

Case report: Management of an impacted second premolar

Précis

This paper describes the prevalence, aetiology, and management of impacted second premolars in relation to the current evidence.

Abstract

Impaction of mandibular second premolar teeth may result from local factors such as abnormal positioning of the tooth bud and insufficient space in the dental arch. It can also be caused by ankylosis, early exfoliation, or prolonged retention of the primary second molars. Pathological factors such as alveolar cysts or odontomes have also been implicated. The recommended treatment for these cases varies according to case-specific clinical characteristics. This may include periodic observation, space maintenance, or surgical exposure with/without orthodontic traction or extraction. In this paper, the aetiology, diagnosis and treatment planning for mandibular second premolar impaction are reviewed. Furthermore, the treatment of one case will be presented.

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Introduction

Impacted teeth can have a negative impact on the dentition by producing aesthetic compromise, impaired oral hygiene, development of pathology (e.g., cysts), and possible damage to neighbouring teeth. Impaction of the mandibular second premolar is a relatively rare occurrence. Radiographically investigated samples of adult populations show prevalence ranges between 0.2 and 0.3%.¹⁻⁹ Impacted second mandibular premolars are second in frequency only to impacted mandibular third molars.¹⁰ Impaction is attributed to lack of space or an aberrant path of eruption brought about by idiopathic or local pathological factors.

Literature review

Normal development

The development of the mandibular second premolar begins with coronal calcification starting between 24 and 30 months of age, and ends with complete root formation expected between 12 and 14 years.¹¹ Eruption of the mandibular second premolar typically occurs at 11-12 years of age. Mandibular premolars are susceptible to several anomalies including:

- impaction (prevention of eruption due to a physical barrier);
- aplasia (congenital absence); and,
- supplementals (extra premolars in addition to the normal sequence of teeth).

Aetiology of mandibular premolar impaction

Lack of space for the eruption of mandibular premolars may result from:

- tooth size-arch length discrepancies arising from over-sized, abnormally formed or multi-cusped second premolar teeth;
- severe decay/early loss of the primary second molar teeth permitting mesial drift/tilting of the adjacent first permanent molar teeth; and,
- mesial ectopic eruption of the first permanent molar causing early loss of the primary second molar.

The mandibular second premolar bud usually develops between the roots of the primary second molar. The bud may be distally inclined. This can result in an aberrant, distoangular path of eruption, culminating in impaction against the mesial root of the first permanent molar, especially if this permanent molar mesially tilts.

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Table 1: Aetiology of mandibular premolar impaction.

- Irregular resorption of the roots of the primary second molar
- Prolonged retention of the primary second molar
- Local pathology (e.g., cysts, supernumeraries and odontomes)
- Syndromes (e.g., cleidocranial dysostosis)
- Other genetic factors (e.g., PTHR1 mutations)
- Ectopic development of the tooth bud
- Idiopathic rotation of the tooth bud
- Early extraction of the mandibular first permanent molar

In instances where there is sufficient space for the eruption of the mandibular second premolar, impaction may be caused by (Table 1):

- uneven resorption of the roots of the primary second molar;
- ankylotic prolonged retention of the primary second molar;
- local pathological conditions, including the presence of inflammatory or dentigerous cysts, supernumerary teeth or odontomes;
- syndromic genetic factors such as cleidocranial dysostosis;
- non-syndromic genetic factors such as parathyroid hormone 1 receptor (PTH1R) mutations in primary failure of eruption (PFE);¹²
- ectopic development of the tooth bud;
- idiopathic rotation of the developing tooth bud;¹⁰ and,
- early extraction of the mandibular first permanent molar might also contribute to the intraosseous distal migration of the second premolar until it becomes impacted when it contacts the mesial roots of the adjacent second permanent molar.^{13,14}

In extreme instances, the premolar has been shown to impact in the coronoid process.¹⁵

Management

When there is sufficient space for eruption, treatment options include:

- periodic observation of premolar development, possibly combined with extraction of primary teeth;
- surgical exposure of the impacted tooth, possibly combined with orthodontic traction;
- surgical extraction of the impacted premolar; and,
- surgical repositioning (autotransplantation).^{7,16-18}

In instances where the primary second molar is retained, its extraction is often warranted to encourage spontaneous eruption of the unerupted second premolar. If orthodontic treatment is to be delayed, the application of a mandibular space maintainer will help maintain the necessary space in the mandibular arch. Spontaneous eruption of the impacted premolar is observed mostly in patients where the second premolar is not profoundly ectopic and its root development is favourable. If the impacted tooth has an associated cystic lesion, both tooth and cyst are commonly removed to prevent recurrence of the cyst. However, it is also possible to marsupialise the cyst in order to retain the impacted tooth and facilitate its eruption.^{1,8} Extraction is commonly indicated for impacted premolars having caused root resorption to standing teeth.¹⁹

Where the space in the mandibular arch is insufficient to accommodate the second premolar, the implementation of a carefully planned orthodontic treatment can provide this space. Possible complications in the management of these teeth include:

- damage to roots of adjacent teeth;
- loss of vitality of the impacted premolar or adjacent teeth;
- paraesthesia of the inferior alveolar nerve; and,
- mandibular fracture.^{8,19}



FIGURE 1: Clinical absence of both mandibular second premolars with retained left primary second molar.

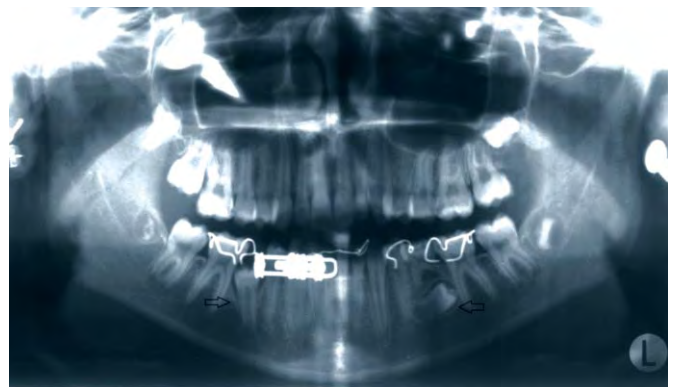


FIGURE 2: Orthopantomograph at presentation demonstrating the presence of both mandibular second premolars with distoangular impaction of the 35 (removable orthodontic appliance in situ).

Case report

A 14-year-old female patient was referred for orthodontic consultation. At the time of presentation, she was wearing a mandibular removable appliance incorporating expansion screws within the lingual acrylic baseplate. This device was fabricated by her family dentist to address the lack of space in the lower arch, with the aim of gaining the necessary arch length to allow for normal eruption of the mandibular second premolars. Intraoral examination evidenced that neither second premolar had erupted nor could be palpated (Figure 1).

Close clinical examination revealed a lack of space for eruption of the right mandibular second premolar (<7mm), while there was sufficient mesiodistal space to accommodate the left mandibular second premolar. The right primary second molar had been extracted two years previously due to caries. The panoramic radiograph revealed the presence of both mandibular second premolars (Figure 2). The right premolar was vertically inclined whereas the left premolar was impacted at an acute, almost horizontal inclination facing the



FIGURE 3: Baseline periapical radiograph of impacted left mandibular second premolar pre-surgery.



FIGURE 5: Radiographic view six months post op.

mesial root of the first permanent molar (**Figure 3**). The impacted premolar had not developed more than one-third of its prospective root length. In addition to the above, mild imbrication of the lower anterior teeth was noted accompanying a class II molar and canine relationship. No clinically significant dental pathology was detected except for plaque-induced gingivitis. Oral hygiene instructions were administered in an attempt to improve this. Extraoral examination of the patient showed a class I skeletal profile, symmetrical facial attributes, competent lips and an aesthetically pleasing smile.

The existing removable appliance was discarded, a mandibular fixed orthodontic appliance was applied, and extraction of the left second primary molar was carried out. After the initial levelling and alignment stage of the orthodontic treatment, active coil springs were inserted bilaterally on a rectangular 17x22 stainless steel archwire with the aim of gaining adequate space for spontaneous eruption of the second premolars. Six months later, the cusp tip of the right second premolar was evident, while there was no sign of



FIGURE 4: Clinical view of appliance to orthodontically erupt the impacted premolar with the bonded bracket.



Baseline → Six months post op

FIGURE 6: Radiographic progress of treatment from initial presentation to six months.

the left tooth.

Surgical exposure of the impacted tooth was planned and performed. Since the impacted tooth was positioned centrally within the alveolus, it was decided to access the tooth occlusally so as to maintain the integrity of the buccal and lingual alveolar plates. At the time of surgery, a bracket with a stainless steel chain was bonded to the impacted tooth allowing for subsequent orthodontic traction (**Figure 4**).

The eruptive orthodontic force on the impacted tooth was renewed every three weeks via the application of elastic thread. Six months later the tooth was clinically erupted and a periapical radiograph demonstrated continued root formation (**Figures 5 and 6**). Arch alignment and closure of residual spaces constituted the orthodontic finishing procedures. The fixed appliance was then removed and a fixed canine-to-canine lingual retainer was applied. Post-treatment clinical and radiographic examination revealed no adverse effects pursuant to the combined orthodontic-surgical approach.

Conclusions

Mandibular second premolars may develop with varying degrees of rotation and inclination. Rehabilitation of deeply impacted mandibular second premolars presents a significant challenge for the orthodontist and oral surgeon. Surgical exposure of a moderately mesiodistally or buccolingually impacted second premolar may result in spontaneous eruption, where there is sufficient space. In cases of deep or horizontally impacted mandibular second premolars, surgical exposure combined with orthodontic traction is typically the treatment of choice.

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