

A Case Report of Titanium Implant with Anatomically Contoured, Partially Submerged Zirconia Abutment and Seven-Year Follow-Up

Neiha Dhanoa and Ajay K. Ojha

Introduction

Titanium and zirconia are both well-established biomaterials for dental implant applications. Titanium remains the gold standard due to its excellent mechanical strength, corrosion resistance, and long-term biocompatibility ^[1]. Zirconia, on the other hand, has gained increasing attention for its favorable optical characteristics and its ability to promote soft-tissue attachment comparable or superior to titanium ^[2,3].

A limitation of conventional titanium or zirconia abutments is their standardized circular cross-section, which does not reproduce the anatomic morphology of natural tooth roots. This discrepancy can result in unnatural emergence profiles and pronounced cervical embrasures ^[4].

This case report describes the management of an immediately placed titanium implant that was intentionally positioned deeper within bone and restored with a custom, root-shaped zirconia abutment. The abutment was roughened to enhance bone contact, and bone grafting was performed around it to replicate a natural emergence profile. A seven-year follow-up demonstrates the long-term stability of the implant and peri-implant tissues, supporting the potential for partial osseointegration of zirconia abutments.

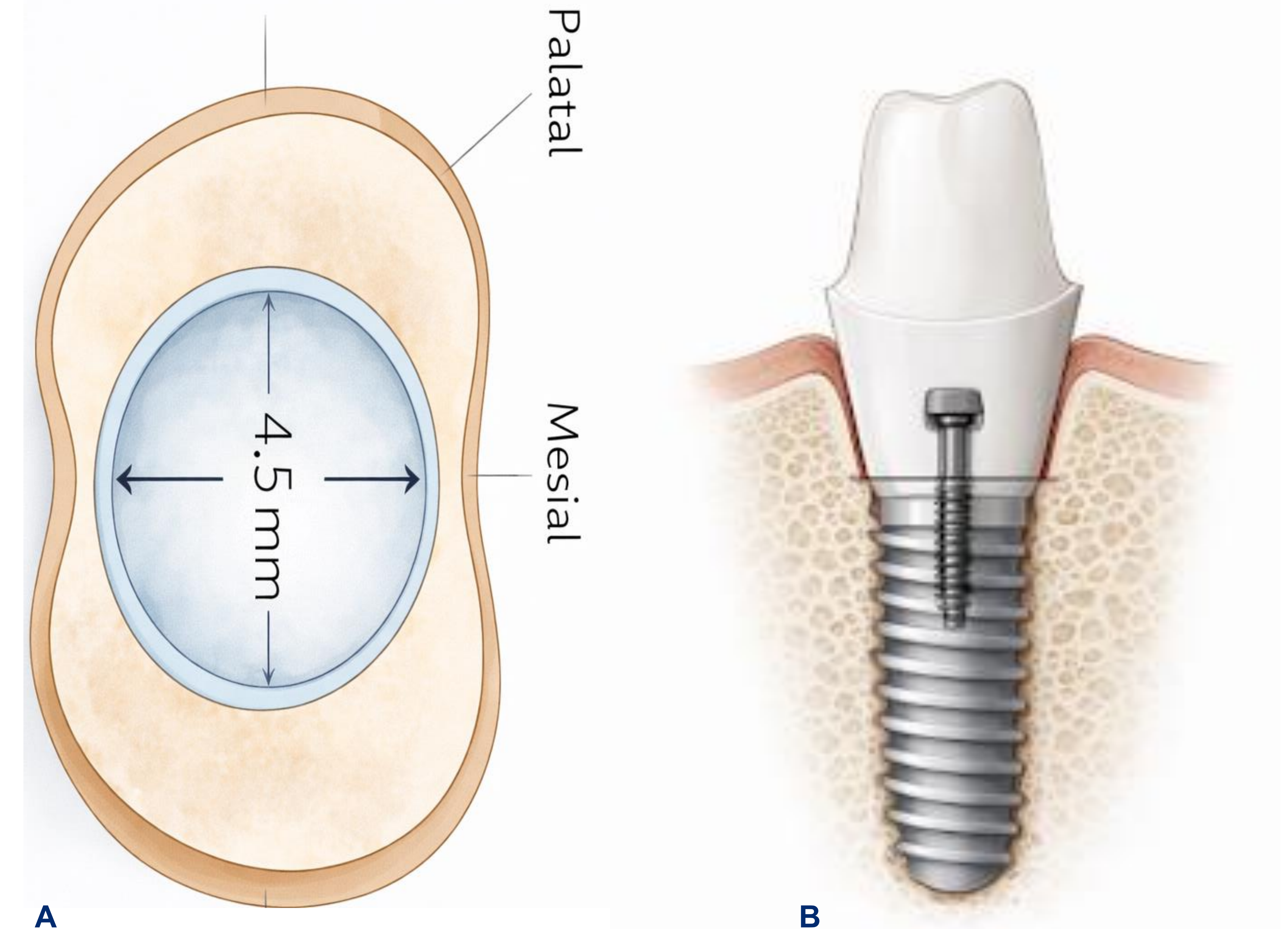


Figure 1: Diagrammatic representation (A) Cross-section of an implant inside a premolar tooth. (B) Longitudinal section of bone around a zirconia abutment.

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Method

A 72-year-old Southeast Asian male presented with a fractured and decayed maxillary right first premolar, deemed non-restorable. The patient was medically stable and provided informed consent for implant therapy. The tooth was extracted atraumatically on **February 2, 2018**, and an **MIS Conical V3 implant (4.3 mm × 11.5 mm)** was immediately placed into the extraction socket. An open-tray impression was made using **polyvinyl siloxane (PVS)**. The site was grafted with **DirectGen freeze-dried bone allograft (FDBA)** and covered with an **RCM-6 resorbable membrane**. The flap was repositioned and sutured with **5-0 PGA sutures**. After a healing period of **five months**, stage 2 surgery was performed on **July 2, 2018**. A **custom zirconia abutment**, fabricated at MIS Dental Laboratory (New Jersey, USA), was torqued to **30 N·cm**. The abutment featured a root-like cross-section resembling the natural maxillary first premolar root form but was delivered with a smooth surface. The subgingival portion of the abutment was manually roughened chairside using **diamond burs and sandblasting** before placement to increase surface texture and potential bone contact.



Figure 2: MIS Conical V3 Implant after placement into extraction socket.



Figure 3: Open tray impression done at the time of implant placement.



Figure 4: Zirconia abutment torqued in place and grafted around on same day as Stage 2 surgery.

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Method

Bone grafting was repeated around the zirconia abutment using the same graft and membrane materials, and the soft tissues were sutured with 5-0 PGA. The abutment was intentionally left uncrowned for six weeks to allow for soft-tissue maturation. After this period, sutures were removed and a provisional PMMA crown was fabricated and cemented with IRM. After serial follow-up visits, a definitive impression was made at the abutment level using PVS material. A zirconia crown was then fabricated and cemented using IRM. The patient was placed on a six-month maintenance schedule, during which peri-implant tissues were assessed clinically and radiographically.



Figure 5: After 6 years bone on distal is still good around the zirconia abutment.

Results

The patient's oral health gradually declined with age, and he presented intermittently with carious lesions on other teeth and generally reduced oral hygiene during subsequent recall visits. However, the implant site remained stable and functional throughout the seven-year follow-up period. Clinical examination revealed healthy peri-implant mucosa without bleeding on probing, mobility, suppuration, or mucosal recession. Radiographically, approximately 2–3 mm of crestal bone remodeling was noted around the zirconia abutment, consistent with physiologic adaptation rather than pathologic loss. The deep implant placement and anatomic abutment design appeared to preserve buccal and palatal bone contours.

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Figure 6: After 7 years bone on distal is still good around the zirconia abutment.

Conclusion

This case demonstrates successful long-term function of a titanium implant restored with a custom, anatomically contoured, partially submerged zirconia abutment that appeared to achieve partial osseointegration. Intentional submergence of the implant platform allowed the zirconia abutment to serve as a trans-osteal extension, providing support to peri-implant bone and soft tissue and producing an emergence profile closely resembling that of a natural tooth. Over a seven-year period, minimal bone remodeling and stable peri-implant soft tissues were observed despite declining oral hygiene and deterioration of adjacent teeth, indicating a favorable biological response to the zirconia abutment surface. While histologic confirmation of osseointegration was not obtained, the clinical and radiographic findings suggest that roughened zirconia abutments may allow for direct bone contact and long-term stability in select clinical scenarios. Further controlled studies and histologic evaluations are warranted to validate this restorative approach and to better understand the bone–zirconia interface.

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