
Management Of Path Of Insertion In Fixed Prosthodontic For Mesially Tilted Mandibular Second Molars : A Literature Review

Izzulhaq Fauzandhi Arsa¹⁾, Pamungkas Handy Mulyawan²⁾
^{1,2)} Universitas Muhammadiyah Surakarta

*Corresponding Author
E-mail: izzulhaqf13@gmail.com

Abstract

The loss of posterior teeth that is not promptly rehabilitated may result in tooth movement toward the edentulous space, leading to tilting of the abutment teeth. One of the most common conditions is mesial tilting of the mandibular second molar following the loss of the mandibular first molar, which may disrupt occlusal relationships, affect abutment alignment, and create difficulties in achieving an ideal path of insertion during fixed prosthodontic treatment. An inappropriate path of insertion may increase the complexity of tooth preparation and compromise the long-term success of the restoration. This study aimed to review the management of path of insertion in fixed prosthodontic treatment involving mesially tilted mandibular second molars through a literature review approach. The literature search was conducted using Google Scholar, PubMed, and ScienceDirect for articles published between 2016 and 2026. The findings indicated that successful management of path of insertion depends on proper abutment evaluation based on biomechanical principles and Ante's Law, as well as the selection of an appropriate treatment strategy according to the clinical condition. Several treatment options, including modified tooth preparation using a proximal half crown, orthodontic uprighting, non-rigid connector, and telescopic crown, have been reported to improve the path of insertion in selected cases. In conclusion, selecting an appropriate treatment strategy based on clinical conditions and biomechanical principles may help achieve an optimal path of insertion, thereby supporting the long-term success of fixed prosthodontic treatment.

Keywords: Path of Insertion, Fixed Prosthodontics, Fixed Partial Denture, Tilted Abutment, Mesially Tilted Mandibular Second Molar.

INTRODUCTION

Posterior tooth loss is a common condition encountered in dental practice and may adversely affect masticatory function, occlusal stability, phonetics, and esthetics. Failure to promptly rehabilitate missing posterior teeth may result in positional changes of adjacent and opposing teeth, including drifting, tipping, and extrusion. These changes can disrupt occlusal harmony and increase the complexity of subsequent fixed prosthodontic treatment (Zhu et al., 2024). One of the most common positional changes is mesial tilting of the mandibular second molar following long-term loss of the mandibular first molar. This condition alters the long axis of the abutment tooth, resulting in a lack of parallelism between abutments in fixed prosthodontic treatment. Furthermore, tilting of posterior teeth may complicate prosthesis design and affect the distribution of occlusal forces within the fixed prosthodontic system (Amelia et al., 2026).

The success of fixed prosthodontic treatment is influenced by several biomechanical principles, including retention, resistance, stability, and an appropriate path of insertion. The path of insertion refers to the direction in which a fixed prosthesis is inserted onto the abutment teeth, allowing complete seating of the prosthesis without mechanical interference. Misalignment of the long axes of the abutment teeth due to molar tilting may result in undercuts, difficulties in seating the fixed prosthesis, and uneven distribution of occlusal forces within the prosthetic system (Huang et al., 2017). In cases of mesially tilted mandibular second molars, achieving a common path of insertion becomes more challenging because conventional tooth preparation often requires excessive reduction of tooth structure. Excessive tooth preparation may increase the risk of pulpal involvement, weaken the abutment tooth structure, and compromise the long-term prognosis of the fixed prosthesis. Furthermore, the selection of abutment teeth should also take periodontal support into consideration in accordance with Ante's Law to ensure optimal distribution of occlusal loads (Fan et al., 2024).

Various management approaches have been reported to address discrepancies in the path of insertion caused by mesial tilting of molar teeth. These approaches include modification of abutment tooth preparation, the use of non-rigid connectors, and adjustment of fixed prosthesis design to achieve a common path of insertion while minimizing unnecessary removal of tooth structure. The selection of an appropriate treatment approach should take into account the degree of tooth inclination, the periodontal condition of the abutment teeth, and the biomechanical principles of fixed prosthodontics, including evaluation of abutment support in accordance with Ante's Law (Mukhopadhyay et al., 2021).

Based on the literature reviewed, this study aims to evaluate the management of the path of insertion in fixed prosthodontics involving mesially tilted mandibular second molars.

RESEARCH METHODS

This study employed a literature review method using a qualitative descriptive approach to review the management of path of insertion in fixed prosthodontic treatment involving mesially tilted mandibular second molars. The literature search was conducted electronically through several scientific databases, including Google Scholar, PubMed, and ScienceDirect. The search strategy used combinations of the following keywords: "path of insertion," "fixed prosthodontics," "fixed partial denture," "tilted abutment," "mesially tilted mandibular second molar."

The selected articles consisted of national and international scientific publications published between 2016 and 2026, available in English or Indonesian, and accessible in full text. The inclusion criteria were: (1) original research articles, case reports, review articles, and systematic reviews related to the management of path of insertion in fixed prosthodontics; (2) studies discussing mesially tilted mandibular second molars or tilted abutments; and (3) full-text articles published between 2016 and 2026. The exclusion criteria included: (1) duplicate articles; (2) articles not relevant to the research topic; (3) articles with incomplete data; and (4) publications available only as abstracts. Standard prosthodontic textbooks were also used as supporting references to strengthen the theoretical foundation.

Article selection was performed through several stages, including article identification, title and abstract screening, full-text eligibility assessment, and final selection based on the established inclusion criteria. The selected literature was analyzed descriptively by comparing the objectives, research methods, and findings of each study. The results were synthesized narratively to identify similarities, differences, and clinical implications of the reported management strategies. Finally, the findings were presented in tables and discussed systematically to provide a comprehensive overview of the management of path of insertion in fixed prosthodontic treatment involving mesially tilted mandibular second molars.

RESULTS AND DISCUSSION

Table 1. Journal Analysis Results

Author and Year	Title	Result
Passia et.al, (2019)	Rotational Path of Insertion in Fixed Prosthodontic When Abutment Axes Do Not Match : A Case History Report	Discrepancies in the axial alignment of the abutment teeth may hinder the achievement of an optimal path of insertion and complicate prosthesis seating.
Zhu et,al (2024)	Biomechanical Behaviour of Tilted Abutment After Fixed Partial Denture Restoration of CAD/CAM Material	An increased degree of abutment inclination is associated with higher stress concentrations in the connector, the roots of the abutment teeth, and the surrounding periodontal tissues. Furthermore, the prosthetic material influences the distribution of stress within the fixed partial denture (FPD).
Dr. Pranjal Braman et.al, (2025)	Abutment Selection in Fixed Prtial Denture : An Overview of Clinical Criteria and Management of Complex Abutment Scenarios	Periodontal condition, crown-to-root ratio, alveolar bone support, and the application of Ante's Law play important roles in determining the long-term prognosis of fixed prosthodontic treatment.
Dr. Sunita C et.al, (2019)	Conservative Approach for Management of Tilted Abutment in Fixed Partial Denture – A Case Report	The use of a proximal half crown successfully achieved an optimal path of insertion through a more conservative tooth preparation approach, preserving healthy tooth structure and reducing the risk of pulpal involvement compared with a full-coverage crown.
Kresnoadi et.al (2024)	Rehabilitation of Missing Teeth with Severely Tilted Abutment Tooth Using Telescopic Crown Bridge : A Case Report	The use of a telescopic crown has been shown to improve the path of insertion while providing satisfactory functional and esthetic outcomes in cases involving tilted abutments.

A tilted tooth is a condition in which the tooth deviates from its normal long axis, resulting in the loss of an ideal centric contact. Tooth tilting may occur in the mesial, distal, buccal, or lingual direction, depending on the underlying etiological factors. The most common cause is the loss of adjacent or opposing teeth, which leads to tooth migration into the edentulous space. Failure to

promptly restore missing teeth may also disrupt orofacial functional balance and induce compensatory changes that can complicate treatment planning in fixed prosthodontics (Arifin & Pertiwi, 2021). One of the most frequently encountered clinical problems is mesial tilting of the mandibular second molar, which creates difficulties in achieving an appropriate path of insertion during the fabrication of a fixed prosthesis. The lack of parallelism between the long axes of the abutment teeth may interfere with prosthesis insertion, reduce retention and resistance, and ultimately compromise the long-term success of the fixed prosthesis. Therefore, achieving an appropriate path of insertion is considered one of the key factors in fixed prosthodontic treatment planning (Marghalani, 2016). This finding is consistent with the case report by (Passia et al., 2019), which demonstrated that discrepancies in the axial alignment of abutment teeth may hinder the achievement of an optimal path of insertion during fixed prosthodontic treatment.

In addition to affecting the path of insertion, tilting of the abutment teeth may also influence the distribution of forces transmitted to the prosthesis and its supporting tissues. An increase in the degree of abutment inclination has been associated with higher stress concentrations in the connector, the roots of the abutment teeth, and the surrounding periodontal tissues. (Zhu et al., 2024) reported these findings through a biomechanical analysis demonstrating that changes in abutment angulation significantly affect stress distribution within fixed prostheses. Therefore, treatment planning for cases involving tilted abutments should not only focus on achieving an optimal path of insertion but also consider biomechanical principles to improve the long-term prognosis of the prosthesis.

Another important aspect to be considered in the management of mesially tilted mandibular second molars is the evaluation and selection of abutment teeth. The design of tooth preparation and the type of retainer to be used should be determined only after a comprehensive evaluation of the abutment teeth based on the biomechanical principles of fixed prosthodontics. One of the fundamental principles is Ante's Law, which states that the total periodontal surface area of the abutment teeth should be equal to or greater than that of the teeth being replaced by the fixed prosthesis. This principle serves as a guideline to ensure that the abutment teeth are capable of adequately supporting and distributing occlusal loads, thereby improving the long-term success of the fixed prosthesis (Dr. B. Lakshman Rao et al., 2025). In addition, periodontal condition, crown-to-root ratio, tooth mobility, and alveolar bone support should also be evaluated to determine the suitability of a tooth as an abutment (A et al., 2022). These findings are consistent with the report by (Dr. Pranjal Barman et al., 2025), which emphasized that these factors, including the application of Ante's Law, play a crucial role in determining the prognosis of fixed partial dentures in cases involving compromised abutments. Such evaluations provide the foundation for determining whether the abutment teeth can provide adequate support before planning the path of insertion and tooth preparation.

The management of fixed prosthodontic treatment for mesially tilted mandibular second molars requires comprehensive treatment planning to achieve an optimal path of insertion while preserving the remaining tooth structure. Various treatment options have been reported, including proximal half crowns, telescopic crowns, non-rigid connectors, orthodontic uprighting, cross-pin and wing pontic designs, as well as modifications of tooth preparation and prosthesis design. The selection of an appropriate treatment modality should be based on the degree of tooth inclination, the biological condition of the abutment teeth, biomechanical requirements, and the long-term prognosis of the prosthesis (Jaiswal et al., 2021). Modification of tooth preparation represents one of the conservative treatment options for achieving an optimal path of insertion. In the case reported by (Dr Sunita et al., 2024) the use of a proximal half crown for a mesially tilted mandibular second molar successfully achieved an optimal path of insertion without requiring aggressive full-crown preparation. This approach preserves more healthy tooth structure and reduces the risk of pulpal involvement compared with a full-coverage crown. Furthermore, this conservative approach is consistent with the principles of fixed prosthodontics, which emphasize preserving as much healthy tooth structure as possible without compromising the function, retention, or stability of the prosthesis (Shillingburg HT, DA Sather, Wilson EL, 2012). The use of a telescopic crown may also be considered in cases involving

tilted abutment teeth because it can compensate for differences in the path of prosthesis insertion. This treatment utilizes a double-crown mechanism that accommodates abutment inclination while improving prosthesis retention. Similarly, (Kresnodi & Rinaldi, 2024) reported that the use of a telescopic crown in cases of severely tilted abutment teeth improved the path of insertion and provided satisfactory functional and esthetic outcomes.

Each of these treatment strategies has its own advantages and limitations. Therefore, the selection of an appropriate approach should be based on the degree of tooth inclination, the biological condition of the abutment teeth, biomechanical requirements, and the treatment objectives. An appropriate treatment approach is expected to achieve an optimal path of insertion, preserve the remaining tooth structure, and support the long-term success of fixed prosthodontic restoration.

CONCLUSION

Resin- Based on the findings of this literature review, the successful management of the path of insertion in fixed prosthodontic treatment involving mesially tilted mandibular second molars depends on proper evaluation of the abutment teeth, the application of biomechanical principles, including Ante's Law, and the selection of an appropriate treatment strategy according to the patient's clinical condition. Various treatment approaches, such as orthodontic uprighting, proximal half crown, telescopic crown, and non-rigid connector, may be considered to achieve an optimal path of insertion based on the indication of each case. Appropriate treatment selection is expected to preserve the remaining tooth structure, improve the success of the restoration, and enhance the long-term prognosis of fixed prosthodontic treatment.

REFERENCES

- A, S. P., Raghavan, R., & S, R. S. (2022). *Factors Influencing Abutment Selection in Fixed Partial Denture-A Review*. 7(4), 800–804.
- Amelia, A., Setyawan, B., & Rakhmatia, Y. D. (2026). *Design modification of a porcelain-fused-to-metal (PFM) adhesive bridge for a mandibular molar with a short clinical crown : A case report*. 38(1), 168–176. <https://doi.org/10.24198/pjd.vol38no1.66158>
- Arifin, R., & Pertiwi, F. C. (2021). REHABILITATION OF MASTICATION AND LACK OF SPACE TREATMENT IN NARROW EDENTULOUS WITH FIXED-FIXED BRIDGE (CASE REPORT). *Dentino (Jur. Ked. Gigi)*, VI(2), 183–189.
- Dr. B. Lakshman Rao, Dr. G., S., & Dr. A. Sathvika. (2025). *Importance of 'Ante's Law' in Prosthodontics – A Reweigh*. 9(4), 168–182. <https://doi.org/10.5281/zenodo.16919682>
- Dr. Pranjal Barman, Dr. Rajesh Kumar, Dr. Sunil Kumar M. V, & Dr. Krishan Kumar. (2025). *Abutment Selection in Fixed Partial Dentures : An Overview of Clinical Criteria and Management of Complex Abutment Scenarios*. 24(6), 27–30. <https://doi.org/10.9790/0853-2406062730>
- Dr Sunita, C., Dr. Shubham, K., Dr. Subhraneel, B., Dr. Deepti, J., Dr. Sanjeet, S., & Dr. Kanika, S. (2024). *Conservative Approach for Management of Tilted Abutment in Fixed Partial Denture - A Case Report*. 7(5), 21–25. www.ijdsir.com
- Fan, X., Chen, L., Chen, Q., Wang, F., Wu, Y., & Sun, Y. (2024). *Influence of a mesial cantilever on stress , strain , and axial force in fixed partial dentures with a distally tilted implant in the atrophic posterior maxilla*. 68(4), 615–623.
- Huang, C., Liu, F., & Luk, K. (2017). Interference factors regarding the path of insertion of rotational-path removable partial dentures. *Biomedical Journal*, 40(1), 69–75. <https://doi.org/10.1016/j.bj.2016.07.003>
- Jaiswal, N., Tembhurne, J., Gangurde, A., & Chauhan, M. (2021). *Conservative management of tilted abutment : A case report*. 7(1), 169–171. www.allresearchjournal.com

- Kresnoadi, U., & Rinaldi, D. H. (2024). *Rehabilitation of missing teeth with severely tilted abutment tooth using telescopic bridge : A case report*. 22(01), 1494–1499. <https://doi.org/10.30574/wjarr.2024.22.1.1169>
- Marghalani, T. Y. (2016). Frequency of undercuts and favorable path of insertion in abutments prepared for fixed dental prostheses by preclinical dental students. *The Journal of Prosthetic Dentistry*, 116(4), 1–6. <https://doi.org/10.1016/j.prosdent.2016.03.014>
- Mukhopadhyay, P., Khalikar, A., Wankhade, S., & Deogade, S. (2021). *Managing Tilted Molar Abutment Using a Digitally Fabricated Split-Pontic Fixed Dental Prosthesis — A Case Report*. 11, 311–316. <https://doi.org/10.4236/ojst.2021.118027>
- Passia, N., Habil, D. M. D., Kern, M., & Habil, P. D. M. D. (2019). *Rotational Path of Insertion in Fixed Prosthodontics when Abutment Axes Do Not Match: A Case History Report*. 32(5), 444–447. <https://doi.org/10.11607/ijp.6139>
- Shillingburg HT, DA Sather, Wilson EL, E. a. (2012). *Fundamentals of Fixed Prosthodontic* (4th ed). Quintessence.
- Zhu, T., Chen, J., Xu, Y., Zhu, Z., Wang, J., Pei, X., Qiao, M., Cheng, B., & Li, R. (2024). *Biomechanical behaviour of tilted abutment after fixed partial denture restoration of CAD / CAM materials*. 24(1128), 2–12. <https://doi.org/10.1186/s12903-024-04890-7>