#### Introduction to fixed orthodontics

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#### Case selection and planning

- 1. Concept of minor, limited and comprehensive Orthodontics
- 2. Patients treated at the McGill Dental clinic
- 3. Importance of screenings
- 4. "Fixed" does not equal magic
- 5. Limitations of therapy provided

#### Case study

- a. Complete Orthodontic records
- b. Precise diagnosis
- c. Treatment objectives
- d. Skeletal "corrections"
- e. Space requirements
- f. Treatment in the three dimensions of space
- g. Management of the vertical dimension

#### Mechanotherapy

- a. Molar relationship
- b. Space management
- c. Type of movements (biomechanics)
- d. Advantages over a removable approach
- e. Duration of treatment

#### Molar relationship

 In our clinic, the molars should be in CI I before bracketing is started

- Crowding managementOverjet

# Cl II molar and management of crowding

#### Space management

- You must create the space before alignment is attempted.
- If the space is present, it must be used judiciously

## ACCO



#### Space creation



#### Vertical dimension

• The bite must be opened before retraction of the incisors is attempted.



#### Tooth movement

- a. Tipping
- b. Rotation
- c. Translation
- d. Root movement (torque)
- e. Intrusion
- f. Extrusion

## Tipping

- The crown moves in the direction of the force
- The apex moves in the opposite direction

### Tipping

• Sometimes desirable if the crown of the tooth has been pushed labially by a finger habit.







#### Tipping from occlusal view

- The force being away from the center of resistance will create a moment.
- This moment will tend to rotate the tooth in the direction of the force.





- Slow movement
- Used to level the incisal edges or the marginal ridges



- Usually achieved by positioning brackets strategically on the crown of a tooth
- You can also place bends (step ups) in stainless steel wires.

- Extrusion of the adjacent teeth
- Newton's principle of action-reaction.



#### Extrusion



 Fixed orthodontics is needed to achieve this movement

#### Extrusion

- Superelastic wires of small diameter must be used (light forces must be applied)
- Bracket placement will dictate the amount of extrusion

#### Extrusion

• Purpose of extrusion?

1. Position incisal edges or marginal ridges

- Position all the teeth at their proper level on the occlusal plane
- Bracketing position will dictate the amount of extrusion
- Combination of extrusion-intrusion







#### 2. Extrude a tooth to be restored

- Needed to restore a tooth with
  - Sub gingival fracture
  - Deep decay
- Inadequate crown length

#### 2. Extrusion of a tooth to be restored

- Biological width
- Extrusion vs CCL or in combination
- Supracrestal fiberotomy should be performed to enhance the root extrusion and minimize bone deposition at the crestal margin

Limited orthodontics

#### Rotation







#### Rotation

- Easy procedure with fixed orthodontics
- Very difficult with removable appliances

#### Rotation

Rotation (pure) –

 (http://en.wikipedia.org/wiki/Rotation)
 When a body rotates about the center of resistance (ie when the center of rotation is at the center of resistance.

From K.Kousaie: Physics in Orthodontics

#### Root movement



#### Root movement



- Large moment to move the apex in the desired direction
- The crown must be held stationary (High anchorage requirements)

#### Root Movement



- Wires (Nickel titanium) may be used
- Stainless steel wires with special bends are also an option

#### Root movement

• The center of rotation is at or near the incisal edge, and the rotation occurs about this point. The crown therefore moves a smaller distance than the root. These movements take time because of the large amount of bone resorbtion required for the movement.



#### Translation

All points on the body move in the same direction and with the same magnitude.
 The center of rotation is effectively at an infinite distance away from the tooth because there is no rotation.



#### Translation

 Combination of a moment and a single force to move the tooth bodily (<u>equivalent force system</u> as we cannot apply directly a simple force on the center of resistance) • End of sept 2007 lecture

#### Elastomeric elastic

#### \$imple force







## Translation: View from the occlusal plane



Clinical applications of biomechanical concepts

## Tipping

- Simple force:
  - Hawley with a finger spring to push a tooth labially
  - Adjust the spring with a bird beak

Activation of the spring will result in a simple force applied to the lingual of the tooth: labial tipping will occur

#### Tipping with round wire





## TIPPING WITH ROUND WIRE



 Depends on the amount and the desired movement of the adjacent teeth

#### Intrusion appliances

- Removable
- Essix type (Invisalign)
- Fixed orthodontics (2x4; full arch with bends)

## Intrusion arch

#### Brackets, wires and auxiliaries







## Height gage

## Height gage

#### **Direct bracketing**

- Clean teeth
- Etch for 30 seconds
- Resin cure 5 seconds
- Place bracket as close as possible, press
- Remove excess of composite
- Reposition

- Cure for 20 seconds mesial then distal
- Wait 10 minutes
- Select wire (usually Niti for alignment)
- Insert wire
- Lightly engage the wire in the brackets
- Instructions to the patient

#### End oct 2007