Functional Appliance

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Functional Appliance

- A variety of fixed or removable appliances
- Designed to ‘reposition’ the mandible
- Leading to muscle stretching
- Forces transmitted to dentition and basal bone
Functional Appliance

- Muscular forces generated by altering the mandibular position sagitally & vertically
- Resulting in orthodontic & orthopaedic changes
- Most effective skeletal Cl II tx (retrognathia)
- Most effective during active growth

Bishara, 1989
Growth modification involving functional appliances have the objectives of acting as a therapeutic biomechanical interference to cause clinically significant morphological alterations in a growing child’s dentition and craniofacial skeleton.

Vig & Vig, 1986
The First Functional Appliance
Breastfeeding

- Places beneficial orthopaedic forces on the jaws
- Helps to develop airways (pacifier suckling deforms airways)
- Cultivates positive down & forward growing forces required by both upper & lower jaws

Page, 2001
Breastfeeding

- Suckling forces generally act to form wide dental arches
- Suckling also promotes good swallow muscle tone which assists proper jaw and airway development

Page, 2001
Functional Appliances

- Andreasen Activator
- Bionator
- Frankle Functional Regulator FR2
- Harvold Activator
- Teuscher Appliance
- Clark Twin Blocks
- Herbst Appliance
Clark Twin Blocks
Herbst Appliance
Timing of Tx

- Effective during active growth
- The faster the growth, the faster the response, the shorter the tx time
- Most common time for tx – pubertal growth spurt
- Early tx - 9-10 yrs
- Definitive tx - 12-13 yrs
Early tx

- To intercept a developing problem
  - Improve aesthetics
  - Decreased trauma risk to anterior teeth
  - Early correction of deleterious habit
  - Improve eventual prognosis
  - Decrease length of definitive tx

Twelftree, 1998
Early tx

- Ideal tx time – when four upper incisors have erupted
- Most common – correction of large OJ caused by retrognathic mandible
- Tx - Reposition mandible forward
- Tx discontinued once correction achieved
- Some relapse will occur
Definitive tx

- During pubertal growth spurt
- Usually all permanent teeth have erupted
- Correction of max-mand discrepancy usually followed by fixed appliance tx
- Functional appliance may also be used during fixed appliance tx
Effects of Tx

- **Skeletal**
  - Condylar growth
    - Increased condylar remodelling
    - Increased glenoid fossa remodelling
  - Increased lower face height

Ruf et al., 2002
Effects of Tx

- Dentoalveolar
  - Retroclination of upper incisors
  - Proclination of lower incisors
  - Mesial eruption of lower posterior teeth
Mode of Action of Functional Appliances

- Dentoalveolar changes
- Restriction of forward growth of maxilla
- Stimulation of mandibular growth beyond what is normally seen in growing children
- Redirection of condylar growth from upward and forward directed growth to posterior direction
Mode of Action of Functional Appliances

- Changes in neuromuscular anatomy and function that would induce bone remodelling

- Adaptive changes to glenoid fossa location to a more anterior and vertical direction
Dento-Alveolar Effects

- Dento-alveolar changes – 60-70%
  - Inhibition of downward and forward eruption of maxillary teeth
  - Retroclination upper incisors
  - Proclination of lower incisors
**Orthopaedic Effects**

- **Orthopaedic changes - 30-40%**
  - Condylar growth
    - Increased condylar remodelling
    - Increased glenoid fossa remodelling
  - Increased lower facial height
Clark Twin Blocks

- Consists of separate upper & lower appliances
- More comfortable & aesthetic
- Pt able to eat & speak without restriction of tongue, lip & mandible movements
- Pt able to cooperate to wear appliance 24hrs

Fricker, 1998
Clark Twin Blocks
Clark Twin Blocks

- Constructed to a protrusive bite
- With appliances in mouth, pt not able to occlude in former distal position
- Mandible forced to adopt protrusive bite
Clark Twin Blocks

- Block ~ 5-6mm thick between molars (mouth open beyond freeway space) so that pt cannot return to former distal occlusion
CTB design

- **Baseplate**
  - Upper - up to 6s
  - Lower - up to $\frac{1}{2}$ cusps of 5s

- **Expansion screw**
  - Necessary only when compensatory expansion needed to accommodate lower arch as the mandible translates forward
CTB design

- Retention
  - Upper
    - Adams clasps at upper 6s, 4s
  - Lower
    - Adams clasps at lower 4s
    - Ball clasps at lower anterior teeth
CTB design

- Occlusal blocks
  - Upper
    - From 6s up to mesial of 5s
  - Lower
    - From mid-cusp of lower 5s to mesial of lower 4
  - Occlusal inclined plane – 70°
Orthodontics and Dentofacial Orthopaedics:
A Comprehensive Textbook
Appliances for Cl II div 2
Bite Registration

Boxing wax
Wooden spatula
Hot water
Pt bites with incisors edge to edge.

~ 6mm separation of molars
Fold wax lengthwise twice to 1/3 size

Do not flatten
Turn folded wax lengthwise and fold once with spatula in between
Crimp lower edge against spatula

Do not flatten
Pt bites with incisor edge to edge
Stages of Tx

- **1st stage**
  - To correct anteroposterior relationship from skeletal Cl II to Cl I

- **2nd stage**
  - Settling of posterior teeth into occlusion from Cl II molar relationship to Cl I
  - Upper bite blocks trimmed to allow eruption of lower posterior teeth
  - Lower bite blocks trimmed to level occlusal plane
Stages of Tx

- In deep bite cases, trim blocks
- In reduced or open bite cases, do not trim blocks
Tx Protocol

- Full-time wear for first 6 months
  - Worn at all times including eating and sleeping
  - Removed only for brushing of teeth
  - Not to be worn during sporting activities

- Night-time wear for next 6-9 months

- Finishing may be undertaken with fixed appliances
Advantages of CTB Tx

- Comfortable – pt able to eat, speak
- Aesthetic – appliance not obvious
- Mandible able to move freely
- Compliance – can be removable or temporarily cemented
- Improved facial appearance
- Normal speech
Advantages of CTB Tx

- Easy to manage clinically
- Not easily breakable
- Allows independent arch development
- Improvement of vertical height
- Allows for asymmetrical correction
- Rapid & efficient correction of skeletal discrepancy & malocclusion
Advantages of CTB Tx

- Tx can be undertaken from childhood to early adulthood
- May be integrated with fixed appliances
- Tx of TMJ dysfunction – splint allows displaced disc to be recaptured
- Tx of sleep apnoea – increases airway space
That’s All Folks