**Definition:** Anchorage is the resistance offered against the forces of reaction generated by the active components of the appliance to make desirable tooth movements possible.

**Classification:**

<table>
<thead>
<tr>
<th>I. According to site</th>
<th>II. According to jaw involved</th>
<th>III. According to number of units utilized</th>
<th>IV. According to manner of force applied</th>
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<tbody>
<tr>
<td>2. Extraoral</td>
<td>2. Inter-maxillary</td>
<td>2. Compound</td>
<td>2. Stationary</td>
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<td>• Cervical</td>
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<td>3. Reciprocal</td>
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<td>• Occipital</td>
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<td>3. Muscular</td>
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**A CLASSIFICATION COMPROMISE**

Intraoral

- Intramaxillary
  - Simple
  - Stationary
  - Reciprocal

Intermaxillary

- Simple
- Stationary
- Reciprocal

Extraoral

- Occipital
- Cervical
- Cranial
- Facial

**Description of terms:**

1. **Intraoral anchorage:** Anchorage within the mouth utilizing teeth, mucosa and other intraoral structures.
2. **Extraoral anchorage:** Anchorage obtained from outside the oral cavity.
3. **Muscular:** Anchorage obtained from actions of muscles. For e.g., vestibular shield (oral screen).
4. **Intramaxillary anchorage:** Anchorage established in the same jaw.
5. **Intermaxillary anchorage:** Anchorage distributed to both upper and lower jaws.
6. **Simple anchorage:** Anchorage that resists tipping forces, so that the tooth is free to tip.
7. **Stationary anchorage:** Anchorage that resists bodily movements, so that tooth is free to translate.
8. **Reciprocal anchorage:** Anchorage where two or more teeth moving in opposite directions are pitted against each other by the application of equal and opposite resistance.
9. **Single anchorage:** Anchorage where only one tooth is utilized (Primary anchorage).
10. **Compound anchorage:** Anchorage where two or more teeth are used.
11. **Reinforced anchorage:** Any additional anchorage that supplements or augments already existing anchorage is called reinforced anchorage. Here, in addition to teeth as anchorage sites, non-dental anchorage sites are utilized. For e.g., Mucosa, head, muscle.

**I. INTRAORAL ANCHORAGE**

A. **INTRAMAXILLARY ANCHORAGE**

1. **Simple single anchorage:** When one tooth having greater resistance is utilized to move (by tipping) another tooth with lesser resistance within the same jaw. For example, retraction of 1st premolar with a helical type of retractor.
2. **Simple compound anchorage:** When a group of teeth are having greater resistance are utilized to move (by tipping) another group of teeth with lesser resistance within the same jaw. For example, retraction of canine with a helical type of retractor into the extraction space of 1st premolar.
3. **Stationary single anchorage:** A tooth having greater resistance is utilized for bodily movement of a tooth having lesser resistance, within the same jaw. For example, anchor bend in edge-wise technic to prevent mesial tipping of molar teeth. If at all the anchor tooth moves, it has to do so bodily.
4. **Stationary compound anchorage:** Group of teeth having greater resistance used for bodily movement of another group of teeth with lesser resistance, within the same jaw. For example, retraction of canine in edge-wise technic.

5. **Reciprocal single anchorage:** Two teeth within the same jaw having equal resistance are pitted against each other to move equally in opposite directions. For example, correction of midline diastema.

6. **Reciprocal compound anchorage:** Group of teeth are pitted against another group of teeth within the same jaw having equal resistance to move equally in opposite directions. For example, bilateral symmetrical expansion.

### B. INTERMAXILLARY ANCHORAGE

1. **Simple single anchorage:** Tooth having greater resistance in one jaw is used to tip a tooth having lesser resistance in the other jaw. For example, the use of elastics for crossbite in the molar area. If at all the anchorage tooth moves it moves by tipping.

2. **Simple compound anchorage:** Group of teeth having greater resistance in one jaw is employed to move (by tipping) teeth with lesser resistance in the other jaw. For example, Catlan’s appliance for anterior crossbite.

3. **Stationary single anchorage:** A single tooth having greater resistance in one jaw is used for bodily movement of a tooth having less resistance in the other jaw. For example treatment of posterior crossbite by placement of a hook in the gingival region to create an active root thrust of maxillary molar tooth.

4. **Stationary compound anchorage:** Group of teeth with greater resistance used for bodily movement of teeth having lesser resistance in the other jaw. For example modification of inclined plane of Catlan’s appliance for bodily movement of upper incisor.

5. **Reciprocal single anchorage:** A single tooth of one jaw is pitted against a tooth with equal resistance of another jaw. For example, use of Class II elastic for crossbite in the upper 1st molar with lower 1st molar.

6. **Reciprocal compound anchorage:** A group of teeth in one jaw used for movement of a group of teeth in the other jaw in equal and opposite direction. For example, box-type elastic in anterior openbite; activator.

### II. EXTRAORAL ANCHORAGE

This is a sort of stationary anchorage, because very little or no change takes place in these extraoral sites.

#### Sites:
- Neck (cervical)
- Back of the head (occipital)
- Top of the head (cranial)
- Face (through face mask)
- Chin (symphyseal)
- Side of the head (parietal)

#### Components:
- Vertical (or) High-pull
- Medium (or) Intermediate-pull
- Low (or) Horizontal-pull
- Cervical pull

#### A. Headgear:
- In vertical pull the direction of forces is perpendicular to the occlusal plane. Useful in cases of deepbite.
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- In intermediate pull the direction of forces are at an angle of 45° to the occlusal plane. Useful in cases of upper anterior retraction.
- In low pull, the direction of forces is at an angle of 17° to the occlusal plane. Useful in total maxillary retraction.
- In the cervical pull the forces are at an angle of 17° below the occlusal plane. Useful in Class II with maxillary prognathism.
- Reverse headgear: Here the line of pull or force is from symphysis to the condyle; if there is openbite, the force should be as vertical as possible. E.g., Irie and Nakamura appliance.

Nota: Please refer treatment of Class II and Class III malocclusions for further details on headgear.

B. Facebow:
Available commercially or they can be fabricated in the laboratory. May be detachable or non-detachable.
- Detachable is indicated when appliance is worn full-time, but the headgear part-time. This is readily accomplished by soldering tubes on to the bridges of the clasps on permanent 1st molars. A “U” loop is incorporated in the inner facebow for adjustment and to act as a stop against the molar tubes.
- Non-detachable is indicated if both the appliance and the headgear are worn full-time. Here the facebow is directly attached to the baseplate of the appliance. E.g., En masse appliance.

Facebow is made up of two parts: Inner bow and outer bow. Anteriorly the inner bow is at the level of patient’s lip line. The extraoral part is parallel to the occlusal plane and clear of the lips and cheeks. A hook is bent in the outer facebow approximately at the level with the 1st molar so that it is about 4 cm anterior to the hook of the headgear. Elastics are selected which will give an appropriate force. It is important that the facebow is clear of the incisors when the headgear is worn, otherwise they may be subjected to excessive forces.

C. J-hooks:
This is an alternative method for applying force to a removable appliance. This is an excellent method for reinforcing anchorage. Hooks are soldered to the short labial bow or labial bow itself, or some clasps are known to engage “J” hooks. The force is directed upwards so that the appliance does not get displaced.

REINFORCED ANCHORAGE
Any method that augments or supplements anchorage already present constitutes reinforced anchorage.

Need for reinforced anchorage (Indications):
1. When anchorage demand is more.
2. To prevent unwanted movements of anchored teeth.
3. If periodontal conditions of anchoring teeth are not favourable.
4. To provide greater force for rapid movement of teeth.
Methods to reinforce anchorage:
1. Anterior inclined plane.
2. Sved type of plate.
3. Rigid labial bow.
4. Muscular anchorage
5. Extraoral methods of anchorage. (Note: see page 2 of “Anchorage” notes)
6. Intermaxillary methods of anchorage. (Note: see page 2 of “Anchorage” notes)

Anterior inclined plane: The mandible may be used to reinforce the anchorage by the engagement of the lower incisors onto upper inclined bite plane which is constructed at an angle of 60° to the occlusal plane. This exerts a backward pull on the appliance through the mandible.

Sved type of plate: Occasionally further reinforcement may be obtained by extending the inclined bite plane over the incisal edges. This is called Sved plate, which has the advantage of splinting the incisors to prevent them from being labially inclined.

Rigid labial bow: A “fitted labial bow” is constructed to engage the labial surfaces of the incisors at the junction of cervical two-thirds and incisal one-third of each crown to splint the teeth.

Muscular anchorage: For example lip plumper, which utilizes lip musculature and is used in cases
- where deciduous 2nd molar is prematurely lost and molars have drifted mesially
- crowding at the premolar region
- Where space is needed for alignment of anterior teeth.

FACTORS AFFECTINGANCHORAGE
1. Length of the root: ↑ed length, ↑ed anchorage due to more root area.
2. Number of roots: More roots, more anchorage.
3. Shape of the root:
   - Triangular roots (maxillary canine, for e.g.) have >> resistance.
   - Conical roots (premolar, for e.g.) have << resistance.
   - Flat roots (mandibular incisors, for e.g.) resist movement better in the mesio-distal direction.
4. Periodontal status: Periodontally diseased teeth are poor sources of anchorage.
5. Number of teeth used as anchorage: ↑ed number, ↑ed anchorage
6. Position of the tooth in the dental arch: Mandibular 2nd molar located between mylohyoid line and external oblique ridge offers more resistance to bodily movement.
7. Proximal contacts & Intercuspation: Good proximal contacts and proper intercuspation offer better anchorage.
8. Inclination of the tooth: If the axial inclination of the tooth is opposite to the direction of force acting upon it, better anchorage. For e.g., distally tilted teeth.
9. Amount of force used: ↑ed amount of force requires ↑amount of anchorage. There is threshold below which tooth movement is minimal. If heavy forces are used, these will exceed the threshold value for the anchor teeth, and anchor teeth will move rapidly.
10. Type of force: Tipping forces require less anchorage than forces causing bodily movement.
11. Number of teeth to be moved: >> number of teeth to be moved, >> anchorage is needed.
12. Vitality of teeth: Non-vital teeth are not suitable for anchorage.
13. Mesial drift: There is a natural tendency for teeth to drift mesially. Anchorage should therefore be supervised carefully when the force of reaction is mesially directed.
15. Musculature: If the forces of musculature are against the orthodontic movement of teeth, there is need for >> force to move them, and therefore require >> anchorage.
16. Age of the patient: Teeth of adults offer better resistance than those of the young.
17. Extraoral anchorage: The presence of extraoral anchorage reinforces existing anchorage.

CLINICAL CONTROL OF ANCHORAGE
1. Appliance design and adjustment:
   Adequate space must be available to relieve crowding.
   Only few teeth should be moved at a time.
   As many teeth as possible must be included in the anchorage.
   If the space is short, anchorage must be reinforced.
   Appliance should be adjusted to produce only light forces (For e.g., 25-40g for single-rooted teeth).
   Amount, direction and manner of force application must be varied between active and resistance elements.
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2. Recording treatment progress:
   - Helps in noticing anchorage loss.
   - Lower arch with mandible in centric relation may be used for reference (because most appliances are confined to the upper arch).

3. Anchorage loss: Cause of anchorage loss must be ascertained and corrected if possible. The following features may evince anchorage loss:
   - Mesial movement of molars.
   - Space closure by movement of posterior teeth.
   - Proclination of anterior teeth.
   - Spacing of teeth.
   - \(\uparrow\) in overjet.
   - Change in molar relations.
   - Buccal crossbite of upper posteriors.

Causes of Anchorage loss:
1. Excessive demands on anchorage.
2. Inadequate anchorage.
3. Part-time wear.

Baker’s anchorage: This is used to correct protrusion of upper teeth and underdevelopment of lower teeth and jaw by employing intermaxillary elastics. In Class III cases reverse elastics are utilized.

Cortical Anchorage
Cortical bone is more resistant to resorption, and tooth movement is slowed when a root contacts it. Thus, torquing the roots of posterior teeth outward against the cortical plate inhibits their movement mesially when extraction spaces are to be closed. This cortical anchorage can be used for reinforcing anchorage. Disadvantage: If a root is persistently forced against the cortical plate, tooth movement is greatly slowed, root resorption is likely, and eventual penetration of the cortical bone may sometimes occur.

Anchorage mechanics (Degree of anchorage):
Minimal anchorage mechanics: Anchorage prepared to close half of the extraction space.
Moderate anchorage mechanics: Anchorage prepared to close one-fourth of the extraction space.
Maximum anchorage mechanics: Anchorage prepared to close less than one-fourth of the extraction space.

Teeth in the order of diminishing resistance (to provide anchorage):
1. Mandibular molars
2. Maxillary canine
3. Mandibular canine
4. Maxillary molars
5. Maxillary central incisor
6. Mandibular premolars
7. Maxillary premolars
8. Maxillary lateral incisor
9. Mandibular incisors.