

Atypical Extraction used in the Orthodontic Treatments

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Abstract

Orthodontic extractions remain a somewhat controversial topic. The removal of teeth should be considered as a therapeutic option in cases of insufficient facial harmony, space constraints, and instability in occlusion. The decision to extract is influenced by factors such as the severity and type of malocclusion, the patient's age and morphological characteristics, dental history, oral hygiene, caries rates, and the quality of the teeth. Specific teeth may need to be extracted depending on the type of malocclusion. In certain scenarios, timely extractions can lead to spontaneous correction of the malocclusion. Extractions can involve various combinations of teeth. The indications and contraindications for these extractions are detailed, highlighting the advantages and disadvantages in different cases. Extractions have been shown to facilitate profile changes, aid in teeth alignment, and reduce lower facial height. Deciding whether or not to extract requires careful and thorough diagnostic evaluation.

Keywords: Atypical extraction, Mandibular incisor extraction, Asymmetric extractions.

INTRODUCTION

Dental extraction, or tooth pulling, is essential in orthodontics for creating space and improving alignment. Extraction decisions depend on malocclusion, facial form, growth pattern, tooth condition, and periodontal health. Premolars are typically chosen due to their strategic location, aiding in effective treatment biomechanics. Typical extraction patterns involve first bicusps, while atypical extractions address specific issues such as midline correction or impacted teeth, often in adults with periodontal disease.^[1] Modern orthodontics offers diverse extraction options to optimize treatment outcomes, emphasizing facial balance, esthetics, and stability.

TREATMENT AND DIAGNOSIS

Extraction choices in orthodontics should consider treatment objectives, stability, occlusion, and esthetics. Decisions are patient-specific, avoiding routine extractions.^[2] For maximum anterior retraction, typically four first premolars are removed; for less retraction in patients with prominent chins, upper first and lower second premolars are chosen. In cases of deep anterior overbite, extractions closer to the front ease bite opening, while open-bite treatments benefit from second premolar or first molar extractions to accentuate the curve of Spee.^[2] The decision depends on the clinician's skill and patient needs, making treatment planning complex and individualized.

INDICATIONS

- Achieving arch space: To correct negative dental-osseo discrepancy, which usually manifests as crowding
- Facial esthetics: To reduce dentoalveolar protrusion
- Occlusion: To properly connect both arches in normo-occlusion
- Stability: To better maintain the results achieved.

ATYPICAL EXTRACTION OF MANDIBULAR CENTRAL INCISORS

The frequency of extraction of a lower incisor in orthodontics clinics is highly variable. Most authors put the figure at 1.1–6% of all patients treated for malocclusion. For example, Proffit in the 1950s recorded the extraction of a lower incisor in 20% of all malocclusive patients treated with extractions.^[3]

Indications for extracting a lower incisor are:

- Malocclusion of Angle Class III, light-moderate, with

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- little negative overjet or 0 overjet and decreased overbite
- Malocclusion of Angle Class I or II with Bolton discrepancy.

Undesirable effects

- Excessive overjet and overbite. Reopening of extraction space. Inadequate posterior occlusion
- Loss of inter incisor papilla with the appearance of “black triangles”
- Mesial inclination of the lower canines
- Excessive lingual inclination of the remaining lower incisors
- Inconsistency of midlines (inevitable).

Contraindication

- Bolton discrepancy, upper excess. Increased overbite
- Triangular anatomy of lower incisors, especially with periodontal disease
- Increased overjet.

Advantage

1. It may reduce the treatment time
2. There is only a minimal alteration in inter-canine width
3. Incisor extraction therapy does not demand much retraction of the anterior teeth so the anteroposterior position of the incisors is not changed much.

Disadvantage

1. Overjet increases if there was no Bolton discrepancy before the start of treatment
2. A Class III occlusal relationship will be the result if the overjet is normal after the removal of the lower incisor
3. A midline discrepancy is inevitable and there are chances for extraction space to reopen in the long term.

Decision-making for which incisors to extract

The critical decision of which lower incisor to extract on several considerations, including periodontal condition, the presence of gingival recession, and the location of any restoration, including endodontic treatment.

According to Uribe and Nanda,^[4] extraction of a lateral incisor is generally preferred because it is less visible from the front. However, the incisor that is farthest outside the natural arch and the closest to the crowding is usually the best tooth for extraction.

ATYPICAL EXTRACTION OF MAXILLARY CENTRALS INCISORS

Extracting maxillary incisors is rarely recommended in orthodontic treatment. Removal of a permanent incisor or canine for orthodontic purposes is generally discouraged unless there is significant root apex displacement.^[5]

Managing ankylosed permanent maxillary central incisors in growing patients is a clinical hurdle for orthodontists. Ankylosis, often due to trauma, integrates the tooth with surrounding bone, hindering eruption and causing infraocclusion, gingiva, and labial displacement.

Orthodontically, the absence of maxillary anterior teeth can create space to address crowding or an enlarged overbite without other extractions. This strategy involves lateral incisors acting as central incisors, canines as lateral incisors, and first premolars as canines, along with necessary prosthetic adjustments.^[5]

Some of the indications of maxillary incisor extraction are:

- a. Severe crowding with an unfavorable displacement of a lateral incisor and good contact between the central incisor and canine may warrant lateral incisor extraction, reshaping the canine to simulate an incisor
- b. Extraction is necessary for any abnormally impacted or erupted incisor that cannot be aligned with available methods
- c. If one lateral incisor is congenitally absent and the other is diminutive, extract the small lateral incisor to allow the canine to erupt next to the central incisor for symmetry
- d. Extract a lateral incisor in cases of abnormal transposition with the canine to achieve proper occlusion
- e. Extract central incisors if they cannot be preserved after trauma, allowing laterals to erupt mesially and be reshaped as centrals
- f. Extract incisors with root malformations like dilacerations that hinder orthodontic movement before treatment
- g. Extract incisors that cannot be saved due to periapical issues as part of general treatment.

ATYPICAL EXTRACTION OF CANINE

The permanent canines are important teeth and are not frequently extracted in orthodontics. Extraction of the impacted or ectopically erupting canine is the inevitable choice of treatment only when there is a relation to its location or anatomy. Their extraction causes flattening of the face, altered facial balance, and change in facial expression.

The most common causes for canine impactions are usually localized and are the result of any one or combination of the following^[6]

- Tooth size-arch length discrepancies
- Abnormal position of the tooth bud
- The presence of an alveolar cleft
- Cystic or neoplastic formation
- Dilaceration of the root
- Ankylosis
- Iatrogenic origin (discussed earlier)
- Idiopathic condition with no apparent cause.

Canine may have to be extracted in one of the following conditions:

- a. Ectopically erupted canine
- b. When maxillary canine is completely excluded from the arch and approximation contact between the lateral incisor and first premolar is good, extraction of the canine may be considered
- c. Mandibular canine may be extracted when it is likely to be very difficult to align
- d. Buccally erupted canine – thin buccal cortical plate

- e. Palatally locked canine – causes internal or external root resorption
- f. Palatally torqued against thick cortical plate cone beam computed tomography confirmation
- g. Deciduous canines may be extracted as a part of a serial extraction procedure
- h. Premature shedding of a deciduous canine often in the lower arch indicates the arch length discrepancy and the corresponding tooth on the opposite side of the arch has to be extracted to prevent arch asymmetry
- i. In Class II cases, sometimes lower deciduous canines are shed prematurely; the upper deciduous canines should also be removed to avoid an increase in the overjet
- j. Conversely, in Class III cases, if the upper deciduous canines are shed early, it may discourage the development of the upper arch and may worsen the Class III condition. To prevent this, lower deciduous canines need extraction.

ATYPICAL EXTRACTION OF MAXILLARY INCISORS

The first molars are called as cornerstones of dentition and they are the commonly utilized teeth for intraoral dental anchorage.

The functional significance of the first molars means that they are rarely suggested for extraction in the conventional treatment of malocclusion. However, it is not uncommon to find first molars affected by severe pathologies, such that their removal is considered within an interdisciplinary therapeutic plan. These pathologies are extensive decay, severe enamel defects, and ankylosis.^[7]

The space left after the extraction of the first permanent molar can be closed by medicalization of the second molars and eventually the wisdom teeth.

The first molars are not usually extracted for orthodontic purpose. Extraction of the first permanent molars has to be avoided for the following reasons:^[7]

- a. Extraction of the first molar does not provide adequate space for relief of the anterior crowding
- b. The extraction of the first molar results in the deepening of the bite
- c. Masticatory efficiency is reduced.

Indications

- a. In Class II cases with mild anterior crowding and minimum overjet, upper first permanent molars can be extracted. The relief of crowding and reduction of overjet are better treated by distal movement of the premolars and the canine. Care is needed here to avoid loss of space by untoward mesial movement of the second permanent molar
- b. Skeletal open bite cases in mixed dentition cases can benefit from extraction of the first molar as there is a tendency for the bite to deepen after extraction of the first molars. However, the subsequent eruption of the second molars usually restores the original bite condition
- c. Periodontally weakened molar with a poor prognosis has to be extracted.

Wilkinson extraction

Wilkinson advocated extraction of all the four first permanent molars between the age of 8^{1/2} and 9^{1/2} years on account of their susceptibility to caries. The benefits of extracting the first molars at an early age are:^[7]

- a. They are more caries-prone teeth
- b. Extraction of the first molar provides additional space for erupting the third molars and impaction of the third molars can be avoided
- c. Overcrowding of the arch is minimized and favors a lower risk of caries of the remaining teeth.

Wilkinson's extraction has a number of drawbacks and contraindications:

- a. The extraction of the first molars offers limited space to relieve crowding of the incisor teeth
- b. The second premolars and the second permanent molars frequently rotate as they erupt in the extraction site
- c. Adequate anchorage for tooth movement by orthodontic appliances is lost
- d. Improper contact between the second premolar and second molar may invite food accumulation.

ATYPICAL EXTRACTION OF SECOND PERMANENT MOLAR

Mandibular second molar is positioned distally at the end of the dental arch and therefore is away from the site of crowding. Its extraction does not help in relieving the crowding. The extraction of second permanent molars is uncommon but indicated for the following reasons:^[7]

To relieve impaction of second premolar

The premature loss of the second deciduous molar results in mesial drift of the first permanent molars leaving inadequate space for the second bicuspid to erupt. The extraction of second molars in such cases may allow the distal movement of the first permanent molars, thereby providing sufficient space for the second premolars to erupt.

To prevent third molar impaction

The removal of second molars has been advocated for the prevention of lower third molar impaction. Since the position of the eruption of the third molar is variable, extraction of the second molar is not usually indicated to relieve third molar impaction. The cases that benefit from such extraction are those:

- When the third molar is upright or its long axis is not tilted mesially more than 30° to the long axis of the second molar.
- The second molar is extracted only after calcification third molar crown or just after root formation has started, usually between 12 and 14 years.
- Upper second molar extraction if carried out before the eruption of third molars results in a satisfactory third molar position. Maxillary tuberosity should be insufficient to accommodate all 3 molars.^[8]

Distalization of the first molar

To correct mild-to-moderate arch length deficiencies existing with good facial profiles. It is advisable in some cases to

extract the second molar before the first permanent molars are distalized.

Open bite cases

The extraction of the posterior-most tooth-like second molars deepens the bite and may be considered in some open bite cases.

ATYPICAL EXTRACTION OF THIRD PERMANENT MOLAR

The role of mandibular third molars in the relapse of lower anterior crowding after orthodontic treatment has been widely debated.^[9] Since then, many studies have examined third molar development and its impact on the lower arch. However, extracting third molars during orthodontic treatment does not create space for decrowding or reduce anterior proclination.^[10]

Indication

- Absence of space for erupting the third molar can result late lower anterior crowding
- Malformed third molars that disrupt normal occlusion.

Contraindications

- Extracted or missing mandibular premolars and avoiding upper arch extractions can cause a Class III molar relationship, where aligning mandibular third molars can improve occlusion with maxillary second molars
- Extraction of first or second permanent molars is often indicated for non-growing individuals with Class II malocclusions or open-bite tendencies
- When first or second molars have been extracted due to extensive caries and periapical involvement.

ASYMMETRIC EXTRACTIONS USED IN THE TREATMENT OF PATIENTS WITH ASYMMETRIES

Coordinated facial, maxillary, and mandibular midline alignment is crucial for a successful orthodontic outcome and optimal facial balance. Correcting significant midline discrepancies in orthodontics often involves using asymmetric inter-arch treatment mechanics, but employing such methods, such as combining Class II and Class III elastics, can pose risks of undesirable side effects, particularly if skeletal balance is already present, potentially leading to mandibular rotation and subsequent relapse.

Mandibular dental midline deviation with skeletal symmetry

In Class II subdivision malocclusions with distally positioned mandibular molars, a three-premolar extraction plan, relocating the mandibular canine, and maintaining maxillary midline symmetry, can minimize reliance on intermaxillary elastics. For Class III malocclusions, one premolar extraction on the Class III side with lingual arch use may optimize molar anchorage, but retention of the mandibular third molar is advised if present, to aid in intercuspation with the upper second molar.^[11]

Maxillary dental midline deviation with skeletal symmetry

In adult patients with Class II subdivision malocclusions and maxillary dental midline deviation, extraction of a maxillary premolar on the Class II side can greatly aid in correcting canine positioning to achieve a Class I relationship, particularly when the mandibular arch does not require extractions.^[11]

Maxillary and mandibular dental midline deviation with skeletal symmetry

Identifying true deviations of both maxillary and mandibular midlines from those caused by asymmetric arch crowding is crucial. If midlines remain off-center after mental correction based on crowding distribution, extraction of ipsilateral upper and lower premolars may be necessary. The choice between first or second premolar extractions, or a combination, depends on the desired midline correction and the original buccal segment relationship. In cases where maxillary and mandibular midlines are both off from the facial midline but in opposite directions due to crowding asymmetry, extracting an upper premolar on the Class II side and a mandibular premolar on the Class III side may be appropriate, considering the drawback of unopposed upper second molars in a Class III molar relationship unless the lower third molar is present or anticipated to erupt into good occlusion.^[12]

Asymmetric extractions and orthognathic surgery

Orthognathic surgery planning for patients with asymmetric buccal segments and symmetric skeletal bases requires pre-operative consideration of asymmetric extraction patterns or mechanics to prevent post-surgical facial asymmetry. Achieving a Class I canine relationship beforehand aids in optimal maxillary or mandibular advancement or setback, reducing the risk of creating posterior transverse discrepancies. In bilateral sagittal split osteotomy surgery, straight advancements or setbacks help maintain facial symmetry, while minimizing maxillary rotation is crucial in quadrangular Le Fort osteotomy surgery for a successful outcome.^[11]

DISCUSSION

Asymmetric extractions address specific malocclusions and dental asymmetries, offering tailored solutions for midline correction and occlusal balance. Such extractions can reduce treatment time and facilitate orthodontic mechanics, leading to more stable and functional outcomes. Clinical considerations must include precise diagnosis and control over orthodontic mechanics. The decision of which teeth to extract should be based on achieving the best functional and esthetic results. Managing space closure and anchorage control in asymmetric extractions can be complex and therefore the use of specific tools and techniques, such as unilateral elastics, is crucial for maintaining midline correction and overall dental stability.^[13]

The effects of lower second molar extraction on severe skeletal class III malocclusion in 32 patients were examined and results showed significant improvements in molar relationship, overjet, overbite, occlusal plane angle and facial profile, including

better lip competence and reduced chin prominence. The results showed significant improvements in molar relationship, overjet, overbite, occlusal plane angle, and facial profile, including better lip competence and reduced chin prominence. This approach, which facilitated distal molar movement and anterior crossbite correction, was highlighted as a less invasive alternative to orthognathic surgery, though further research on long-term stability and retention is needed.^[14]

The extraction of mandibular incisors in orthodontic treatment is a viable option for correcting crowding and achieving optimal arch form. It offers benefits such as reduced treatment time and improved long-term stability. Careful assessment of space requirements and tooth size analysis guides the decision-making process. Proper mechanics and retention protocols are essential for successful outcomes. Case selection and planning play a critical role, with interproximal reduction being considered in certain situations. Overall, mandibular incisor extraction, when performed thoughtfully, can result in stable, esthetically pleasing outcomes with minimal intervention.

Atypical extraction patterns, such as removing mandibular incisors or buccally placed canines, can lead to improved arch shape and width maintenance without compromising stability or esthetics. Careful consideration of factors such as periodontal health, tooth size, and arch harmony guides treatment decisions, offering a nuanced approach to orthodontic care and enhancing patient outcomes.

Atypical extraction of maxillary incisors is a rare but viable option in orthodontic treatment for severe crowding, congenital absence, abnormal transposition, or irreparable trauma. Close collaboration between orthodontists, prosthodontists, and periodontists is essential for effective planning and execution. Patient education and follow-up care are crucial for ensuring successful outcomes and long-term stability.

The permanent first molars play a fundamental role in dental occlusion and are rarely extracted for orthodontic purposes due to their significance in maintaining arch length and masticatory efficiency. However, they may be removed in cases of severe pathologies such as extensive decay, severe enamel defects, or ankylosis, necessitating an interdisciplinary therapeutic approach. Extraction of first molars can lead to challenges such as deepening of the bite and potential rotation of adjacent teeth. Early extraction of first molars, as advocated by Wilkinson, aims to prevent caries and minimize arch overcrowding, although it comes with drawbacks like limited space relief and potential loss of anchorage for orthodontic appliances. In orthognathic surgery planning, considerations for first molar extractions are crucial to prevent post-surgical asymmetry and achieve optimal outcomes.

Asymmetric extractions can result in varied molar relationships (Class II or III on different sides) without significant esthetic or functional issues. Properly managed, these treatments can provide excellent results in terms of occlusion and facial harmony. Overall, asymmetric extractions are a valuable tool in orthodontics, particularly for complex cases requiring precise mechanical control and tailored treatment approaches.^[14]

CONCLUSION

In orthodontic therapy, the primary objective is to enhance facial and dentoalveolar aesthetics by striving to correct malocclusion toward a normal condition. Atypical extractions should be considered to achieve the closest approach to normalcy in terms of function, health, facial influence, and appearance, with the operator's skill being crucial in executing the treatment plan effectively. While all molar relationships exhibit stability in function, attempting to convert a Class II/III into a Class I molar may be unnecessary, and teeth that could compromise treatment outcomes or require extensive anchorage should be extracted to achieve a functionally stable occlusion.

REFERENCES

1. Chung KR, Choo H, Lee JH, Kim SH. Atypical orthodontic extraction pattern managed by differential en-masse retraction against a temporary skeletal anchorage device in the treatment of bimaxillary protrusion. *Am J Orthod Dentofacial Orthop* 2011;140:423-32.
2. Brandt S, Safirstein GR. Different extractions for different malocclusions. *Am J Orthod* 1975;68:15-41.
3. Vignesh T, Kumar KP, Tamizharasi SK. Mandibular incisor extraction in orthodontics: A systematic review. *J Indian Acad Dent Spec Res* 2014;1:1.
4. Uribe F, Nanda R. Considerations in mandibular incisor extraction cases. *J Clin Orthod* 2009;43:45-51.
5. Janson G, Valarelli DP, Valarelli FP, De Freitas MR, Pinzan A. Atypical extraction of maxillary central incisors. *Am J Orthod Dentofacial Orthop* 2010;138:510-7.
6. Fleming PS, Scott P, Heidari N, Dibiase AT. Influence of radiographic position of ectopic canines on the duration of orthodontic treatment. *Angle Orthod* 2009;79:492-6.
7. Williams RT. Single arch extraction--upper first molars or what to do when non-extraction fails. *Am J Orthod* 1979;76:376-93.
8. Klein DJ. The mandibular central incisor, an extraction option. *Am J Orthod* 1997;111:192-9.
9. Huggins DC, NeBride LJ. The eruption of lower third molars following the loss of lower second molars: A longitudinal cephalometric study. *Br J Orthod* 1978;5:13-20.
10. Bishara SE, Andreasen G. Third molars: A review. *Am J Orthod* 1983;83:131-7.
11. Rebellato J. Asymmetric extractions used in the treatment of patients with asymmetries. *Semin Orthod* 1998;4:180-8.
12. Bolton WA. Disharmony in tooth size and its relation to the analysis and treatment of malocclusion. *Angle Orthod* 1958;28:113-30.
13. Melgaço CA, Araújo MT. Asymmetric extractions in orthodontics. *Dent Press J Orthod* 2012;17:151-6.
14. Lin J, Gu Y. Lower second molar extraction in correction of severe skeletal class III malocclusion. *Angle Orthod* 2006;76:217-25.