Dental Sciences and Hospital, Mahe, India.

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Abstract

Diabetes mellitus, particularly when poorly controlled, poses significant challenges to conventional implant therapy due to impaired healing, compromised bone metabolism, and increased infection risk. Basal implantology, which relies on cortical bone engagement rather than cancellous bone, offers a graftless alternative for full-arch rehabilitation in medically compromised patients.

A 58-year-old male with uncontrolled type II diabetes presented with severe masticatory difficulty and generalized periodontitis. Clinical and CBCT evaluation revealed extensive maxillary and mandibular ridge resorption, narrow crestal widths, and inadequate posterior bone height, making conventional implants and grafting unsuitable. A full-mouth rehabilitation plan using basal cortical implants with immediate loading was formulated. Pterygoid implants were placed bilaterally in the maxilla, and strategic basal implants were used in the mandible to achieve bicortical stability. Immediate provisional prostheses were delivered within 72 hours. Postoperative healing was uneventful, and the patient reported significant improvement in function and comfort.

Basal implants provided stable anchorage in dense cortical bone and avoided graft-dependent procedures, reducing surgical morbidity in this uncontrolled diabetic patient. Immediate loading further optimized functional recovery. Basal implantology may be a predictable option for full-arch rehabilitation in high-risk diabetic patients with severe atrophy, though long-term success depends on maintenance and systemic control.

Keywords: *Basal Implantology; Cortical Implants; Uncontrolled Diabetes Mellitus; Full-Arch Rehabilitation; Immediate Loading; Pterygoid Implants*

Introduction

Dental implant therapy has become a predictable and widely accepted option for restoring edentulous arches; however, its success is highly dependent on the quality and quantity of available bone, as well as the patient's systemic health. Diabetes mellitus, particularly when poorly controlled, remains one of the most significant systemic risk factors influencing implant survival and postoperative healing.

Uncontrolled hyperglycemia impairs microvascular function, compromises immune response, delays osseointegration, and increases susceptibility to infection, making conventional implant placement challenging and often contraindicated.

Basal implantology, also known as cortical or strategic implantology, has emerged as a viable alternative in situations where traditional implant therapy may fail. These implants engage the basal cortical bone, highly mineralized, infection-resistant, and less prone to resorption allowing immediate loading even in the presence of compromised alveolar bone. Their unique design and anchorage in remote cortical areas offer a predictable solution for medically compromised patients, including those with diabetes, severe ridge atrophy, chronic periodontal infection, or a history of failed implants.

Despite a growing body of evidence supporting the use of basal implants in compromised conditions, literature documenting their use in patients with uncontrolled diabetes remains limited. Such cases provide valuable insights into treatment planning, surgical considerations, systemic risk management, and functional outcomes.

Case Presentation

A 58-year-old male patient, Mr. Gopalan, reported with a chief complaint of difficulty in mastication and compromised esthetics due to multiple missing teeth in both arches. His medical history revealed uncontrolled Type II diabetes mellitus, with fasting and post-prandial glucose values 179 mg/dL and 317 mg/dL respectively. There was no history of diabetic ketoacidosis, but the patient reported chronic fatigue, delayed wound healing, and long-standing periodontal problems. Clinical intraoral examination showed generalized mobility, chronic generalized periodontitis, and moderate-to-severe residual ridge resorption in the maxillary and mandibular arches. The patient was partially edentulous in both jaws.

A CBCT scan (medium FOV, Planmeca) was obtained for full-arch implant evaluation. Panoramic and 3D reconstructions confirmed extensive alveolar bone loss with reduced basal bone height in several regions of the maxilla and mandible. The findings were as follows.

Maxilla

The maxillary arch demonstrated moderate to severe ridge resorption with predominantly D3-D4 bone density. Bone height ranged from 5.29 mm to 19.14 mm in the posterior quadrants, with significantly reduced bucco-palatal width in several sites, particularly at tooth positions 15, 18, 21, 24, 25, and 26, where crest width was as narrow as 1.5-3.0 mm. Mild to moderate mucosal thickening of both maxillary sinuses was noted.

Anterior maxillary bone height remained relatively favorable (e.g., site 11: 16.71 mm, site 12: 17.27 mm), but bone width progressively narrowed subcrestally. The nasopalatine foramen was located 3.91 mm palatal to 21 and 2.80 mm palatal to 11, with a canal diameter of 4.57 mm, positioned 10.17 mm from the alveolar crest.

Due to posterior bone loss, pterygoid implant placement was evaluated bilaterally. Virtual planning showed:

- Right pterygoid implant angle: 43.4° to the Frankfort horizontal plane, 11.4° palatal inclination
- Left pterygoid implant angle: 41.2° to the Frankfort plane, 15° palatal inclination.

Adequate bone volume was noted along the pterygomaxillary buttress to support long basal implants.

Mandible

The mandibular arch exhibited well-preserved basal bone height in the anterior region, ranging from 34-36 mm from the alveolar crest to the inferior border, with D3-D4 density. Posterior bone height declined to 15-21 mm, and the crestal width at sites 36-38 showed variable narrowing (e.g., site 36: 2.39 mm at crest).

The inferior alveolar nerve canal was positioned at:

- Right side: 12.99 mm below the crest in the 46 region
- Left side: 17.98 mm below the crest in the 36 region.

The mental foramina were located 26.90 mm (right) and 25.97 mm (left) distal to the midline.

Posterior mandible showed areas of narrow crestal width (3-4 mm), making conventional implant placement difficult without grafting. Basal implant placement with bicortical anchorage in the lingual cortical plate and engagement of cortical structures was deemed more appropriate.

After reviewing systemic risk, bone availability, and the patient's desire for a fixed full-arch solution, full-mouth rehabilitation using basal cortical implants with immediate loading was planned. Basal implantology was selected due to:

1. The patient's uncontrolled diabetic status, which contraindicates conventional grafting.
2. Adequate basal cortical anchorage available in the pterygoid buttress, nasal floor, and mandibular basal bone.
3. Severely resorbed crestal bone in posterior regions where conventional implants would require sinus lift or ridge augmentation.



Figure 1: *Panoramic view.*



Figure 2: *Pre-operative clinical image-frontal view.*



Figure 3: *Pre-operative clinical image-left lateral view.*



Figure 4: *Pre-operative clinical image-right lateral view.*



Figure 5: *Pre-operative clinical image-maxillary arch.*



Figure 6: *Pre-operative clinical image-mandibular arch.*

Implant site assessment

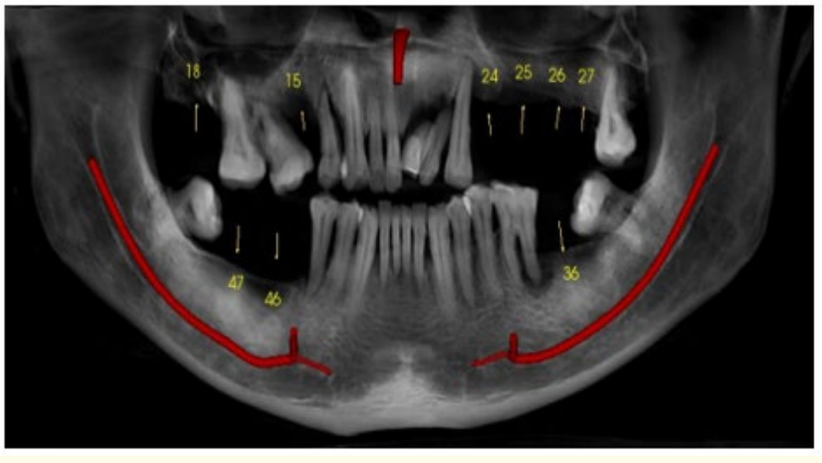


Figure 7

Right pterygoid implant planning

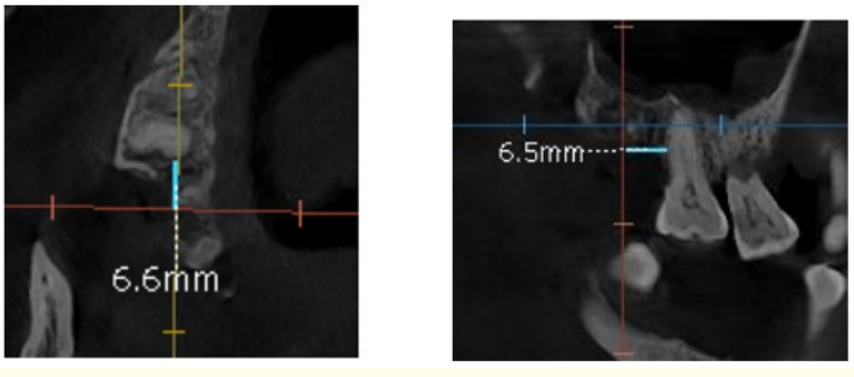


Figure 8: *Axial and sagittal view showing implant alveolar crestal entry point is 6.6 mm distal to tooth 17.*

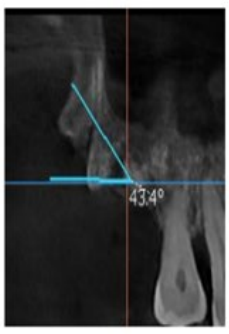


Figure 9: Implant is angulated at 43.40 wrt Frankfort horizontal plane.

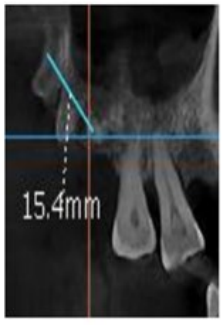


Figure 10: Length available from the alveolar crest to the posterior border of pterygomaxillary process.

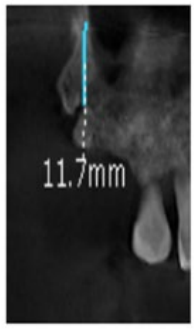


Figure 11: Height of pterygomaxillary process.

Figure 9, 10, 11

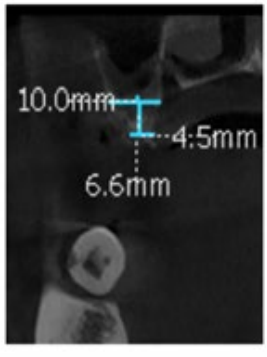


Figure 12: Height and width of alveolar bone at the point of entry.

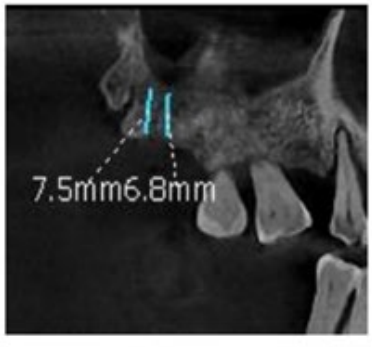


Figure 13: Proximity to sinus floor from alveolar crest.



Figure 14: Virtual implant angulated 11.40 degree to palatal to sagittal plane.

Figure 12, 13, 14

Left pterygoid implant planning

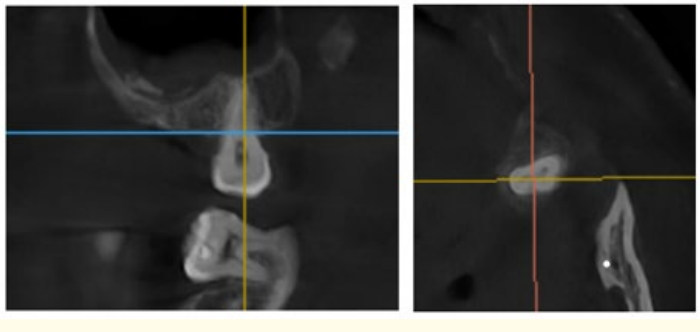


Figure 15: *Axial and sagittal view showing implant alveolar crestal entry point is at the level of 28.*

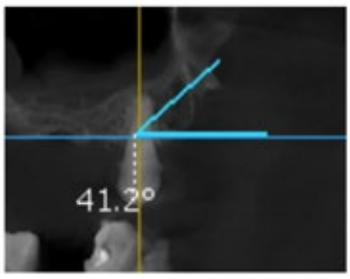


Figure 16: *Implant is angulated at 41.20 wrt Frankfort horizontal plane.*

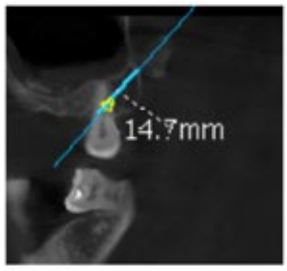


Figure 17: *Length available from the alveolar crest to the posterior border of pterygomaxillary process.*

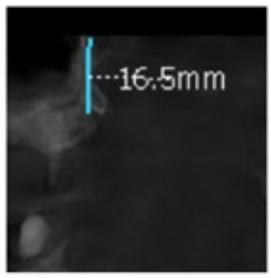


Figure 18: *Height of pterygomaxillary process.*

Figure 16, 17, 18

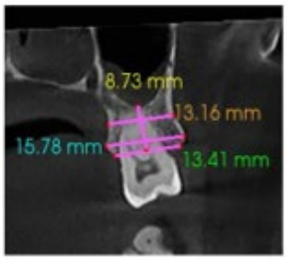


Figure 19: *Height and width of alveolar bone at the point of entry.*

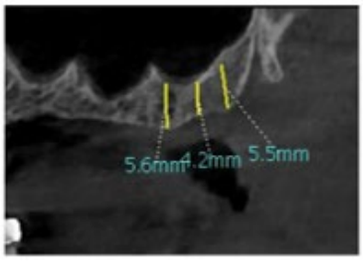


Figure 20: *Proximity to sinus floor from alveolar crest.*

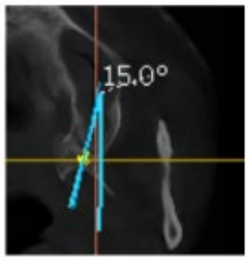


Figure 21: *Virtual implant angulated 15 degree to palatal to sagittal plane.*

Figure 19, 20, 21

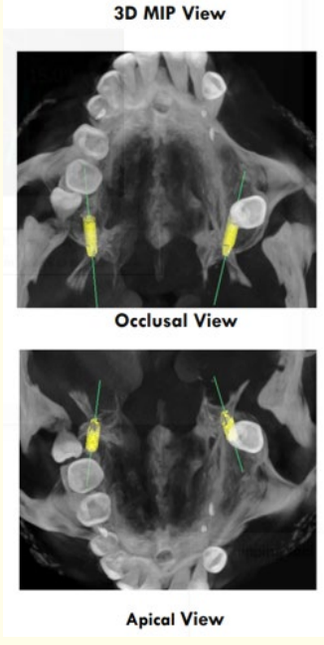


Figure 22



Figure 23: *Intraoral welding done on maxillary arch using 2 mm wire.*



Figure 24: *Intraoral welding done on mandibular arch using 2 mm wire.*



Figure 25: *Intraoral welding done for rigid stabilization using 2 mm wire.*



Figure 26: *Postoperative.*

Discussion

The present case demonstrates the successful full-arch rehabilitation of an uncontrolled diabetic patient using basal cortical implants with immediate loading. Diabetes mellitus, particularly in its poorly controlled form, is known to compromise osseointegration and wound healing due to microvascular dysfunction, impaired neutrophil activity, and increased susceptibility to infection. These systemic impairments directly influence the predictability of conventional implant therapy, which depends heavily on the quality of cancellous alveolar bone for primary stability and long-term integration [1].

Basal implantology offers a unique advantage in such medically compromised individuals. Basal or cortical implants derive stability from highly mineralized basal bone, which maintains structural integrity even in systemic conditions that negatively affect trabecular bone turnover [4,6]. This characteristic makes basal implants a preferred option in patients with uncontrolled diabetes, severe ridge atrophy, chronic periodontal infection, or a history of graft failure. Studies have shown that cortical bone is less influenced by glycemic fluctuations, enabling predictable anchorage even in compromised patients [7].

In the present case, CBCT evaluation revealed severe maxillary and mandibular ridge resorption, reduced posterior maxillary bone height, and narrow crestal widths in both arches. These findings indicated that conventional root-form implants would require adjunctive procedures such as sinus augmentation or ridge grafting. Such grafting procedures are contraindicated or highly risky in uncontrolled diabetic individuals due to poor healing and elevated infection risk [8]. Basal implantology, by contrast, bypasses the need for grafting by engaging remote cortical structures such as the pterygoid buttress, nasal floor, and mandibular basal cortex [6,9].

The use of pterygoid implants in the maxilla was specifically beneficial. Pterygoid implants anchor within dense cortical areas of the pterygomaxillary region, providing strong primary stability and avoiding the pneumatized sinus an essential consideration in diabetic patients with sinus mucosal thickening [10,11]. In the mandible, basal implants allowed engagement of lingual cortical plates and the interforaminal region, thereby overcoming the limitations imposed by narrow crestal bone and proximity to the inferior alveolar nerve.

Immediate loading is a key feature of basal implantology. Unlike conventional implants that require 3-6 months of undisturbed healing, basal implants reliably permit immediate functional loading due to bicortical anchorage [5,6]. Immediate loading has been shown to improve patient comfort, preserve neuromuscular activity, and reduce postoperative complications including peri-implant soft-tissue inflammation, which is highly relevant in diabetics [12].

Furthermore, polished-surface basal implants placed transcrestally are less susceptible to peri-implantitis because the design minimizes bacterial colonization and avoids microgaps at the crestal bone level [6]. This is particularly advantageous in patients with a history of periodontitis, as in the present case. Recent clinical studies confirm favorable success rates of basal implants even in medically compromised populations, provided that biomechanical principles and prosthetic considerations are strictly followed [12,13].

While early outcomes in this case were favorable, long-term success will depend on the patient's adherence to strict oral hygiene measures and improved glycemic control. Continuous monitoring is essential since systemic instability may still influence soft tissue health around the prosthesis.

Overall, this case supports the growing evidence that basal implantology is a viable and predictable treatment modality for uncontrolled diabetic patients where conventional implant therapy is unsuitable.

Conclusion

This case demonstrates that basal cortical implants with immediate loading can offer a reliable full-arch rehabilitation option even in uncontrolled diabetic patients with severe ridge resorption. By engaging stable cortical bone and avoiding grafting, functional and esthetic restoration was achieved safely. Continued follow-up and glycemic control remain essential for long-term success.

Conflict of Interest

No conflicts of Interest were present.

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