

Optimizing Implant Placement in Cases of Limited Interocclusal Space: Strategies and Challenges

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Abstract

Effective treatment planning is crucial for implant-supported dental prostheses' success, requiring a thorough assessment of various factors, including bone quality, quantity, and available space. Evaluating space availability, encompassing height, width, and angulation, is imperative to ensure optimal implant positioning devoid of anatomical limitations. Adequate vertical space is essential for accommodating the implant-supported restoration while preserving proper occlusal function and esthetics. However, not all cases adhere to ideal standards, especially those featuring limited interocclusal space, as seen in scenarios of long-standing edentulous areas lacking prior prosthetic rehabilitation. Ideally, the interocclusal space should measure between 8-12 mm vertically. This case report details the management of reduced interocclusal space through the strategic placement of deeply positioned implants and the incorporation of a screw-retained fixed partial denture, effectively addressing the challenges associated with limited space.

Categories: Dentistry, Oral Medicine, Healthcare Technology

Keywords: screw retained prosthesis, fixed partial denture, vertical space, interocclusal space, implant-supported dental prosthesis

Introduction

Impressively, dental implants boast a 10-year survival rate of 95% in clinical practice, making them integral to modern dentistry [1,2]. Adequate interocclusal space is crucial for successful implant placement, as emphasized by Misch CE [3], who recommends a minimum vertical distance of 8-12 mm. However, restoring unrestored edentulous spaces resulting from posterior tooth loss presents challenges, leading to unpredictable movement of adjacent teeth and complicating traditional prosthodontic approaches with standard dental implants.

When faced with reduced interocclusal space during dental implant procedures, implantologists employ sophisticated strategies to optimize placement. These include surgical restoration of edentulous space through posterior maxillary segmental osteotomy [4,5], reduction of over-erupted opposing teeth [6], orthodontic treatment to retract extruded teeth [6,7], and utilization of an integrated crown-supported, screw-retained cast abutment with an implant [8]. Reduced CHS (crown height space) can have several negative effects, such as a reduced abutment height that could compromise long-term maintenance, insufficient bulk of restorative material for strength or aesthetics, and insufficient restoration retention. Abutments below 3 mm tall are best secured with screw retention for reliability. For abutments between 3 mm and 4 mm, you can opt for either screw retention or explore various cement types suitable for non-retrievable cementation. Abutments exceeding 4 mm in height can utilize retrievable cement for easy removal.

However, these procedures are complex, resource-intensive, and may necessitate sacrificing healthy dental tissues. Additionally, the invasive nature of wound healing and potential surgical complications further compound the challenges [9]. This case report presents one case study of the posterior region with less/limited interocclusal space using an endosteal implant with deep placement along with customization abutments with screw-retained for the final prosthesis.

Case Presentation

A 45-year-old female patient has visited the department of prosthodontics at Sharad Pawar Dental College and Hospital to replace missing 45, 46 and 47 (mandibular right 2nd premolar, 1st and 2nd molars). Intra-oral examination revealed interocclusal space near 45 and 46 is 3 mm and 47 is 2 mm, respectively (Figure 1).

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FIGURE 1: Limited interocclusal distance shown posteriorly between maxillary teeth and mandibular ridge

Hence, there is an inadequate vertical dimension to replace the posterior teeth on the right mandibular region, as the ideal crown height should range from 4.23 to 3.67 for mandibular posteriors. On radiographic investigation, cone beam computed tomography (CBCT) showed adequate bone for endosteal implant placement (Figures 2-5). Consequently, after a thorough examination and considering the findings, the treatment plan was to place two endosteal implants and restore the lost interocclusal space. Restoring the lost vertical dimension while considering underlying conditions is crucial. A better treatment plan approach would be the deep placement of endosteal implants to regain the lost interocclusal space [10].

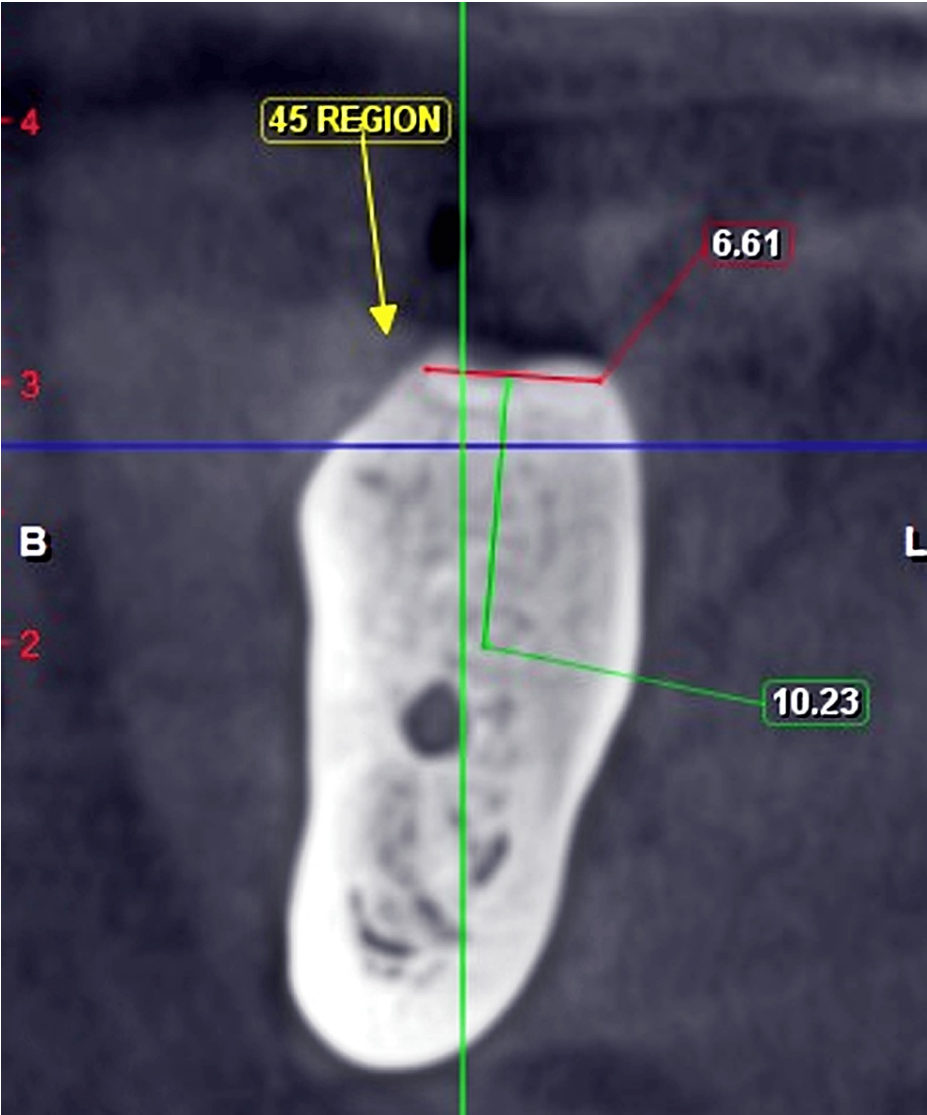


FIGURE 2: CBCT image a (sagittal section, 2 mm slice view)

The cone beam computed tomography (CBCT) image shows available bone height and width in the 45 region.

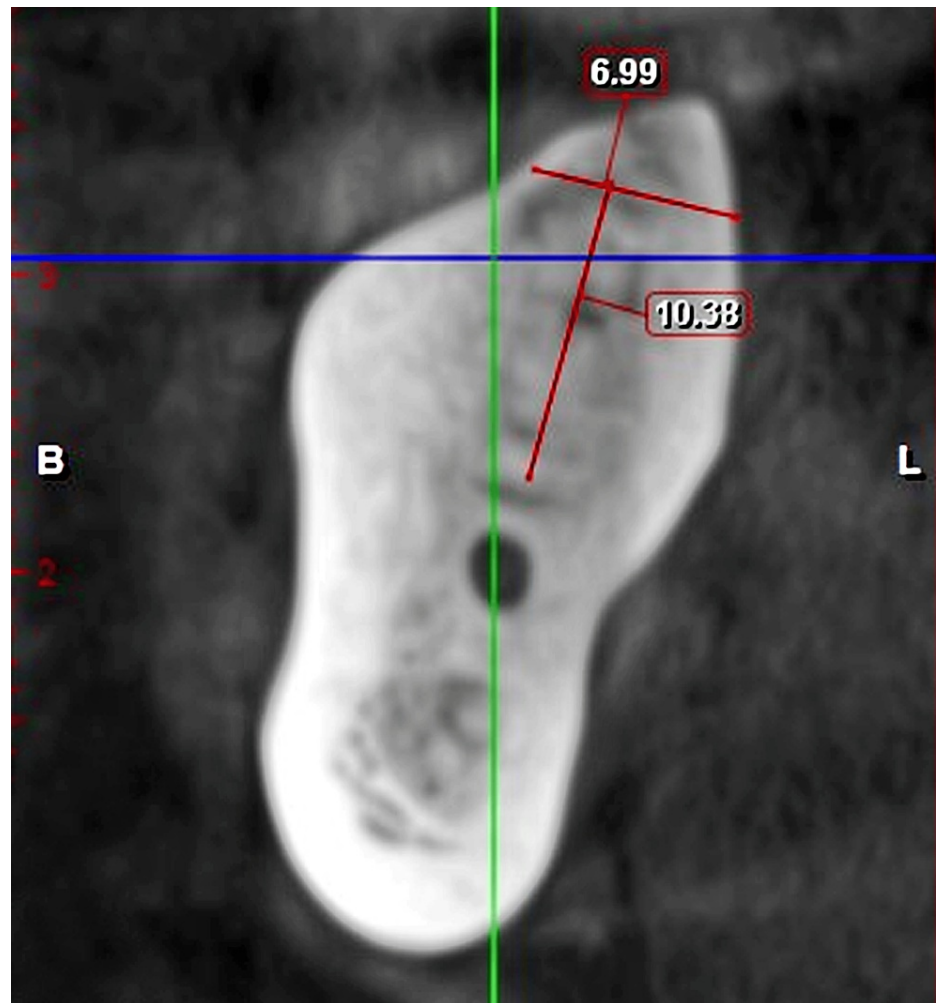


FIGURE 3: CBCT image 2 (sagittal section, 2 mm slice view)

The cone beam computed tomography (CBCT) image shows available bone height and width in the 47 region.

The patient has been explained about the treatment plan and informed consent was obtained. Two deep endosteal implants (Osstem TS III implant system (Osstem Implant Co., Ltd., Seoul, Korea) dimensions are 45 region 5 mm width x 10 mm length, 47 region 5 mm width x 8.5 mm length) were inserted after the surgical procedure, which was carried out under local anesthesia using lignocaine and adrenaline at a ratio of 1:100,000. Post-surgery patients have received oral hygiene and post-surgical instructions along with standard antibiotic prophylaxis. For achieving osseointegration, the implants submerged were kept for three months before proceeding with the second stage of surgery to place healing abutments (Figure 4).

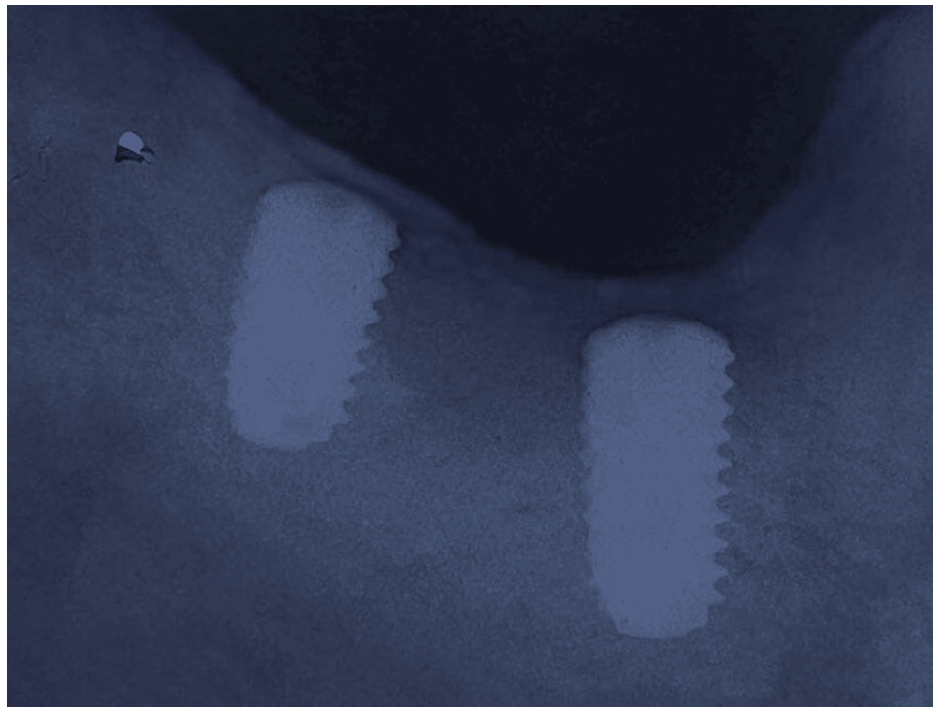


FIGURE 4: Three months post-surgical osseointegrated implants

At the 20-day follow-up, a closed tray impression was taken using Aquasil Ultra material (Dentsply Sirona, Pennsylvania, USA) and regular closed tray impression copings from the Osstem implant system. Due to the preplanned implant placement, the implants were positioned 1.5 mm below the bone crest level, and customized abutments were planned to ensure a minimum crown height of 4-5 mm for all posterior teeth. Intraoral verification of the customized screw-retained metal trail was performed to ensure proper fit and adequate space for ceramic layering (Figures 5-6).



FIGURE 5: Screw-retained metal trail for posterior mandibular teeth



FIGURE 6: Screw retained implant fixed partial denture final prosthesis

A screw-retained fixed partial denture was inserted and verified for proper fit, and a torque of 30 N was applied, followed by packing the screw access holes with Teflon and restoring them with composite material (Figures 7-8). A post-insertion radiograph was taken to verify the placement and alignment of the abutments and prosthetic components with the implants.

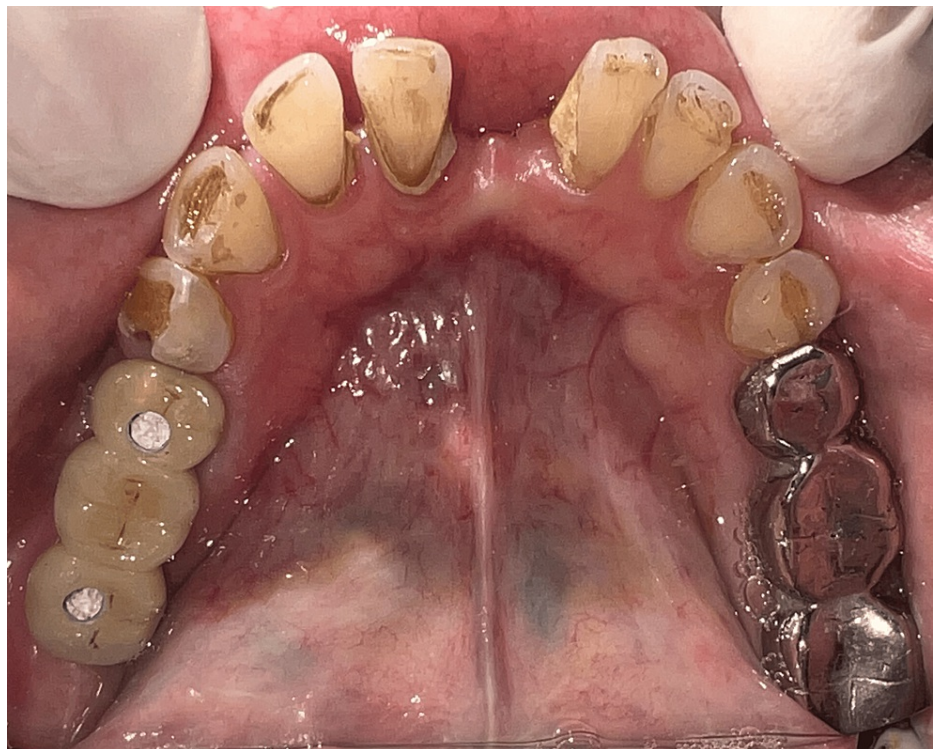


FIGURE 7: Post-insertion picture of screw-retained fixed partial denture



FIGURE 8: Facial view of post-insertion screw-retained fixed partial denture

Post-insertion oral hygiene maintenance instructions and regular yearly follow-up appointments for clinical and radiographic evaluation were provided. During these subsequent examinations, we conducted assessments on the marginal bone level surrounding the implants and evaluated factors such as mobility and other indicators of potential clinical issues to uphold the continued well-being and steadfastness of the implants [11].

Discussion

The present case report outlines the management of decreased interocclusal space with deeply placed implants and implant-retained prostheses. Follow-up was conducted for one year and two months to assess clinical and radiographic outcomes. When dealing with decreased interocclusal distance in teeth in the posterior, the treatment plan can sometimes be unconventional. For example, opting for orthodontic tooth movement is often time-consuming and may not be feasible for many patients. On the other hand, crowns and more endodontic therapy may be required if the height of the opposing extruded teeth is lowered due to hypersensitivity. The last resort, surgical reconstruction via posterior maxillary segmental osteotomy, involves a more invasive procedure with potential complications, including postoperative infection of the surgical site, hemorrhage, vitality loss of the adjacent tooth, and bone fragment necrosis [12].

Any bone development on the implant platform can be carefully removed during the second stage of surgery by utilizing bone-cutting burs and a straight handpiece. This approach offers enhanced precision and minimizes invasiveness when compared to the traditional method of flattening the bone level before implant placement [13,14]. In the third stage, implementing an implant-retained fixed partial denture is strategically planned, given the constraints posed by the limited interocclusal distance. This choice presents several advantages, including the ease of prosthesis retrieval during routine hygiene maintenance, repair procedures, or necessary surgical interventions [15]. In instances where subgingival margins are present with cement-retained prostheses, during the cementation process, there is a risk of excess cement becoming compressed between the soft tissue and the implant [16,17]. As a result, this strategy aims to restore interocclusal space effectively. Specifically, subgingival margins are integrated into the treatment plan to elevate crown height and enhance retention, thereby contributing to a more successful treatment outcome.

Conclusions

In conclusion, this case report demonstrates promising outcomes using the deeply placed Osstem TS III implant system. This endosteal implant, with its tapered design, provides excellent mechanical stability, making it suitable for patients with limited interocclusal space. Throughout the one-year and two-month follow-up duration, no indicators of failure were detected, underscoring the clinical success and functional efficacy of the locking-taper implants. These findings suggest that locking-taper implants may be viable for addressing such cases, particularly when used with screw-retained prostheses. However, further investigation with extended follow-up periods is imperative to corroborate these findings and ascertain the long-term viability of this approach. In essence, our study underscores the potential of locking-taper implants, particularly in conjunction with screw-retained prostheses, as a valuable solution in managing

patients with restricted interocclusal space.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Surekha A. Dubey, Jahnavi P. Gorripati, Sharayu Nimonkar, Madhu Priya

Acquisition, analysis, or interpretation of data: Surekha A. Dubey, Jahnavi P. Gorripati, Sharayu Nimonkar, Madhu Priya

Drafting of the manuscript: Surekha A. Dubey, Jahnavi P. Gorripati, Sharayu Nimonkar, Madhu Priya

Critical review of the manuscript for important intellectual content: Surekha A. Dubey, Jahnavi P. Gorripati, Sharayu Nimonkar, Madhu Priya

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Disclosures

Human subjects: Consent was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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