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EXTRACTION PLANNING IN ORTHODONTICS

Qodirov Muhammadali

Andijan State Medical Institute, Faculty of Dentistry,

Assistant at the Department of Orthopedic Dentistry and Orthodontics

Ulugbek Rakhmonov

Student,Department of Stomatology,

Andijan State Medical Institute.

e-mail: rahmonovulugbek486@gmail.com +(90)532-86-41

Abstract: Planning the extraction of teeth in orthodontic treatments presents challenges but is crucial for achieving functional and aesthetic results and ensuring their long-term stability. This study aims to outline guidelines for determining which teeth to extract in cases of insufficient space due to excessive tooth material.These guidelines provide patterns for making decisions about extracting teeth for various types of malocclusions—such as class I, class II division 1, class II division 2, and class III—as well as for addressing crowding, reducing overjet, or correcting relationships in the back teeth. Factors influencing extraction decisions include oral hygiene, decayed teeth, gum disease, impacted teeth, extra teeth, missing teeth, or for jaw realignment purposes. The success of orthodontic treatment and the stability of results rely significantly on accurately planning which teeth to extract.Considerations for successful tooth extraction in orthodontics involve evaluating facial width and length, oral health, decay, gum health, tooth shape issues, root length and health, the likelihood of impacted teeth, extra teeth, and missing teeth. Precise diagnosis and treatment planning, following these extraction guidelines, contribute to the long-term stability of the corrected outcomes.

Key words: Edentulism,Hypodontia,Extraction ofteeth,long,term,stability,Crowding,Hyperdontia

Introduction: The primary objective of orthodontic treatment is to achieve a natural alignment of the teeth that harmonizes with the facial structure. Angle emphasized that the preservation of all dental units was necessary to achieve facial balance. Soft tissue limitations can restrict the extent of orthodontic adjustments possible, thereby requiring extraction as a necessary measure.

The debates surrounding the decision to extract teeth or not have historically been more influenced by individual preferences rather than concrete scientific criteria.

Specific teeth need to be extracted based on various malocclusions, and determining which ones to extract relies on the patient's medical background, oral hygiene, rate of cavities, and the condition of the teeth.[1]

This study aims to establish protocols or guidelines outlining the timing and specific teeth to extract in instances of class I, class II(1), class II/(2), and class III malocclusions.

Several factors compel the extraction of teeth during orthodontic treatment, including situations like crowding, hyperdontia, cases where spaces need closing due to tooth loss, decayed teeth, protrusion, certain types of bites, impacted teeth, orthodontic treatment aimed at concealing discrepancies, edentulism, orthognathic surgery, and conditions like cleft lip and palate. [3]

Methods:

Guidelines for Extraction in Class I Malocclusion

A class 1 malocclusion means that the molar position, or bite, is normal, but there are other teeth that are misaligned in some way. These anomalies can include:

- Overlapping or overcrowded teeth
- Rotated teeth
- Gaps between the teeth
- Asymmetry
- Open bite

Among Caucasian populations, Class I malocclusion had the highest occurrence rate, reaching 60% compared to other types of misalignments.

There are various methods available for treating Class I malocclusion with crowding,stripping, expansion, derotation, uprighting, distalization, and tooth extraction. [5]

In cases of moderate to severe crowding in the front teeth, extracting all first premolars is a typical approach to alleviate crowding. This method is frequently employed by orthodontists because it sits between the front and back regions of the jaw, offering strong support in the back for moving the six front teeth backward. If one of the second premolars has decay, it might be wise to retain the adjacent first premolar to provide extra support. [11]

Extracting specific combinations of teeth, such as the upper and lower first premolars on one side and the upper and lower second premolars on the opposite side, or variations of this pattern, is sometimes necessary. Symmetrical extraction isn't always possible due to poor prognosis of individual teeth on different sides. For instance, if there's severe decay in the right first premolar and similar issues in the left second premolar, it influences the decision on which teeth to extract. [12]

Removing all second premolars is typically recommended in cases where these teeth are severely decayed, extensively filled, or affected by gum disease, while the first premolars remain in good condition. This approach is chosen when there's moderate crowding in the front teeth and some crowding in the back, along with an anterior open bite. Extracting the second premolars aids in improving the bite depth and correcting the centerline. This method is preferred over removing first premolars if maintaining an unchanged facial profile is desired. If one of the first premolars has decay, it might be wise to keep the neighboring second premolar. [13]

Extracting either the lower left or right central incisor is an uncommon procedure, typically recommended in situations where the incisor is severely misaligned, positioned outside the dental arch yet maintaining good alignment with the back teeth. This extraction is considered in cases where there's a poor outlook due to trauma, decay, or bone loss affecting the incisor. If the lower canines are severely inclined towards the back and the lower incisor is splayed out, extracting the most upright incisor may be necessary to allow the others to be repositioned by tipping them into place. [14]

Guideline for Extraction in Class II Division 1 Malocclusion

Treating Class II malocclusion involves various approaches such as growth modification, orthodontic masking, and surgical correction. This study focuses on establishing a guideline for deciding when and which teeth to extract in cases of Class II division 1 incisor relationship malocclusion. [15]

Among teeth extracted in orthodontics, first premolars are the most commonly removed (approximately 59%), followed by second premolars (13%) and permanent molars (19% - first permanent molars at 12% and second permanent molars at 7%). Permanent incisors are extracted in only 1% of cases.
The preferred extraction strategy for correcting increased overjet in cases of a class I or mild class II skeletal pattern with moderate crowding involves removing maxillary first premolars and mandibular second premolars. This choice encourages the forward movement of the lower molars to aid in adjusting the molar relationship and retracting the upper front teeth. [16]

When addressing class II without crowding and opting for upper first premolar extraction, the front portion of the upper dental arch is moved backward by the width of a premolar (7 mm). This movement allows the canines to establish a class I relationship, while the molars naturally correct to a full class II position. [12]

Extracting only the maxillary first permanent molars is recommended in cases where these molars are severely decayed and there's significant crowding in the upper arch with mild crowding in the lower arch. Additionally, when dealing with ectopic maxillary canines, it's essential to wait until the eruption of the maxillary second permanent molars. Afterward, a Nance appliance is used to reinforce anchorage. [11]
Removing second permanent molars to correct class II division 1 malocclusions is advised in cases with excessive inclination of the front teeth toward the cheeks, minimal overjet, no gaps between teeth, and properly positioned third molars. This approach is suitable for individuals with a dolichocephalic facial pattern, a tendency toward vertical growth, and those requiring retraction of the first permanent molars. Extraction is suggested to reduce the risk of open bites and in instances of existing dental issues like abnormal eruption, anomalies in the crown or roots, decay, extensive restorations, or enamel defects. [13]

Assessing the third molars between the ages of 12 and 14, when their crowns are mostly calcified and their position relative to the second molars is established, is recommended. This evaluation is typically done through radiographic examination.

Extracting second permanent molars to correct class II division 1 malocclusions streamlines treatment and considerably reduces the time required by facilitating quicker and easier distalization of the first molars. [14]
In situations where there's an excessive overjet due to misshapen peg laterals, it's recommended to address the issue by removing these malformed teeth .When dealing with congenitally absent upper lateral incisors or peg-shaped incisors, the preferred approach involves extracting these teeth along with lower second premolars. The gap is closed using upper canines, and adjustments are made to align the back teeth to achieve a class I relationship. [16]

Guideline for Extraction in Class II Division 2 Malocclusion

Class II division 2 occurs when the upper front teeth, specifically the central incisors, are positioned backward while the lateral incisors may be inclined forward, resulting in a minimal or potentially increased overjet. This condition affects approximately 10% of Caucasians.There are two subtypes: 2a, involving the backward tilt of upper incisors with reduced overjet, and 2b, where upper incisors are tilted back but the overjet is increased. [5]

In managing Class II division 2 cases, it's generally advisable to avoid extracting teeth. However, if there's significant crowding, extractions may become necessary. Extraction in the upper back

teeth area with movement toward the back of the mouth (distalization) can be beneficial for correcting the alignment of front teeth and relieving crowding without impacting the overlap of the front teeth over each other (overbite). This approach can also address crowding in the back teeth area for Class II division 2 cases, especially in situations characterized by a low angle between the jaw and skull. In instances where crowding persists despite these methods, extraction becomes a consideration. When extractions are warranted, the preference is usually to remove upper and lower second premolars. In certain cases, extraction of the second permanent molars followed by distalization using specific appliances like Nudger and headgear may be beneficial.

In instances of significant crowding, removing the upper and lower second premolars is favored over extracting the first premolars. This choice helps avoid excessive inward movement of the lower front teeth, which could cause a deeper bite.

Guideline for Extraction in Class III Malocclusion

Class III malocclusion treatments typically involve early orthopedic interventions like rapid palatal expansion combined with a face mask, orthodontic strategies either with or without extractions, and orthognathic surgery. This study primarily aims to outline guidelines for deciding when and which teeth to extract in cases of class III malocclusion .

For class III malocclusion, extractions are part of the camouflage or orthognathic surgery approaches. In the camouflage strategy, the preferred extraction method involves removing the lower first premolars and upper second premolars. This extraction pattern is effective for addressing significant crowding in the lower jaw or situations where there's no crowding but the front teeth have an edge-to-edge alignment. Additionally, this method is useful when the lower jaw's arch exhibits considerable tipping, while the upper arch either has no crowding or shows mild crowding.

Another extraction pattern involves removing either the right or left central incisor. This approach is suitable when there's moderate crowding or a situation known as Bolton discrepancy. However, it may lead to a potential mismatch in the alignment of the upper and lower front teeth and might require a permanent rigid retainer due to the lower front teeth's tendency to shift inward and create a deep bite .In some cases of severe crowding or in instances of Class III malocclusion complicated by an open bite, all first premolars may be extracted .

For high-angle cases with third molars present, extracting the first permanent molars could serve as a viable solution for issues related to crowding in the front and lower teeth, as well as addressing vertical growth concerns. This approach also aims to achieve a class I molar relationship.

In situations necessitating orthognathic surgery, a phase called decompensation is crucial during the presurgical orthodontic stage .This phase involves intentionally making the class III malocclusion more apparent or pronounced. To achieve this, extraction of the upper first premolars and lower second premolars becomes necessary, resembling the extraction approach used in camouflage treatment for class II/1 malocclusion.

Conclusion: Extraction of teeth in orthodontics is a tool, neither inherently good nor bad. When executed correctly, it can enhance treatment stability and quality, but if mishandled, it may lead to severe functional and aesthetic issues. Planning orthodontic extractions should consider the individual's facial dimensions. Successful orthodontic outcomes rely on a comprehensive evaluation, encompassing medical and dental history, thorough examinations, and a systematic treatment planning approach. Factors such as oral health, decay, gum condition, prognosis of impacted teeth, extra teeth, and missing teeth play crucial roles.

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