Maxillary Expansion in the Management of Sleep Apnea

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Who needs to be expanded?

- Significant incisor crowding
- Incisors blocked out from eruption
- Individuals with sleep disordered breathing with known or suspected obstruction due to restricted nasal air flow
- Typically, maxillary constriction significant enough to limit nasal air flow will also demonstrate incisor crowding
Who needs to be expanded?

- Maxillary intermolar width less than 43 mm (mesiolingual cusp tip to mesiolingual cusp tip) in association with other signs of maxillary constriction.
What happens in Mx expansion?
Changes in snoring, hypersomnolence, and OSA


  - **Average reduction in NAR 48.7%**. Pts w/ higher initial nasal airway resistance saw greatest reduction

  - **Decreased NAR w/ RME, but no correlation between amt of expansion & quantity of change in NAR**

Maxillary Expansion for the management of OSA

  - 10 young adults 27+/-2yrs of age, mild-moderate OSA
  - Maxillary transverse deficiency with diminished nasal air flow
  - All RME, 6 SARPE (Surgically Assisted Rapid Max Expansion)
  - **Results:**
    - 9 pts reported improvement in snoring & hypersomnolence
    - AHI 19+/-4 to 7+/-4 for the group, 7 had AHI <5
  - **Their conclusion:** This preliminary data suggests that RME may be a useful treatment alternative for selected patients with OSA
Changes in Nasal Airway Resistance (NAR) 2° to Maxillary Expansion

  - **RME sig reduced NAR, stable after 3 months, low correlation btwn change in NAR & amt of Mx expansion at the first molar, or amt of nasal cavity widening**

  - **Significant median reduction in NAR following RME, but high individual response & variability means some unpredictability**

  - **NAR decreased average of 36.2%. Correlation btwn NAR decrease & magnitude of expansion was weak. Nasal manometry used.**
Maxillary Expansion for the Management of OSA

- Guilleminault C, Li KK. Maxillomandibular expansion for the treatment of sleep-disordered breathing: preliminary result. Laryngoscope. 114(5):893-6, 2004 May
  - Prospective study, 6 patients with SDB, 22.2 +/- 11.4yrs
  - All w/ Maxillary & Mandibular transverse deficiency
  - Treated with surgically assisted maxillary expansion
  - Mean expansion: Mx 10.3 +/- 3mm, Mn 9.5 +/- 2.9
  - Results:
    - ESS 10.2 (+/- 1.9) to 5 (+/- 2.9)
    - AHI 13.2 (+/-15.6) to 4.5 (+/-5.8) events/hr
    - LSAT 88.2 (+/-2.9%) to 91.3 (+/-3.3%)
  - Conclusion: MME improves SDB in patients with maxillary and mandibular transverse deficiency
Maxillary Expansion for the Management of OSA

  - 31 children w/ maxillary constriction, w/o adenoid hypertrophy, with OSA
  - Fixed Mx expander-activated 10-20 days
  - Results:
    - Mean cross-sectional expansion of Mx 4.32 +/- 0.7mm
    - Apnea-hypopnea index 12.2 events/hr to <1 events/hr 4 months post expansion

Conclusion: RME may be a useful approach in dealing with abnormal breathing during sleep for patients with maxillary transverse deficiency
Changes in Nasal Airway Resistance (NAR) 2º to Maxillary Expansion

  – **NAR significantly reduced w/ the use of RME**
Maxillary Expansion and OSA Management


- 10 children, mean age 6.6 ± 2.1 years at entry and 9.7 ± 1.6 years at 36 month follow-up. O/W healthy kids who’s parents refused adenotonsillectomy and had crossbite, maxillary constriction and/or high arch narrow palate

- Brouillette symptom questionnaire, AHI, HOI (Hypopnea Obstruction Index), and AI (Arousal Index) compared

- AHI went from 5.8 +/- 6.8 down to 1.5 +/- 1.6
- Habitual snoring went from 78.5% down to 35.7%
- Sleepiness went from 50% down to 7.1%
- Oral breathing went from 92.9% down to 14.3%
Maxillary Expansion and OSA Management

- 11 OSAS young subjects (mean age 6.9±1.04 years)
- Polysomnography and Cardiovascular monitoring
- Pre expansion AHI=6.09±3.47; SAO₂=93.09%±1.60.
- 12 months post expansion, AHI=2.36 ± 2.24; SAO₂=96.81% ±1.60.
- These changes were associated with an improvement in clinical symptoms, such as reduction of snoring and sleep apnea.
Maxillary and Mandibular Expansion
Maxillary incisors blocked out from eruption as noted by failed or delayed eruption after deciduous teeth have exfoliated.
Upper primary lateral incisors are over-retained due to maxillary constriction, lower incisors with marked crowding
Maxillary lateral incisor eruption delayed, lower incisors with marked crowding, decreased intermolar width
Pre-treatment to phase I retention
What Does Maxillomandibular Expansion Do?

- Increases dental arch size to provide space for tooth eruption
- Improves stability of future orthodontic treatment by allowing teeth to erupt into more stable positions relative to surrounding bone
- Encourages normal mandibular AP growth
- Decreases nasal airway resistance, improving nasal air flow
- May be beneficial to individuals with OSA that are known or believed to have obstruction of nasal air flow
- Expansion improves oral cavity width, likely allowing a more forward tongue position
Who is a candidate for maxillomandibular expansion?

• Any individual with dental arch width deficiency that has inadequate space for eruption of permanent teeth (dental indication)

• Individuals with polysomnographic evidence of OSA, who have undergone evaluation by members of the sleep team, and for whom other sources of airway obstruction have been ruled out (soft palate, tongue base, tonsils/adenoids, etc) or have failed medical intervention, and for whom increased nasal airway resistance is suspected or confirmed - with or without significant dental crowding.

• Often, individuals with suspected increased nasal airway resistance also have the dental crowding indication for expansion as well
Thank You!

- **ESS** – Epworth Sleepiness Scale (self-reported 8 item symptom based questionnaire)
- **LSAT** – Lowest $O_2$ Saturation recorded during sleep
- **AHI** – Apnea Hypopnia Index, events per hour. <5 normal. Apnea must be 10 sec in length with associated hypoxia (5-15 mild apnea, 15-30 moderate, >30 severe)
- **Peak Nasal Inspiratory Airflow (PNIA)** uses spirometry. Requires patient effort – maximum inspiration – can vary
- **Acoustic Rhinometry** – uses sound waves to measure nasal/upper airway volume. 35 y.o. technique. Does not require patient maximum effort, less potential variation
- **Nasal Monometry (Rhinomanometry)** – measure airflow in the pharynx and at the nares and use Ohm’s law for gases to calculate nasal airflow, pressure, and resistance