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The Six Keys to Normal Occlusion

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The Six Keys to Normal Occlusion

Lawrence F. Andrews, D.D.S.

AJO-DO 1972 Sep (296-309)

Orthodontic Treatment Goals

Static Occlusion

- Andrews' **Six Keys** (1972) to normal (or optimal) are a widely quoted set of static occlusal goals for tooth relationships in the intercuspal position:
 1. **Correct interarch relationships**
 2. **Correct crown angulation (tip)**
 3. **Correct crown inclination (torque)**
 4. **No rotations**
 5. **Tight contact points**
 6. **Flat curve of Spee (0.0 - 2.5 mm)**
- 7. **Correct tooth size (Bennett & McLaughlin, 1993)**

Static Occlusion

Six significant occlusal characteristics identified & first reported in 1972 by Lawrence F. Andrews “The six keys to **Normal Occlusion**”

These six keys were found to be consistently present in a collection of 120 models of teeth with natural excellent occlusion (“nonorthodontic normal” models).

Orthodontic Treatment Goals

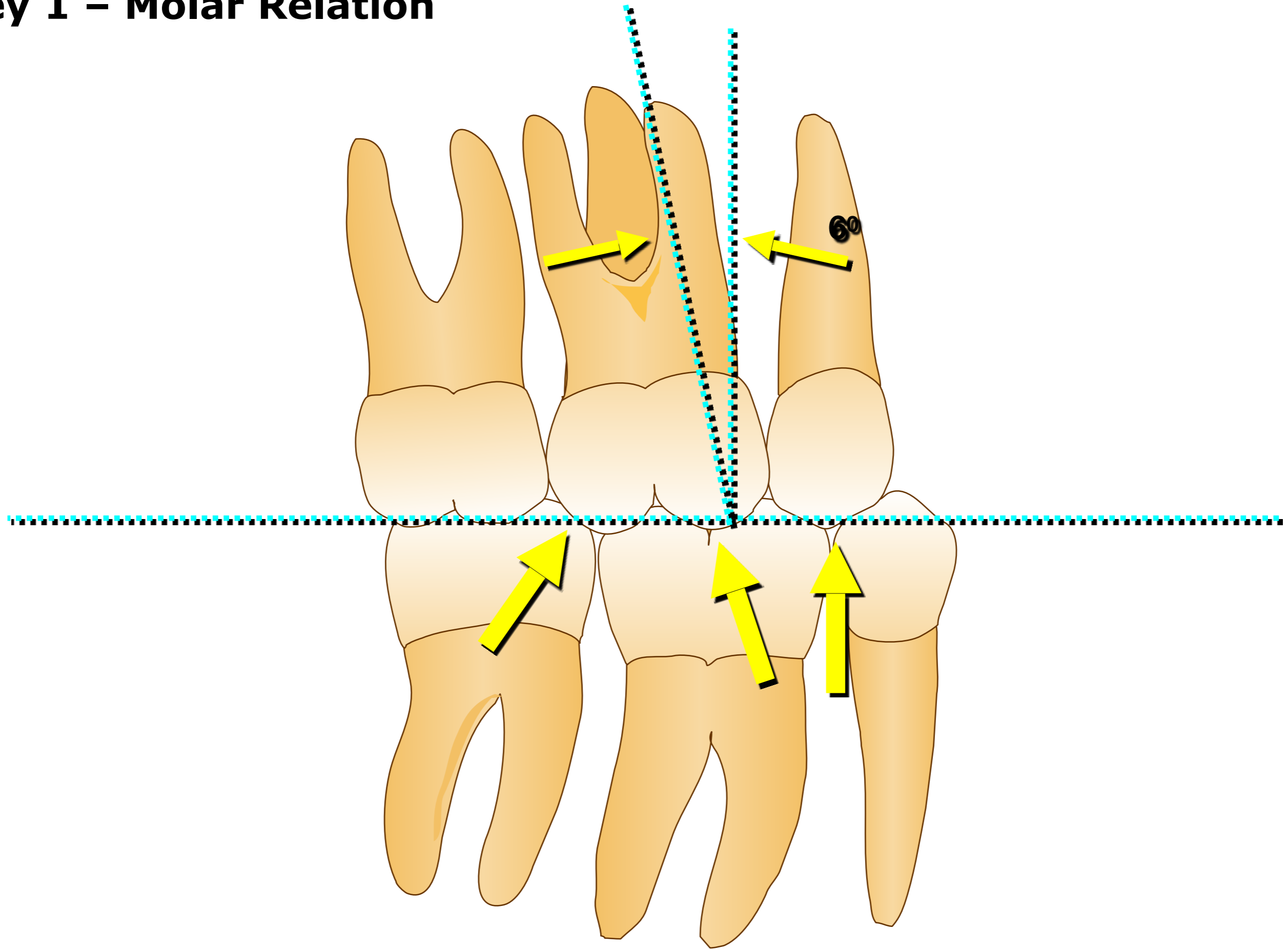
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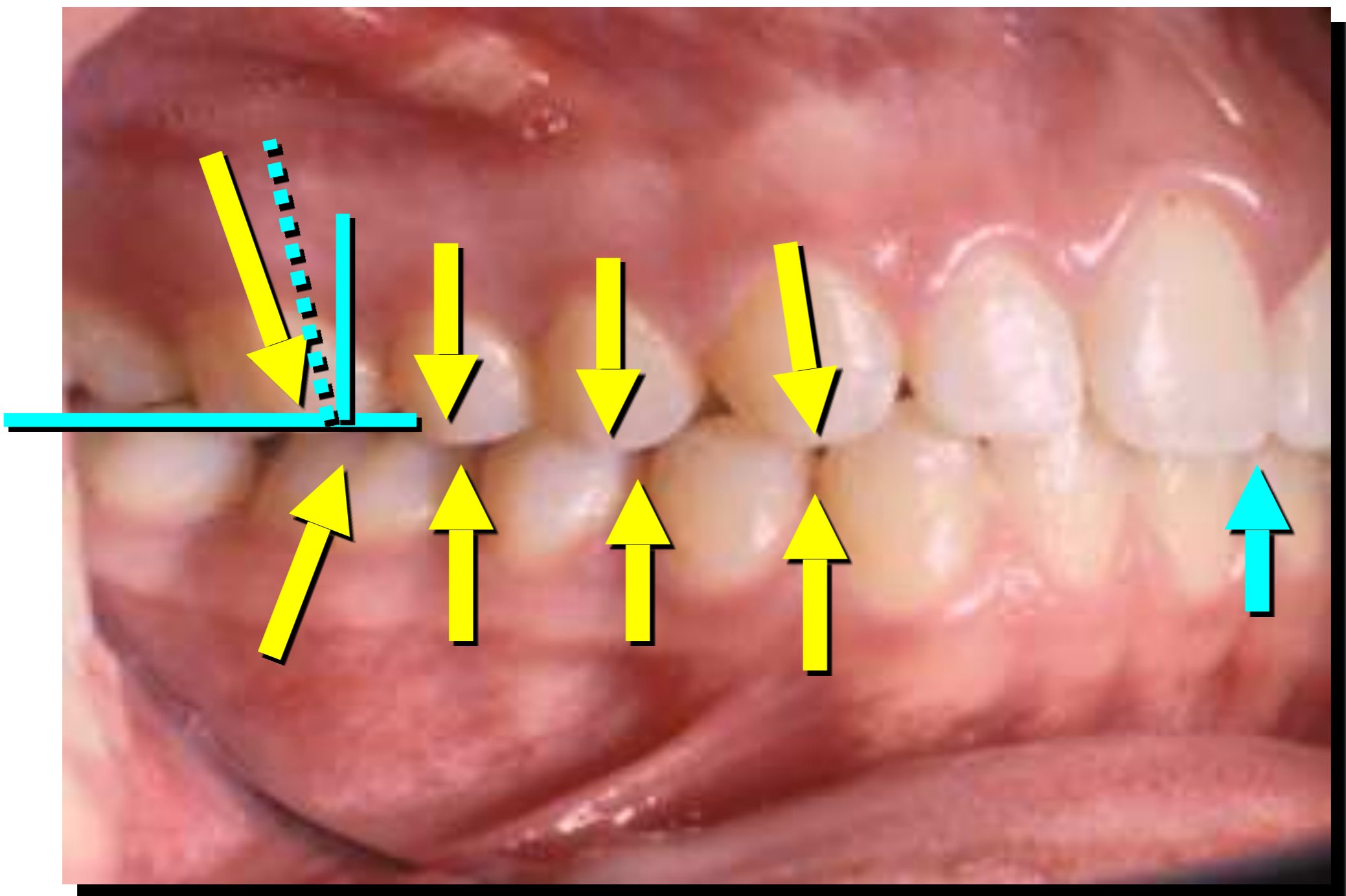
Key 1 – Interarch Relationships

- The distal surface of the distal marginal ridge of the upper first permanent molar contacts and occludes with the mesial surface of the mesial marginal ridge of the lower second molar.
- The mesio-buccal cusp of the upper first permanent molar falls within the groove between the mesial and middle cusps of the lower first permanent molar. The mesio-lingual cusp of the upper first molar seats in the central fossa of the lower first.
- The premolars enjoy a cusp-embrace relationship buccally, and a cusp fossa relationship lingually.
- Maxillary Canine has a cusp-embrace relationship with Mandibular Canine & 1st Premolar. The cusp tip is slightly mesial to embrasure Maxillary Incisors overlap Mandibular Incisors & midlines of arches match.

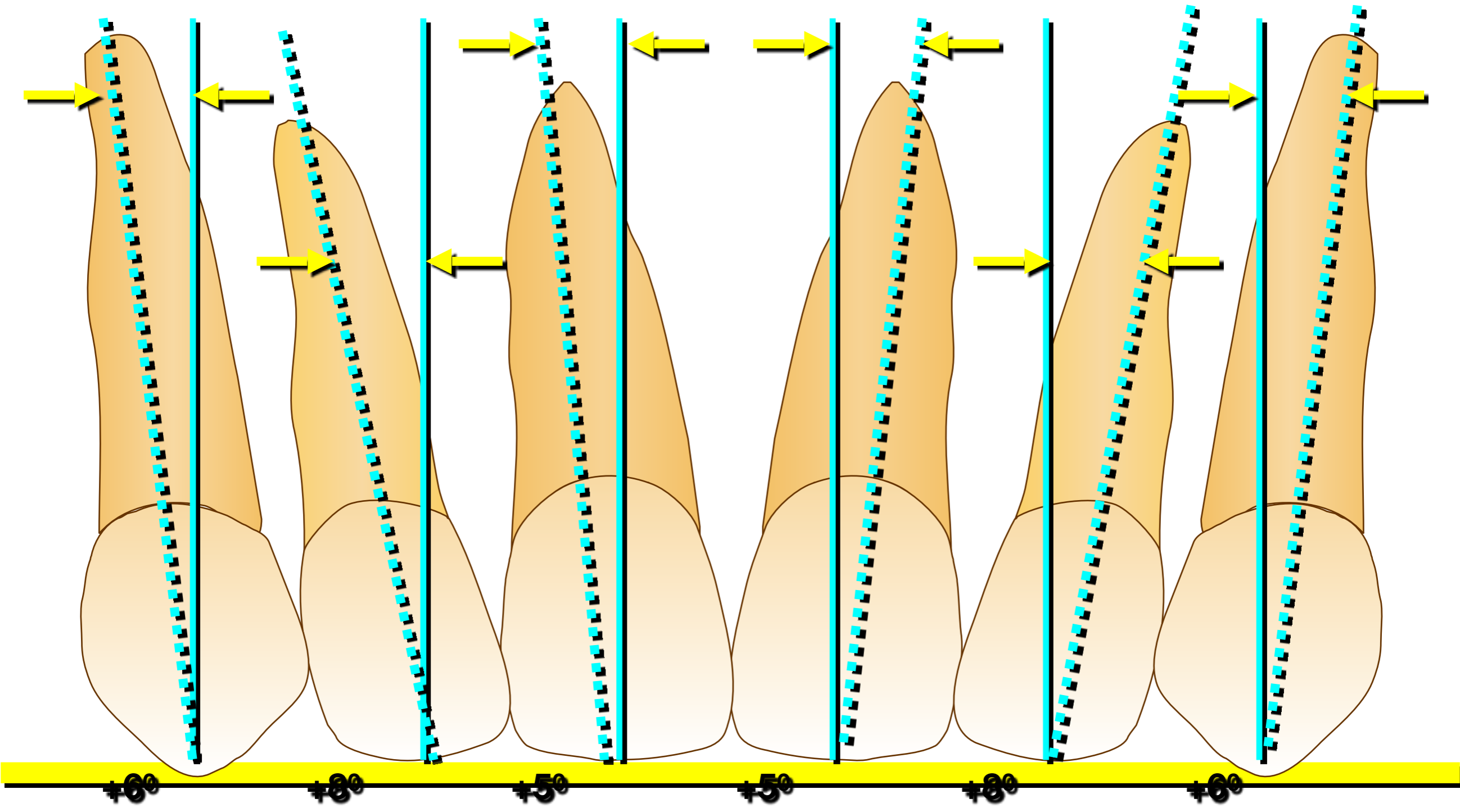
Key 1 - Molar Relation



Key 1 - Molar Relation



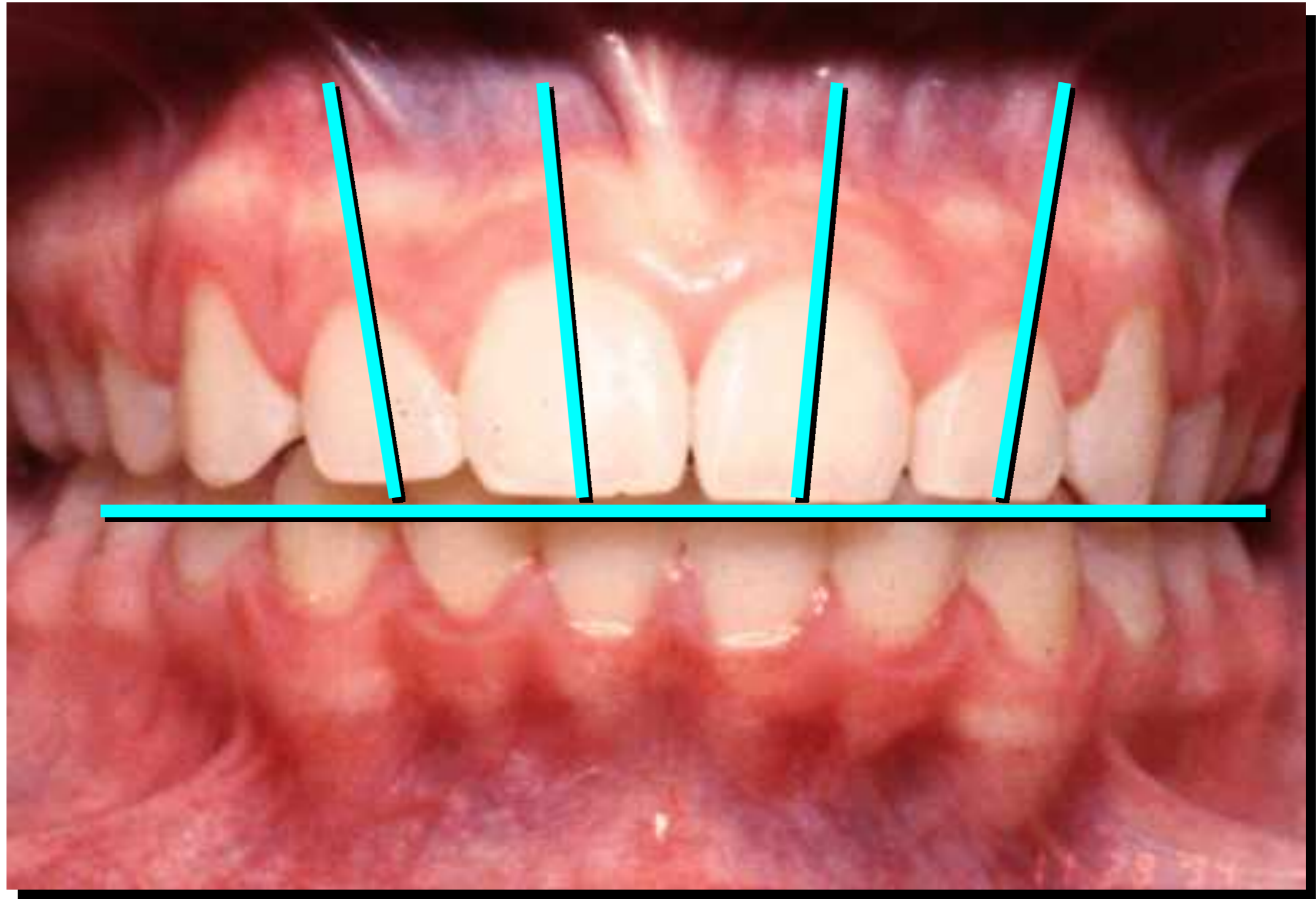
Key 2 – Crown Angulation Relation



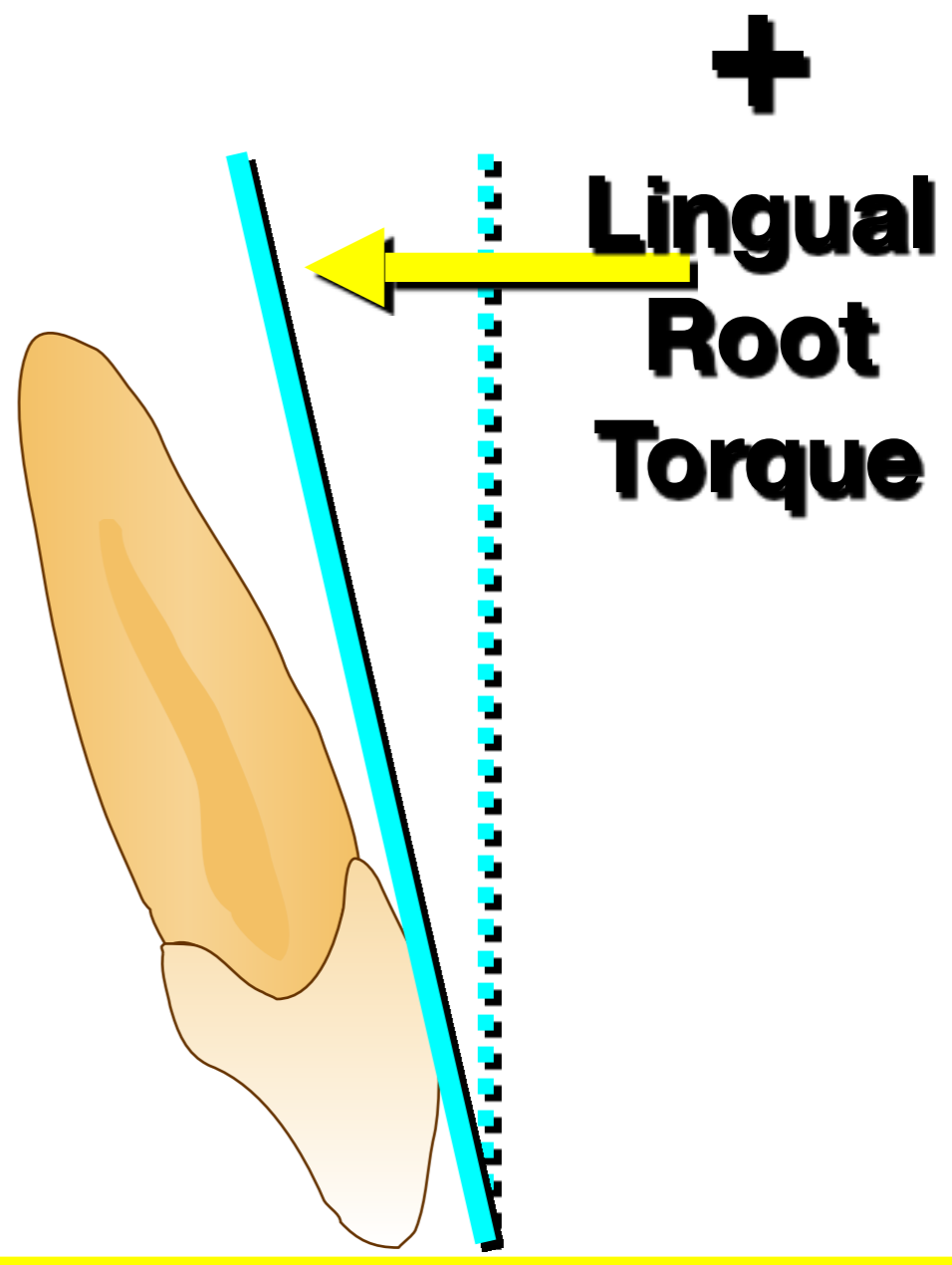
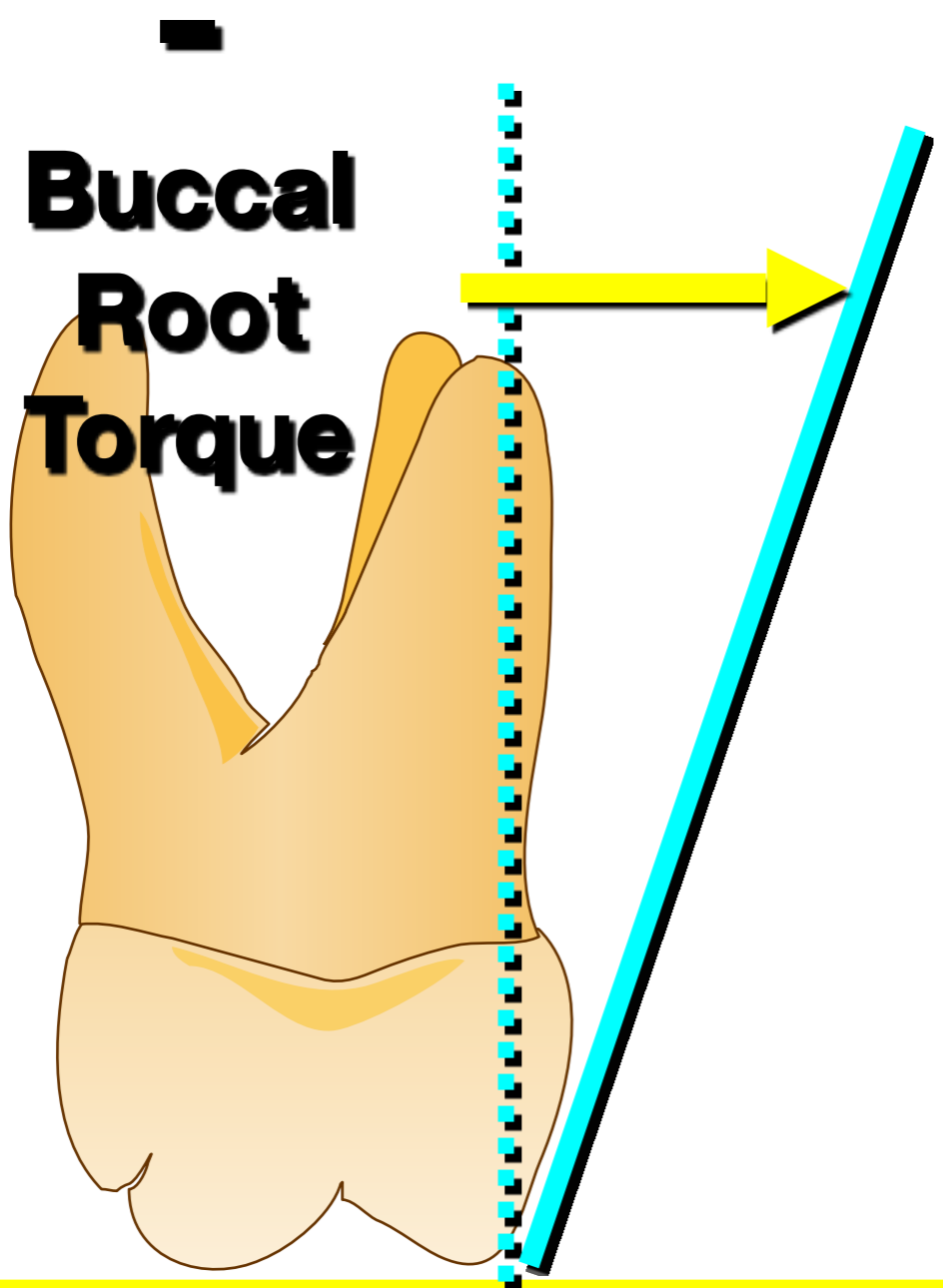
Key 2 – Crown Angulation Relation

- Crown angulation (tip) Facial axis of the clinical crown (FACC) Best viewed from the labial or buccal perspective. For all teeth except molars, is located at the middevelopmental ridge that runs vertically and is the most prominent portion in the central area of the labial or buccal surface. The facial axis of molar crowns is identified by the dominant vertical groove on the buccal surface.
- Crown angulation (tip). Viewed from mesial or distal perspective, the FACC is represented by a line that is parallel to the middevelopmental ridge (or with molars, the dominant groove), and tangent to the middle of the clinical crown on the labial or buccal surface
- Crown angulation (tip) refers to angulation (or tip) of the long axis of the crown, not to angulation of the long axis of the entire tooth.
- Crown Angulation or Crown tip. The degree of crown tip is the angle formed by the FACC and a line perpendicular to the occlusal plane. A "+ reading" when the gingival portion of the FACC is distal to the incisal portion. A "- reading" when the gingival portion of the FACC is mesial to the incisal portion.
- Crown angulation (tip) Each normal model had a distal inclination of the gingival portion of each crown, It varied with each tooth type, but within each type the tip pattern was consistent from individual to individual.
- Crown angulation (tip) Normal occlusion is dependent upon proper distal crown tip, especially of the upper ant. teeth (longest crowns). Degree of tip of incisors, determines the amount of MD space they consume & has a considerable effect on post. occlusion as well as ant. esthetics.

Key 2 – Crown Angulation Relation



Key 3 – Crown Inclination Relation



Inclination (Torque)

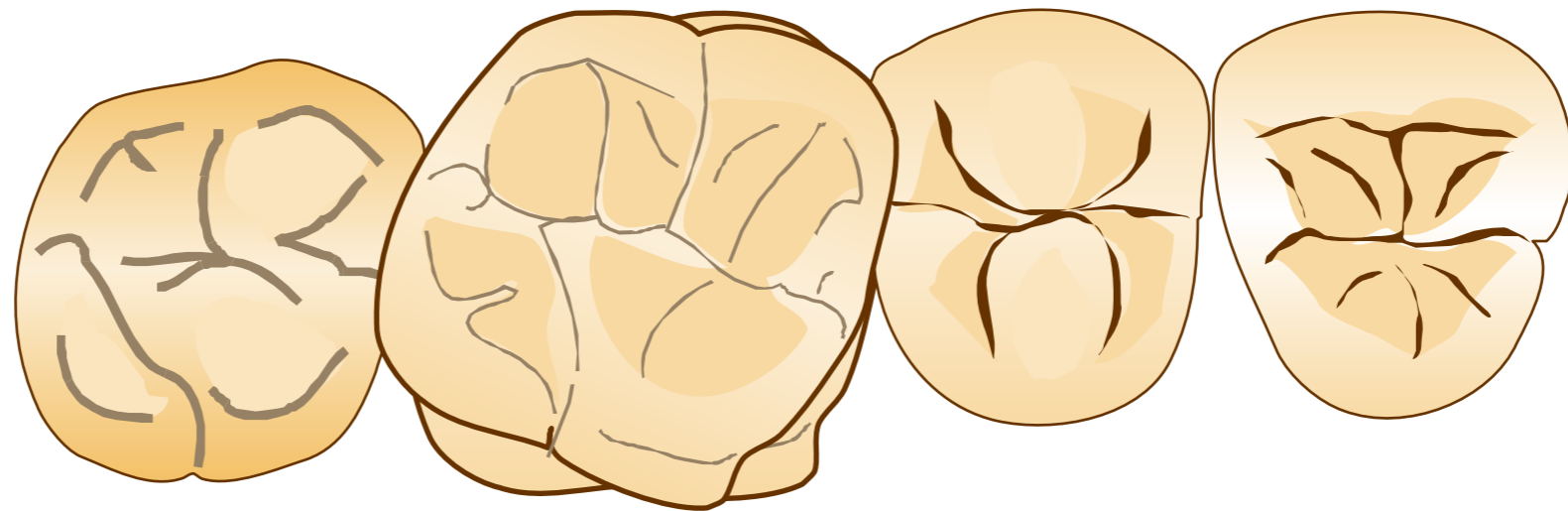
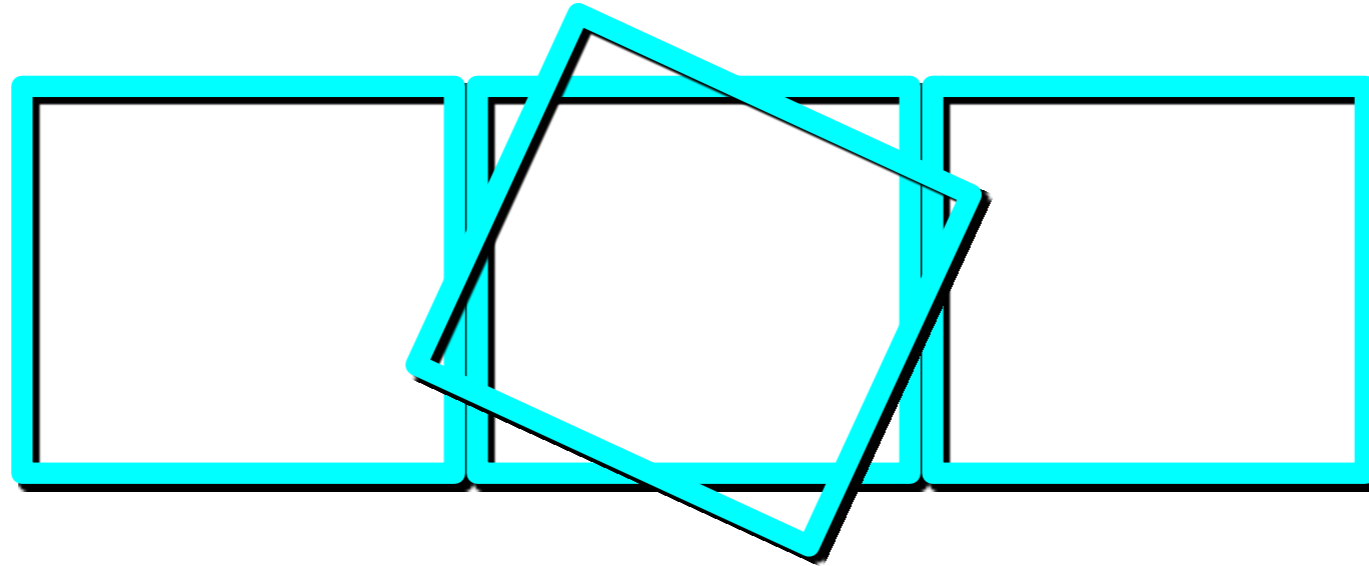
Key 3 – Crown Inclination Relation

- Crown inclination angle formed by a line which bears 90° to the occlusal plane and FACC (as viewed from the mesial or distal). **A +** reading is given if the gingival portion of the tangent line (or of the crown) is lingual to the incisal portion, **A -** reading is recorded when the gingival portion of the tangent line (or of the crown) is labial to the incisal portion.
- **ANTERIOR CROWN INCLINATION.** In upper incisors + crown inclination. In lower incisors - crown inclination The average inter-incisal crown angle - 174°.
- Properly inclined anterior crowns contribute to normal overbite and posterior occlusion, when too straight-up and -down they lose their functional harmony and overeruption results.
- If the inclination of the anterior crowns is not sufficient, space, in treated cases, is often incorrectly blamed on tooth size discrepancy.
- **POSTERIOR CROWN INCLINATION— UPPER.** A minus crown inclination for each crown from the U canine through the U-2nd PM. A slightly more negative crown inclination existed in the U-1st & 2nd molars.
- **POSTERIOR CROWN INCLINATION— LOWER.** A progressively greater "minus" crown inclination existed from the lower canines through the lower second molars.
- As the anterior portion of an upper rectangular arch wire is lingually torqued, a proportional amount of mesial tip of the anterior crowns occurs. The ratio is approximately 4:1. For every 4° of lingual crown torque, there is 1 ° of mesial convergence of the gingival portion of the central and lateral crowns.

Key 3 – Crown Inclination Relation



Key 4 - Rotation

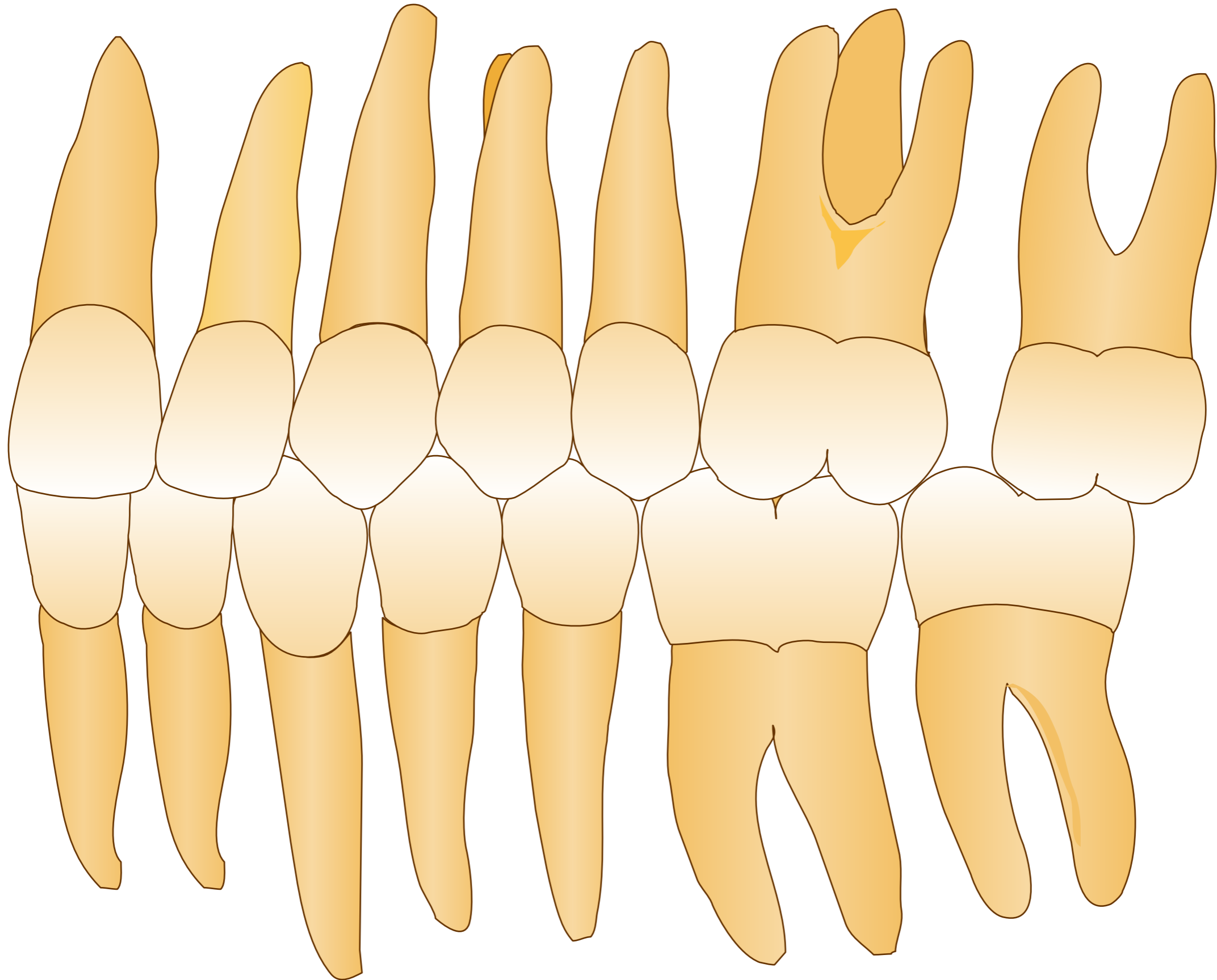


- Teeth should be free of undesirable rotations. Rotated molar, would occupy more space than normal, creating a situation unreceptive to normal occlusion.

Key 4 - Rotation

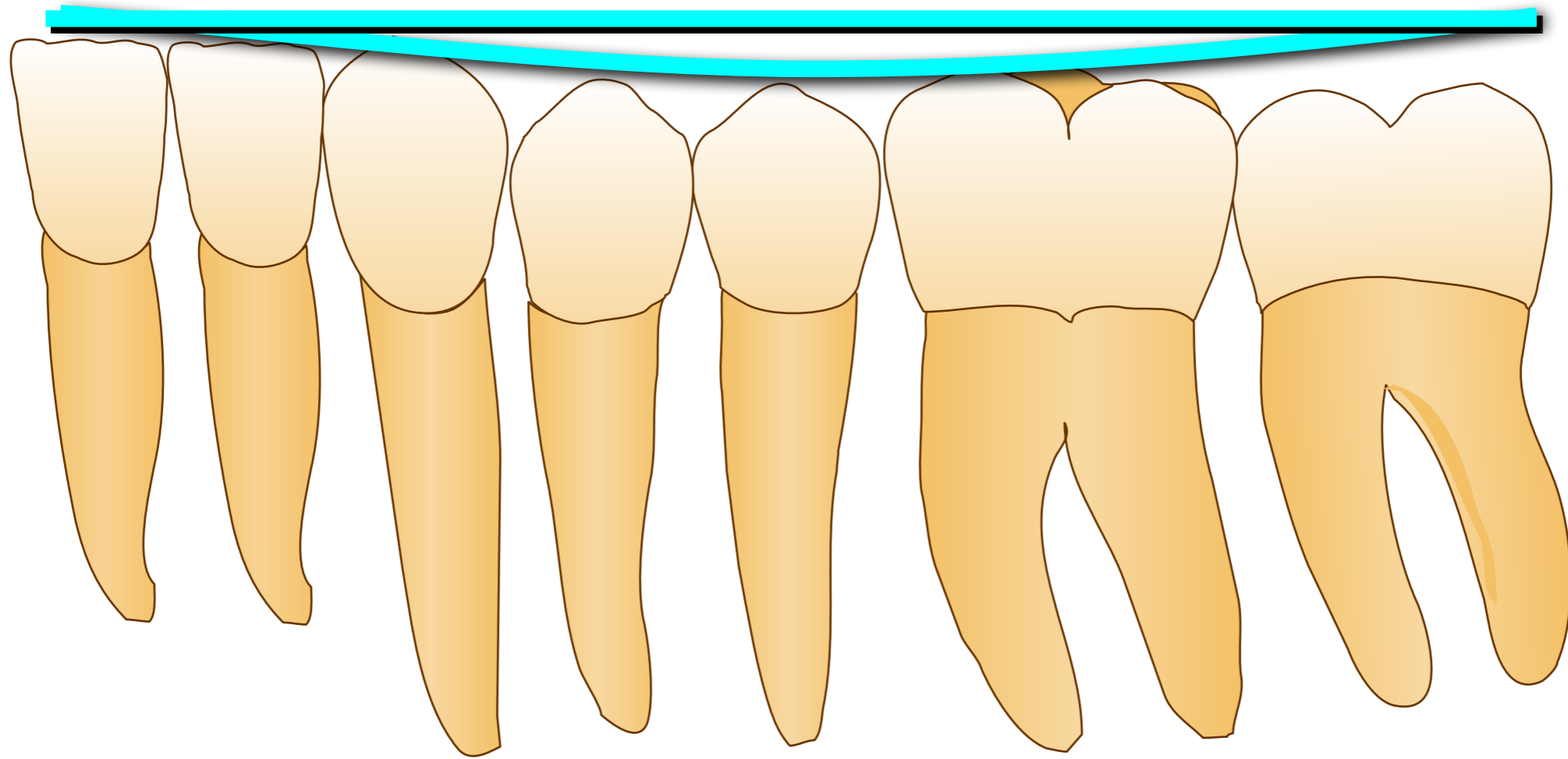


Key 5 - Tight Contacts



- Contact points should be tight (no spaces). Persons who have genuine tooth-size discrepancies pose special problems.
- Serious tooth-size discrepancies should be corrected with jackets or crowns, so the orthodontist will not have to close spaces at the expense of good occlusion.

Key 6 - Curve of Spee Contacts



Key 6 – Flat Curve of Spee

- Occlusal plane (curve of spee), depth of curve of Spee ranges from flat plane to slight concave surface (0- 2.5 mm). A flat plane should be a treatment goal as a form of over treatment. There is a natural tendency for the curve of Spee to deepen with time.
- Lower jaw's growth downward and forward sometimes is faster and continues longer than that of the upper jaw. This causes the Lower Anterior teeth to be forced back and up, crowded lower anterior teeth and/or a deeper overbite and deeper curve of Spee.
- At the molar end of the lower dentition, the 3rd molars are pushing forward, even after growth has stopped, creating essentially the same results. If the Lower Anterior teeth can be held until after growth has stopped and the 3rd molar threat has been eliminated by eruption or extraction, All should remain stable, assuming that treatment has otherwise been proper.
- Intercuspatation of teeth is best when the plane of occlusion is relatively flat There is a tendency for the c.o.s to deepen after treatment.
- Treatment the plane of occlusion until it is somewhat flat or reverse to allow for this tendency.
- A deep curve of Spee results in a more contained area for the Upper teeth, making normal occlusion impossible. Only the Upper 1st Premolar is properly intercuspally placed. The remaining upper teeth, Anterior & Posterior to the 1st PM, are progressively in error.
- A reverse c.o.s is an extreme form of over treatment, allowing excessive space for each tooth to be intercuspally placed www.indiandentalacademy.com

Key 7 – Correct tooth size (Bennett & McLaughlin, 1993)



- Correct tooth size Bennett & McLaughlin. If Andrews' non orthodontic models have shown tooth size discrepancy, it would have resulted in either spacing or crowding in either of arches, until compensated by tip & torque in anterior segment Prior to treatment by Bolton analysis.
- Discrepancy may exist prior to treatment but frequently not noticed until the finishing stage. The potential need for interproximal reduction to ↓ tooth size in one arch or restorative procedure to ↑tooth size in opposite arch should be discussed with patient/parents before treatment.

Thank YOU