

## **EXTRACTION IN ORTHODONTICS**

The indications of extraction of teeth as a part of orthodontic treatment include:

### ***1- Arch Length-Tooth Material Discrepancy (Crowding)***

Ideally the arch length and tooth material should be in harmony with each other. If the dentition is too large to fit in the dental arch without irregularity, it may be necessary to reduce the dentition size by the extraction of teeth. Avoiding extractions by excessively increasing in the dental arch size would not be tolerated by the oral musculature and would lead to relapse.

### ***2- Correction of Sagittal (anteroposterior) Interarch Relationship***

Abnormal sagittal malrelationship such as Class II /III malocclusion may require extraction to achieve a normal interarch relationship.

In Class I malocclusion, it is preferable to extract in both the arches because it is not advisable to discourage the development of only one arch more than the other.

In most Class II cases (with abnormal upper proclination, normal alignment of the lower teeth and where A point is abnormally forward relative to the B point), it is advisable to extract teeth only in the upper arch and to retract the upper incisors and canines. However, when the lower arch is crowded and/or molars are not in full cusp Class II molar relationship, lower extractions may be needed to relieve the lower crowding and bring the lower molars mesially into a Class I molar relationship.

Class III cases are usually treated by extracting teeth only in the lower arch.

### **Guidelines for extraction:**

After a careful space analysis:

- Less than 4 mm space need, extractions rarely indicated.
- 4-9 mm space need, non-extraction or extraction possible; depends on the details of the therapy.
- 10 mm or more space need, extractions almost always required

## **SELECTION OF TEETH TO BE EXTRACTED:**

Extraction for orthodontic reasons will be governed by:

### **1- Condition of the tooth:**

Fractured, hypoplastic, grossly carious teeth, root canal treated teeth and teeth with large restorations are preferred for extraction over healthy teeth. The main consideration is the long-term prognosis for the tooth rather than the appearance.

### **2- Position of the tooth:**

Grossly malpositioned teeth which are difficult to align may often be the teeth of choice for extraction. The position of the apex of the tooth must be considered as it is more difficult to move the apex than the crown.



### **3- Position of the crowding:**

Crowding in one part of the arch is more readily corrected if extractions are done in that part rather than a remote area of the arch. However, incisor crowding is usually relieved by premolar extraction as it gives a more pleasing appearance and occlusal balance than with incisor extraction.



The first premolar, positioned in the center of each quadrant, is usually near the area of crowding whether in the anterior or buccal segment. Hence, it is also the tooth most frequently extracted along with orthodontic treatment.

## **TYPES OF EXTRACTION PROCEDURES**

### ***Balancing Extractions***

Balancing extractions may be defined as the removal of a tooth on the opposite side of the same arch (although not necessarily the same) in order to preserve symmetry.

If a tooth is removed from one side of the dental arch which is crowded, or which has complete contact of teeth all around, there is a tendency for the remaining teeth to move towards the extraction space. This is in the form of forward movement of teeth behind the space, or movement of anterior teeth across the center of the arch, resulting in asymmetry. It is usual to balance extractions in order to prevent such asymmetry.

### ***Compensating Extractions***

Removal of the equivalent tooth in the opposing arch to maintain buccal occlusion. In some Class I crowding cases, it is necessary to extract in both arches to maintain lateral symmetry. Compensating extractions preserve interarch relationship by allowing the posterior teeth to drift forward together.

### ***Enforced Extractions***

These extractions are carried out because they are necessary as in the case of grossly decayed teeth, poor periodontal status, fractured tooth, impacted tooth, etc.

## **EXTRACTION OF UPPER INCISORS**

The incisors, especially the upper central incisors, are rarely extracted as a part of orthodontic therapy. Indications for upper incisor extraction:

- 1- Unfavorably impacted upper incisors (especially dilacerated).
- 2- Grossly carious incisor that cannot be restored.
- 3- Trauma/irreparable damage to incisors by fracture (especially root fracture).
- 4- Severe root resorption (e.g. caused by impacted canine)
- 5- Buccally or lingually blocked out lateral incisor with good contact between central incisor and canines.
- 6- If a lateral incisor is crowded in linguo-occlusion with its apex palatally displaced and the canine is erupting in a forward position and is upright or distally inclined, lateral incisor extraction may be indicated.

## **EXTRACTION OF LOWER INCISORS**

### **Indications:**

- 1- When one incisor is completely excluded from the arch and there are satisfactory approximal contacts between other incisors.
- 2- Poor prognosis as in case of trauma, caries, bone loss, etc.
- 3- Severely malpositioned incisor.
- 4- When lower canines are severely inclined distally with crowded lower incisors, it is very difficult to correct this condition by extractions further back in the arch. An incisor is extracted so that the other incisors can be tipped into correct position.
- 5- In mild Class III incisor relation with an acceptable upper arch and lower incisor crowding, a lower incisor may be extracted to achieve normal overjet, overbite and to relieve crowding.
- 6- Tooth size discrepancy with Bolton's mandibular anterior excess of 4 mm or more.

### **Disadvantages:**

- 1- It is not possible to fit four upper incisors around three lower incisors, either an increase in overjet or upper incisor crowding have to be accepted.
- 2- Retroclination of lower incisors
- 3- Deep bite
- 4- Although crowding may be relieved in the short term, forward movement of buccal teeth may cause further crowding
- 5- Lower intercanine width (ICW) decreases resulting in a secondary reduction in the upper ICW with crowding in the upper labial segment

### **Contraindications:**

- 1- Deep bite cases with horizontal growth pattern.
- 2- All cases which require upper first premolar extraction while canines are in a Class I relationship.
- 3- Bimaxillary crowding cases with no tooth size discrepancy in the incisor area.
- 4- Cases having anterior discrepancy due to either small lower incisors or large upper incisors.

## **EXTRACTION OF CANINES**

The permanent canines are important teeth and are not frequently extracted as a part of orthodontic treatment. Their extraction causes flattening of the face, altered facial balance and change in facial expression.

### **Indications:**

Canine may be extracted in one of the following instances:

- Lower canines which are unfavorably impacted.
- Extraction of crowded lower canines should be avoided because of the poor contact between the lateral incisor and first premolar, unless they are very difficult to align, e.g. when excluded from the arch with severely malpositioned apex.
- Upper canines develop far away from their final location and have a long path of eruption from their development site to their final position in the oral cavity. Therefore, they are commonly impacted or ectopic and their alignment is difficult, even impossible. Extraction may be required in such cases.
- When upper canine is completely excluded from the arch and approximal contact between lateral incisor and first premolar is good, extraction of the canine may be considered.

## **EXTRACTION OF FIRST PREMOLARS**

It is the tooth most commonly extracted as part of orthodontic therapy especially for the relief of crowding because:

- It is positioned near the center of each quadrant of the arch and is therefore near the site of crowding, i.e. the space gained by their extraction can be utilized for correction both in the anterior and posterior region.
- First premolar extraction is the least likely to upset molar occlusion and is the best alternative to maintain vertical dimension.
- The contact between the canine and second premolar is satisfactory.
- First premolar extraction leaves behind a posterior segment that offers adequate anchorage for retraction of the 6 anterior teeth.

## **Indications**

1. To relieve moderate to severe anterior crowding in both arches. In lower arch crowding, where canines are mesially inclined, spontaneous improvement in incisor alignment will follow.
2. Correction of moderate to severe anterior proclination as in Class II div 1 or Class I bimaxillary protrusion.
3. In high anchorage cases, it is preferred over second premolars.
4. As a part of serial extraction.

## **Timing of Extraction**

The first premolars should not be extracted until all premolars, permanent incisors and canines have erupted sufficiently for brackets to be placed on them, as mesial migration is greatly increased by extraction. Extraction should be done no more than three weeks before starting active treatment to avoid mesial migration of posterior teeth and therefore leaving insufficient space for retraction.

The only exception to this rule is when second premolars cannot erupt and are impacted due to crowding.

## **EXTRACTION OF SECOND PREMOLARS**

### **Indications:**

1. Second premolar extraction is preferred in mild anterior crowding cases. The presence of first premolar anterior to extraction site strengthens the anterior anchorage, thereby facilitating closure from behind.
2. Second premolar extraction is preferred when one wishes to maintain soft tissue profile and esthetics.
3. In open bite cases second premolar is preferred for extraction as it encourages deepening of the bite.
4. When second premolar is completely excluded from the arch following forwards drift of first molar after early loss of deciduous second molar.
5. Unfavorably impacted second premolars.
6. Grossly carious or periodontally compromised second premolar.

## **EXTRACTION OF FIRST MOLARS**

The first permanent molar has been seen as untouchable from the very beginning of the history of orthodontics. It is considered as the cornerstone of the dentition. Extraction of first molars is avoided because:

- 1- it does not give adequate space to relieve anterior crowding.
- 2- it deepens the bite
- 3- second premolar and second molar may tip into extraction space
- 4- poor approximal contact between second premolar and second molar
- 5- mastication is affected

However, if fixed appliances are used skillfully most problems caused by enforced first molar extractions can be overcome, but treatment lasts somewhat longer than with first premolar extraction.

### **Indications**

1. Minimum space requirement for correction of anterior crowding or mild proclination
2. Grossly decayed/periodontally compromised molar with poor prognosis
3. Impacted molar (rarely seen).

### **Time for Extraction**

When crowding is absent or confined to the premolar segment and no space is needed for anterior alignment then first molar is removed before second molar erupts to allow it to move forward during eruption and take up the first molar position.

Lower first molar needs to be removed earlier than upper first molar because second molar moves forward less readily in the lower jaw.

When space is required for alignment of anteriors, it is preferable to wait for second molar eruption before first molar extraction to avoid space closure by forward movement of second molar.

## **EXTRACTION OF SECOND MOLARS**

Second molars are positioned 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.

### **Lower Second Molar:**

Extraction may be indicated in the following cases:

1. After premature loss of the second deciduous molar, forward drift of the first permanent molar causes insufficient space for second premolar eruption. Extraction of the second molar allows distal movement of the first permanent molar to provide enough space for premolar eruption.
2. To relieve impaction of lower third molar:
  - a. if the third molar is upright or its long axis is not tilted mesially more than 30° to the long axis of second molar.
  - b. just after root formation of the third molar has started (12 - 14 years).
3. Severely carious, ectopically erupted or severely rotated second molar.
4. Extraction may help in correcting anterior open bite.

### **Upper Second Molars**

Extraction may be indicated in the following cases:

1. In mildly crowded cases, where less than 3-4 mm space is required for the labial segments, good results can be obtained after retraction of the buccal segments.
2. To make space for crowded second premolar by distalization of first molar.
3. To make space for impacted upper third molar,
  - a. if the third molar is in favorable angulation for eruption
  - b. if the size and shape of the third molar is sufficient to serve in place of the second molar
  - c. before the eruption time of the third molar
  - d. If the second molar is in buccal position and third molar is positioned in the tuberosity
4. When second molar is impacted against first molar.
5. Second molar severely carious with questionable prognosis.



## **EXTRACTION OF THIRD MOLARS**

Extraction of third molars during orthodontic treatment does not yield space for decrowding or reduction of proclination.

### ***Indications:***

1. Impacted third molar: third molars are commonly impacted and unless other teeth are missing or have been extracted, there is rarely room to accommodate them in the arch.

The conventional timing of extraction of a third molar is when two-thirds of its root is formed. Extraction of third molar should not be delayed because:

- More difficult to remove when roots are completed.
  - Danger of root dilacerations which may make removal more difficult.
  - Pericoronitis can develop and cause bone loss and pocket formation may occur distal to second molar.
2. Erupting lower third molars in an attempt to prevent or minimize late lower anterior crowding.
  3. Malformed third molars, which interfere with normal occlusion, should be extracted.

### **REFERENCES:**

- Graber LW, Vanarsdall Jr. RL, Vig KWL, Huang GJ. (2017): Orthodontics: current principles and techniques. 6<sup>th</sup> ed. Elsevier Health Science.
- Littlewood SJ, Mitchell L. (2019): An introduction to orthodontics. 5<sup>th</sup> ed. Oxford University Press.
- Phulari BS. (2011): Orthodontics: principles and practice: JP Medical Ltd.
- Proffit WR, Fields HW, Larson BE, Sarver DM. (2019): Contemporary orthodontics 6<sup>th</sup> ed. Philadelphia: Mosby.
- Singh G. (2015): Textbook of orthodontics. 3<sup>rd</sup> ed. JP Medical Ltd.

### **YouTube LINKS:**

**Channel:** [www.youtube.com/c/akramadp](http://www.youtube.com/c/akramadp)

**Lecture:** <https://youtu.be/7MP7SGKD5No>