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CASE REPORT

From Impaction to Alignment: Pre-Orthodontic Surgical Management of Impacted Maxillary Canine and Mandibular Premolar

Achmad Gigih Andy Putra[1*], Dion Sandro Satrya[2], Inggit Dwi Virgianti[3], Ria Vivi Widyaningrum[4]

[1]Department of Biomedical Sciences and Traditional Medicine, Faculty of Dental Medicine, Institut Ilmu Kesehatan Bhakti Wiyata, Indonesia
[2]Department of Oral and Maxillofacial Surgery, Faculty of Dental Medicine, Institut Ilmu Kesehatan Bhakti Wiyata, Indonesia
[3]Private Practice Orthodontist, Toothie Dent Clinic, Indonesia
[4]UPT Puskesmas Pesantren I, Kediri, Indonesia

Correspondence email: achmad.gigih@iik.ac.id

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ABSTRACT

Background: Impaction of the maxillary canine and mandibular second premolar ranks among the most common dental impactions after third molars. However, the simultaneous occurrence of both in a single patient is relatively rare.
Objective: To present the clinical management of concomitant impacted maxillary canine and mandibular second premolar using a combined surgical approach, emphasizing the importance of appropriate surgical intervention in facilitating subsequent orthodontic alignment.
Case: A 19-year-old female presented with irregularly aligned teeth and sought orthodontic treatment. Examination revealed anterior crossbite, ectopic maxillary canine, multiple caries, retained root of tooth 75, persistence of tooth 53, and missing tooth 35. Radiographs confirmed impaction of tooth 13 and tooth 35, with the canine positioned palatally. A multidisciplinary pre-orthodontic treatment plan included extraction of tooth 35 due to space deficiency and surgical exposure of tooth 13 following removal of tooth 53. Procedures were performed under local anesthesia with appropriate pharmacological management.
Outcome: The surgical phase was completed without complications. The patient showed good postoperative recovery and compliance. Orthodontic treatment has been initiated but remain ongoing, with alignment of the impacted canine planned in subsequent stages.
Conclusion: Pre-orthodontic surgical management in essential for facilitating orthodontic outcomes. Careful planning, interdisciplinary collaboration, and staged treatment are critical, particularly in rare combined impaction cases.

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INTRODUCTION

Dental impaction is a condition in which a tooth is prevented from fully erupting, typically due to physical obstructions, insufficient space in the dental arch, or developmental anomalies.[1] Multiple etiological factors have been identified as contributing to dental impaction. These include retained deciduous teeth, abnormal eruptive pathways, supernumerary teeth that obstruct eruption, dental crowding, and various soft- or hard-tissue pathologies.[2] In addition to local factors, systemic factors may also contribute to the etiology of dental impaction. These systemic factors include malnutrition, anemia, vitamin D deficiency, endocrine diseases, and specific bacterial infections.[3] Tooth impaction is influenced by factors such as age, gender, eruption timing, available space, and ethnic background. Numerous studies have investigated the prevalence of impacted teeth among diverse ethnic groups, cultures, and geographic regions.[2]

The maxillary permanent canine exhibits the highest frequency of impaction after the third molar, with an incidence from 0.8% to 5.2% in population. This rate is more than twice that of mandibular canine impaction. Maxillary canine impaction is two to three times more common in females than in males, with an 8:1 palatal-to-buccal ratio. Mandibular canine and premolar impaction rates are 0.18% and 0.08%, respectively.[4]

Clinical indicators suggestive of an impacted tooth include delayed eruption, crowding due to insufficient space, tilting of adjacent teeth, and over-retained deciduous teeth. Diagnosis is established through clinical examination in conjunction with radiographic imaging, which facilitates assessment of the tooth's location, angulation, and relationship to adjacent anatomical structures. Early diagnosis is essential for effective treatment outcomes.[5] Studies indicate that treatment options for impacted teeth include observation, intervention, repositioning, and surgical extraction. Appropriate management should be determined following clinical examination, taking into account the position of the teeth and potential adverse effects on adjacent teeth.[6]

Canine impactions are classified as palatal or buccal, depending on their position relative to the alveolar process. Approximately 85% of palatally impacted canines and 17% of buccally impacted canines possess adequate space for eruption. Buccally impacted canines typically exhibit a favorable vertical inclination, while palatally impacted canines are more likely to present with a horizontal orientation. As a result, buccal impactions may erupt without surgical intervention, whereas palatal impactions rarely do so because of the increased thickness of the palatal cortical bone. Treatment options depend on clinical findings, canine position, and patient preferences, including observation, extraction, surgical exposure with orthodontic alignment,

and surgical repositioning of the impacted tooth.[7] While the management of an impacted mandibular second premolar depends on the position of the tooth, the stage of root development, and the amount of available arch space. Treatment options include conservative observation, orthodontic space creation with forced eruption, or surgical extraction. The primary surgical risk is the proximity of the mental nerve.[8]

Multiple impactions of non-molar teeth in a single patient are uncommon in clinical practice, especially when both maxillary and mandibular teeth are affected simultaneously. These cases present significant diagnostic and therapeutic challenges, as treatment planning must account for tooth position, proximity to anatomical structures, occlusal function, esthetics, and patient-specific factors. Documenting such cases contributes to the literature and enhances clinical understanding of effective management strategies. This case report describes the clinical and radiographic findings, diagnostic considerations, and multidisciplinary management of a patient with multiple impacted non-molar teeth.

CASE REPORT

A 19-year-old female presented to the dental clinic with a chief complaint of irregularly aligned teeth and a desire for orthodontic treatment. She was in good general health, with no history of systemic disease or previous tooth extraction. Extra-oral examination revealed no facial asymmetry or other abnormalities. Intra-oral examination identified an anterior crossbite, ectopic eruption of the maxillary canine, persistence of tooth 53, retained root remnants of tooth 75, multiple carious lesions, and absence of tooth 35 in the dental arch (Figure 1).

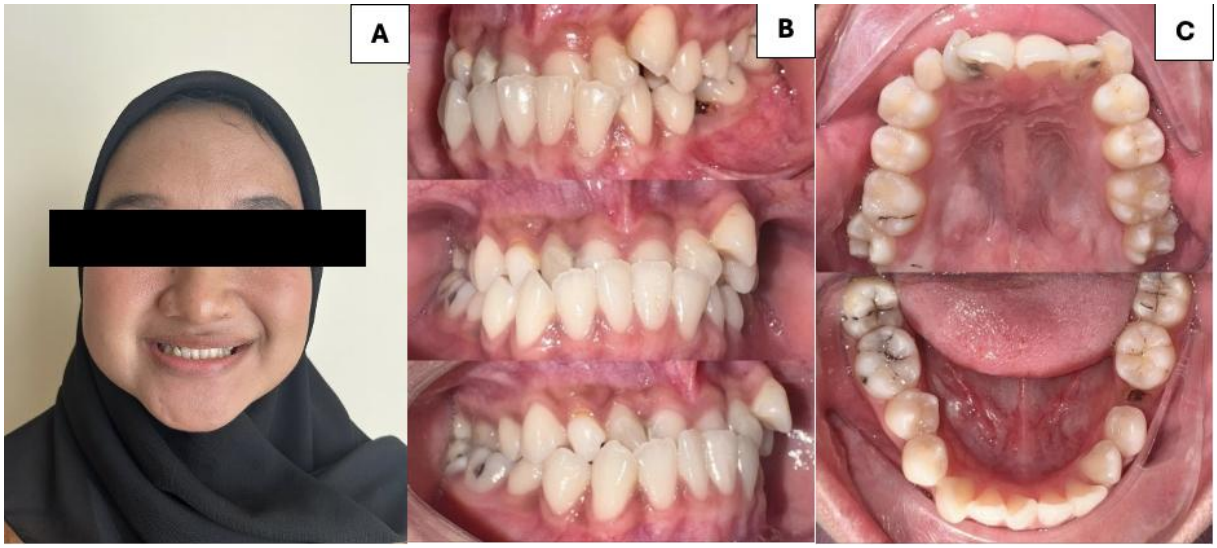

Figure 1. Extraoral and intraoral examination. (A) Extraoral examination revealed no facial asymmetry. (B) Intraoral examination showing the left, frontal, and right views, respectively. (C) Occlusal views of the maxillary and mandibular arches.

Orthopantomography (OPG) and maxillary occlusal radiographs were obtained to assess the suspected impaction of the maxillary canine and unerupted mandibular second premolar. The OPG confirmed impaction of tooth 13 and tooth 35. The occlusal radiograph revealed that the impacted maxillary canine was positioned palatally to the root of the lateral incisor (Figure 2). Based on clinical and radiographic findings, a diagnosis of palatally impacted maxillary canine (13) and impacted mandibular second premolar (35) was established, along with persistence of tooth 53 and retained root remnants of tooth 75.

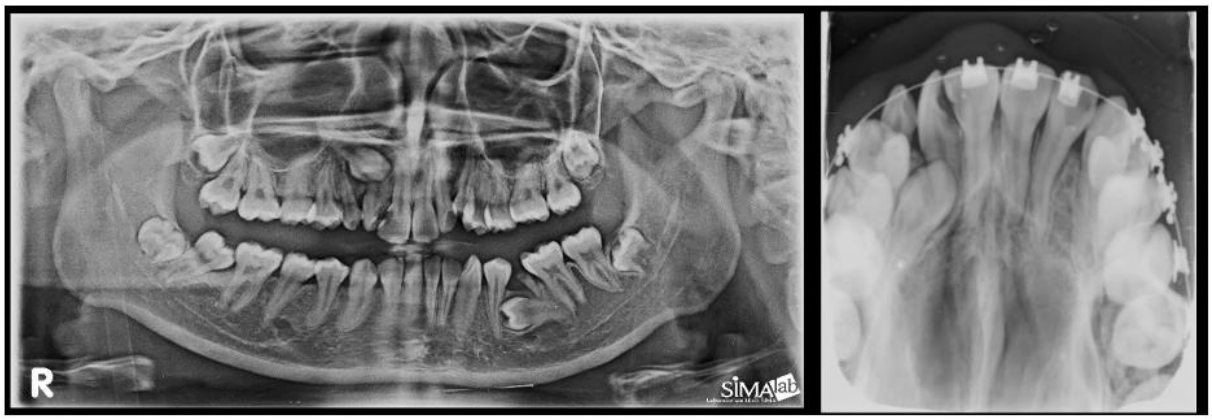

Figure 2. The OPG and maxillary occlusal radiographs

After model analysis and arch space assessment, the orthodontist consulted an oral and maxillofacial surgeon to determine the optimal surgical approach. A multidisciplinary treatment plan combining surgical and orthodontic management was developed. Extraction of the impacted tooth 35 was indicated due to insufficient mandibular arch space, necessitating the extraction of tooth 45 as part of the orthodontic plan. Surgical exposure of the impacted tooth 13 was scheduled following the extraction of the retained deciduous tooth 53 to enable subsequent orthodontic traction and alignment of the canine.

Under local anesthesia, a mucoperiosteal flap was elevated to expose the buccal aspect of the impacted tooth 35 and allow for buccal bone reduction. Bone removal was performed with a straight low-speed handpiece and carbide bur under continuous sterile saline irrigation to ensure adequate access. Due to the tooth's position and morphology, odontosection was carried out by dividing the tooth into three segments to facilitate atraumatic removal. The retained root remnants of tooth 75 were also extracted during the procedure. After complete removal of all fragments, the surgical site was inspected, all bony spicules were removed, and sharp edges were smoothed with a bone file. The surgical socket was thoroughly irrigated to remove debris and residual particles. The flap was repositioned and secured with nylon sutures

to achieve proper wound closure (Figure 3). Postoperatively, oral amoxicillin and clavulanic acid 625 mg three times daily and etoricoxib 90 mg once daily were prescribed for 5 days.

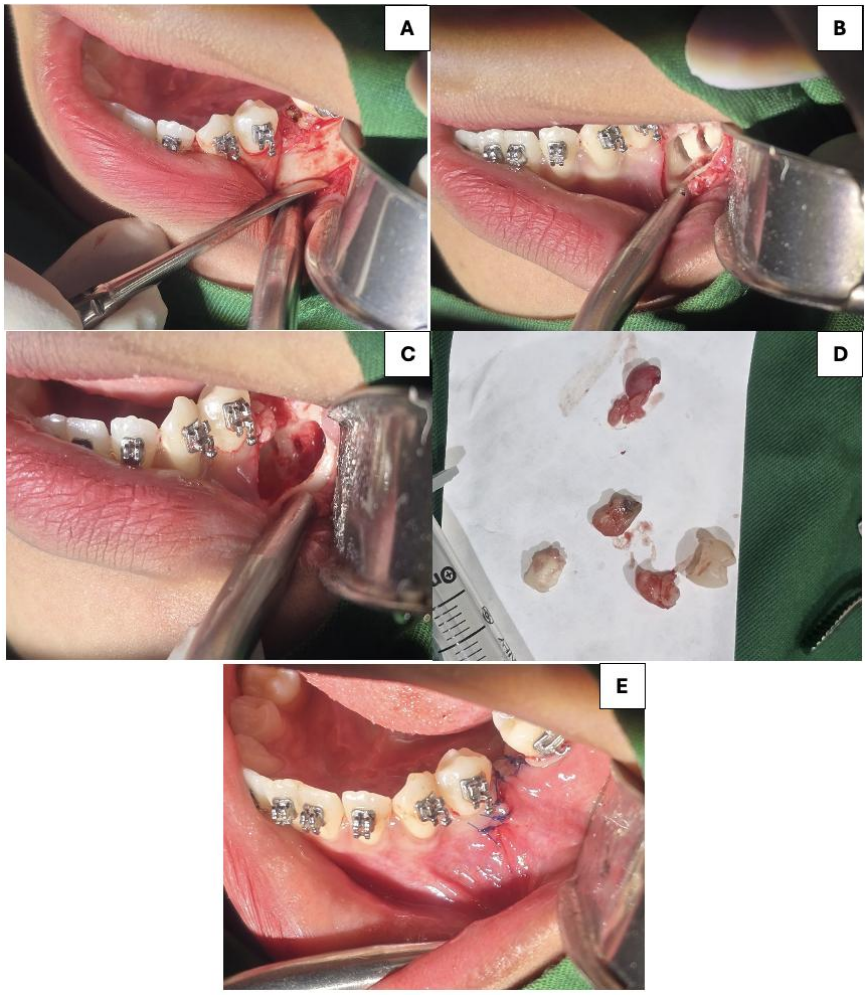

Figure 3. Procedures of removal of the impacted tooth 35. (A) Flap elevation for buccal bone reduction in the region of tooth 35. (B) Sectioning of the tooth into three parts to facilitate removal of the tooth fragments. (C) Tooth socket following the extraction of tooth 35. (D) Fragments of tooth 35 and the root remnant of tooth 75. (E) Postoperative wound

One month later, surgical exposure of the impacted tooth 13 was performed under local anesthesia. The retained deciduous tooth 53 was extracted concurrently to clear the eruption pathway. A palatal mucoperiosteal flap was elevated to access the impacted canine. Bone reduction was performed with carbide burs under continuous sterile saline irrigation to expose the crown of tooth 13 while minimizing thermal injury to the surrounding bone. After sufficient exposure, an orthodontic bracket was bonded to the crown to enable orthodontic traction (Figure 4). The flap was repositioned and closed with three silk sutures. Postoperative medications included cefadroxil 500 mg for 5 days, etoricoxib 90 mg for 5 days, paracetamol 500 mg for 1 day, and methylprednisolone 8 mg for 3 days. Follow-up on postoperative day 7 showed satisfactory wound healing without infection or other complications.

Figure 4. Procedures of surgical exposure of the impacted tooth 13. (A) Flap elevation for palatal surgical exposure of tooth 13. (B) Bone reduction to expose the crown of tooth 13. (C) Bracket placement on the crown of tooth 13. (D) Post–surgical exposure wound on day 7. (E) Periapical radiograph on day 7 after surgical exposure.

The surgical phase was completed without complications. The patient showed good postoperative recovery and compliance. Orthodontic treatment has been initiated but remain ongoing, with alignment of the impacted canine planned in subsequent stages. Written informed consent was obtained from the patient for publication of this case report and the accompanying clinical and radiographic images.

DISCUSSION

The present case is clinically significant because it involved simultaneous impaction of a maxillary canine and mandibular second premolar in a young adult patient, accompanied by retained deciduous teeth. Multiple impacted non-molar teeth are relatively uncommon in clinical practice, particularly when they occur in different arches. This condition required multidisciplinary treatment planning involving both orthodontic and oral surgical considerations. The decision-making process was complex because preservation of the maxillary canine was prioritized for functional and esthetic reasons, whereas extraction of the mandibular second premolar was selected due to limited arch space and orthodontic requirements. A closed-eruption approach was considered appropriate in this case because it allows preservation of attached gingiva and may provide improved periodontal and esthetic outcomes during orthodontic traction of palatally impacted canines.

Management of impacted mandibular premolars commonly involves surgical extraction, in which careful evaluation of the relationship between adjacent teeth and the mental nerve is essential to determine the most appropriate surgical approach.[9] In this case, a triangular flap design was chosen to provide sufficient access and visibility during bone removal and tooth sectioning. A full-thickness mucoperiosteal flap was created with an intrasulcular incision along the buccal aspects of tooth 36 to tooth 35, and a single vertical releasing incision at tooth 34 (Figure 3). The releasing incision was placed at the line angle to avoid direct papillary transection, as injury to the interdental papilla can lead to postoperative papillary necrosis, esthetic issues, and periodontal complications.[10,11]

After reflecting the flap, the buccal bone was removed with a surgical bur and low-speed handpiece to expose the impacted tooth. Tooth 35 was sectioned into three segments to facilitate removal while preserving alveolar bone, which is important for potential future prosthetic or implant rehabilitation. Careful contouring of the alveolar bone was performed to minimize postoperative discomfort and preserve favorable bone architecture for future orthodontic and restorative considerations. Throughout the procedure, copious sterile saline irrigation was used to remove debris, especially beneath the flap, to reduce the risk of postoperative infection. A low-speed handpiece was preferred during bone removal and tooth sectioning to prevent pressurized air from entering the surgical wound, which could cause soft-tissue emphysema, air entrapment, and increase the risk of postoperative complications and infection.[10] After the procedure, the flap was repositioned to its original location to ensure proper coverage and protection of the supporting tissues.

Based on the radiographic findings, particularly the maxillary occlusal radiograph, the impacted canine was classified as Class I according to the Field and Ackerman (1935) classification, indicating a palatal position of the impacted tooth. The OPG further demonstrated the deep position of the canine crown in relation to the adjacent incisor roots (Figure 2).[12] Previous studies have reported that approximately 85% of impacted maxillary permanent canines are located palatally, while only 15% are positioned labially. Maxillary canine impaction has significant clinical implications due to the tooth's essential role in functional occlusion and dental esthetic outcomes. Consequently, preservation of the impacted canine is recommended whenever possible, with careful management during surgical exposure and orthodontic movement to reduce the risk of bone defects and root resorption.[9]

The palatally impacted canine was accessed using a posteriorly based palatal flap. A full-thickness mucoperiosteal flap was elevated via a sulcular incision extending from the second premolar on the affected side to the contralateral first premolar, providing adequate tension-free exposure (Figure 4). Under irrigation, a drill was used to expose the most superficial surface of the impacted crown while preserving the enamel. The cementoenamel junction was not exposed, as the tooth was not intended for extraction. Since the tooth would undergo orthodontic repositioning, a bracket was bonded to the exposed enamel surface. Achieving immediate postoperative hemostasis was challenging because the anatomical characteristics of the hard palate limited effective compression with gauze biting.

The surgical procedures were performed by two different oral and maxillofacial surgeons, which may explain the variations in postoperative medication regimens. Postoperative prescriptions are determined based on the patient's condition, the extent of surgery, and the clinician's judgment to optimize recovery and minimize complications.[13] Both surgeons prescribed etoricoxib, a second-generation cyclooxygenase-2 (COX-2) inhibitor indicated for short-term pain management following dental surgery.[14] Etoricoxib has been reported to provide effective and prolonged postoperative pain control while reducing the need for additional analgesics.[15] Following surgical exposure of tooth 13, paracetamol and methylprednisolone were additionally prescribed because the procedure involved a wider surgical field and longer operative duration. Combination therapy with paracetamol and etoricoxib has been shown to improve analgesic efficacy through complementary mechanisms of action, while corticosteroids help reduce postoperative inflammation, swelling, and discomfort.[9,16–18]

Antibiotics were also prescribed following both surgical procedures to reduce the risk of postoperative infection and support wound healing.[19,20] Previous studies have demonstrated that

prophylactic antibiotics may reduce postoperative complications, including surgical site infection and alveolar osteitis.[21–24] In the present case, co-amoxiclav and cefadroxil were selected because of their broad antimicrobial coverage and effectiveness against common oral pathogens. Co-amoxiclav, a combination of amoxicillin and clavulanic acid, is a broad-spectrum antibiotic widely used in dental practice and has been associated with reduced rates of dry socket and postoperative infection.[20,25] Cefadroxil, a first-generation cephalosporin, was selected because of its favorable bioavailability, tissue penetration, antimicrobial activity against common aerobic oral bacteria, and lower incidence of side effects compared with amoxicillin.[25–27]

Alternative treatment options for impacted mandibular premolars include surgical exposure followed by orthodontic traction, autotransplantation, or conservative observation. However, in the present case, extraction was considered the most appropriate option because of insufficient arch space and the orthodontic treatment plan requiring space management. In contrast, orthodontic alignment of the impacted maxillary canine was prioritized because of its major contribution to canine guidance, occlusal stability, and smile esthetics. Similar cases involving simultaneous impaction of maxillary canines and mandibular premolars have been rarely reported in the literature. Previous reports generally describe management through combined surgical and orthodontic approaches, emphasizing the importance of individualized treatment planning based on arch space availability, tooth angulation, and esthetic considerations.[28,29]

During follow-up, wound healing was observed without postoperative infection, neurosensory disturbance, or significant pain. Despite the successful surgical and early postoperative outcomes, this report has several limitations. Long-term orthodontic follow-up data were not yet available at the time of reporting, preventing comprehensive evaluation of final tooth alignment and periodontal outcomes following orthodontic traction of the impacted canine. Additionally, cone-beam computed tomography (CBCT) imaging was not performed, which may have provided a more detailed three-dimensional assessment of tooth position and proximity to adjacent anatomical structures.

This case highlights the importance of comprehensive clinical and radiographic evaluation in patients presenting with retained deciduous teeth and delayed eruption. Early diagnosis and multidisciplinary collaboration between orthodontists and oral surgeons are essential to achieve appropriate treatment planning and favorable outcomes in cases involving multiple impacted non-molar teeth. This case also emphasizes the importance of investigating

retained deciduous teeth in late adolescence, as persistence of primary teeth may indicate underlying impaction or eruption disturbances requiring radiographic evaluation.

CONCLUSION

Effective pre-orthodontic management of multiple impacted non-molar teeth depends on precise diagnosis, meticulous surgical planning, and interdisciplinary collaboration. A combined surgical approach involving extraction of the impacted mandibular second premolar and surgical exposure of the impacted maxillary canine created optimal conditions for subsequent orthodontic intervention. Careful case selection and individualized treatment planning are critical to maintaining both functional and esthetic outcomes while reducing the risk of postoperative complications. The findings highlight that retained deciduous teeth and delayed eruption should not be disregarded, as they may serve as significant clinical indicators of underlying impaction abnormalities.

DECLARATION

Authors Contributions

[AGAP]: Conceptualization, Writing – Original Draft, Writing – Review & Editing, Project Administration; **[DSS]:** Investigation, Methodology, Validation, Writing – Review & Editing; **[IDV]:** Investigation, Methodology, Formal Analysis, Validation, Writing – Review & Editing; **[RVW]:** Investigation, Writing – Review & Editing, Visualization. All authors have read and approved the published version of the manuscript and agreed to be accountable for all aspects of the work.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Ethics Approval and Consent to Participate

Ethical approval was not required for this case report according to the applicable institutional requirements. Written informed consent was obtained from the patient for the clinical management and use of the relevant clinical information for publication.

Consent for Publication

Written informed consent was obtained from the patient for the publication of this case report and any accompanying clinical and radiographic images.

Data Availability Statement

The data supporting the findings of this case report are available from the corresponding author upon reasonable request, subject to appropriate confidentiality and ethical considerations.

Declaration of Generative AI In Scientific Writing

During the preparation of this manuscript, the authors utilized ChatGPT (OpenAI) for language editing and refinement of the manuscript. The authors reviewed, verified, and edited all AI-assisted outputs and take full responsibility for the integrity and accuracy of the published work.

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