Best Evidence

FUNCTIONAL APPLIANCES/MANDIBULAR ADVANCEMENT

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“All roads lead” to the sleep medicine physician

- Diagnosis
- Determine:
  - Obstruction
    - Where?
  - Central Nervous System
- Monitor
- Determine “cure”
  - Based in science
- Multidisciplinary “team event”
The mandible

• Where does the change need to occur?
• How much change needs to occur?
• Change
  – Acute
  – Evolves
• Determine modality
• Mandibular advancement appliances vs mandibular repositioning devices
**Mandibular advancement appliances for the treatment of pediatric obstructive sleep apnea: a systematic review**

I. Ghassan, B. Galland, C. Robertson, et al.
**Mandibular advancement appliances efficacy on sleep disordered breathing in children: a randomized controlled trial**
J Sleep Res, 26 (2017), p. 8

**Mandibular advancement appliances for sleep-disordered breathing in children: a randomized crossover clinical trial**
J Dent, 71 (2018), pp. 9-17

W.R. Nunes, R.C.D. Francesco-Mion
**Early treatment and preventive strategies for obstructive sleep apnea and hypopnea with the bioajusta x orthodontic- orthopedic treatment**
Sleep Med, 10 (2009), pp. S41-S42

C. Guilleminault, M. Partinen, J.P. Praud, et al.
**Morphometric facial changes and obstructive sleep apnea in adolescents**
P. Cozza, R. Gatto, F. Ballanti, et al.  
Management of obstructive sleep apnoea in children with modified monobloc appliances  

Randomized controlled study of a mandibular advancement appliance for the treatment of obstructive sleep apnea in children: a pilot study  

Class II correction improves nocturnal breathing in adolescents  
Angle Orthod, 81 (2) (2011), pp. 222-228

C. Zhang, H. He, P. Ngan  
Effects of twin block appliance on obstructive sleep apnea in children: a preliminary study  
Sleep Breath, 17 (4) (2013), pp. 1309-1314

A. Stellzig-Eisenhauer, P. Meyer-Marcotty  
Interaction between otorhinolaryngology and orthodontics: correlation between the nasopharyngeal airway and the craniofacial complex  
Orthodontics treatments for managing obstructive sleep apnea syndrome in children: a systematic review and meta-analysis

W. Proffit, H. Fields, D. Sarver
(5th ed.), Contemporary orthodontics, Mosby (2012), pp. 242-245

Randomized controlled study of an oral jaw-positioning appliance for the treatment of obstructive sleep apnea in children with malocclusion
The study was conducted on prepubertal children. The adenoid tissue is still in the peak of growing at the ages of the subjects included in this study. However, the measurements along the nasopharynx increased when compared with the initial ones. Still, similar retrospective and prospective studies are needed at older stages.
Class II correction improves nocturnal breathing in adolescents


*Angle Orthod, 81 (2) (2011), pp. 222-228*

**Materials and Methods:** Sixteen subjects at maximum pubertal growth (12.6 years [±11.5 months]) were selected and treated for 12 months with maxillary expansion and mandibular advancement with a Herbst appliance.

**Objective:** To examine modifications in sleep pattern and in craniofacial morphology of adolescents with mandibular retrognathism.

**Conclusions:** In the short term, the increase in airway space improved nocturnal breathing associated with the correction of mandibular retrognathism.
Orthopedic management
mandibular advancement

Herbst appliance
Jasper Jumper
Forsus
Twin block
Mara
Bionator
Growth Modification
Mandibular retrognathia

• Encourage mandibular growth
• Correct CI II malocclusion
• Improve facial profile
• Most effective in the growing child
Orthopedic correction of Mandibular retrognathia

Often in combination with Maxillary expansion
When orthopedic management is not enough

- **Surgical options**
  - **Orthognathic surgery**
    - Mandibular advancement
    - Bimaxillary advancement (MMA)
    - Very precise
    - Usually in the skeletally mature patient
  - **Distraction osteogenesis**
    - Larger magnitude of advancement can be achieved
    - Titrateable
    - Less precise
    - Skeletally mature or immature patient
• 48yr old nonobese male with severe OSA
• RDI 38 events/hr
• Failed CPAP
• Stoke related to OSA
• DO 37 days, 1mm/day
• Titrated until airway improved
• Patient was monitored and airway dimension was evaluated, during distraction, utilizing the following:
  – Serial cephalometric radiographs
  – Serial polysomnography
  – Serial direct nasoendoscopy
• Retropalatal cross-sectional area more than doubled
• Retroepiglottic cross-sectional area almost doubled
• Posterior airway space as measured on lateral ceph increased by 50%
• Lateral cross-sectional area of pharyngeal airway as measured on a lateral ceph increased by over 50%
Distraction in the orthognathic patient

Sequential upper airway changes during mandibular distraction for obstructive sleep apnea.

Melugin MB, Hanson PR. The use of distraction osteogenesis in the treatment of obstructive sleep apnea. AAOMS 80th Annual Session, 1998
Mandibular lengthening to improve airway & mastication

Pierre Robin Sequence

- Mandibular hypoplasia
- Mandibular retrognathia
- Associated with syndromes or may be isolated
- Glossoptosis
- Associated airway and masticatory dysfunction including life-threatening sleep apnea
- Usually accompanied by wide cleft of the palate
Distraction proceeds until airway compromise is corrected as determined by a sleep medicine physician.
Occlusal “Overcorrection” Normalized by ongoing Deficient Growth

Patient decanulated
Post-consolidation

Patient remains decanulated
Pre-distraction
During distraction
Pre-distraction

Post-distraction
Note the vertical device vector

With external multidirectional Devices you can dial horizontal.

With internal devices you have to place orthopedic forces to change the distraction vector during distraction.

He had a very short rami, so vertical device placement lengthens the ramus more predictably.

Post op posterior openbites are Dealt with orthopedically.
Preop 6 mos. Post-distraction
Distraction in the Treatment of Obstructive Sleep Apnea

Distraction in the Treatment of Obstructive Sleep Apnea

- RM Dasheiff, R Finn -Treatment goals for obstructive sleep apnea-Distraction Osteogenesis of the Facial Skeleton, WH Bell, CA Guerrero
- AD Denny, R Talisman, PR Hanson, RF Recinos-Mandibular distraction osteogenesis in very young patients to correct airway obstruction. PRS Aug 2001 Vol 108(2) pp 302-311.
- SR Cohen, C Simms, FD Berstein, J Thomsen-Alternatives to tracheostomy in infants and children with obstructive sleep apnea. JPS, 1999
Pre-trx records

- Severe mandibular retrognathia and micrognathia
- Unidentified syndrome
The red dot is the unerupted Maxillary incisor
The blue dot is the unerupted Mandibular incisor
Distraction & airway


All roads END at the sleep medicine physician

- Diagnosis
- Treatment decisions based on science
- Monitoring
- Determine “cure”
- Multidisciplinary “team event”
Protocol

Take home message

• Primary or secondary referral
• Sleep Medicine physician
  – Assess structural or central
  – Where is the obstruction
• Monitor treatment
  – Advance structures
  – Enlarge structures
• Assess success or not
• Determines course of action