

**AIRWAY - BREATHING - HABITS
&
MYOFUNCTIONAL CONSIDERATIONS
in
ORTHODONTICS**

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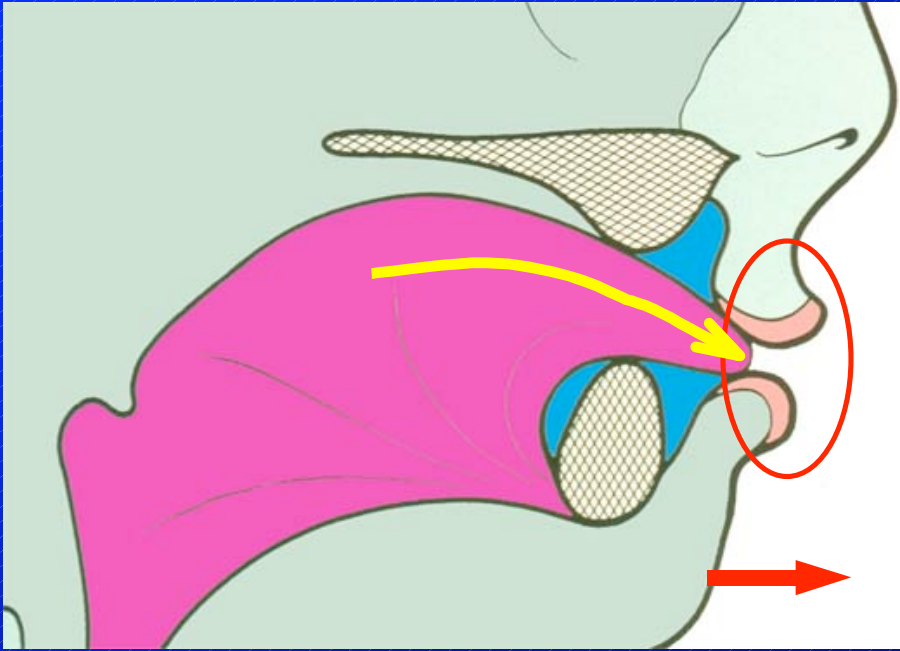
ORAL HABITS

✓ **Most prevalent habit
in children (50%)**

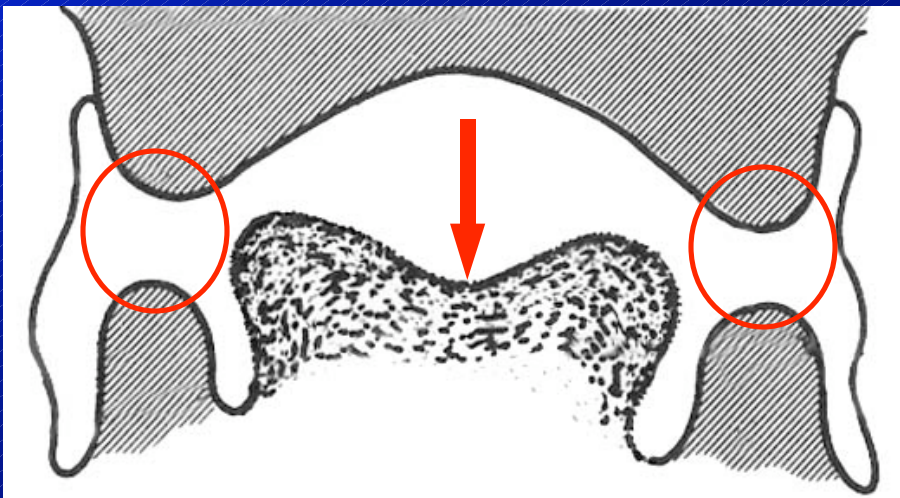
- ✦ **TONGUE THRUSTING**
- ✦ **DIGIT SUCKING**
- ✦ **TONGUE SUCKING**
- ✦ **NAIL & LIP BITING**
 - **foreign objects**



Infantile (Visceral) Swallow

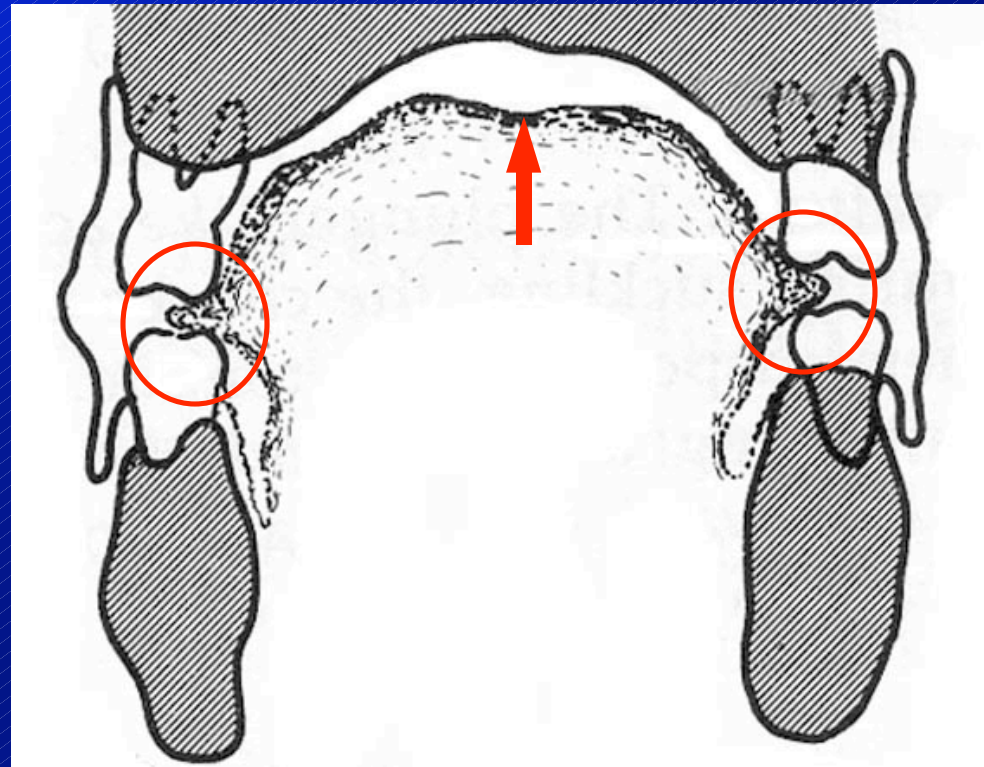
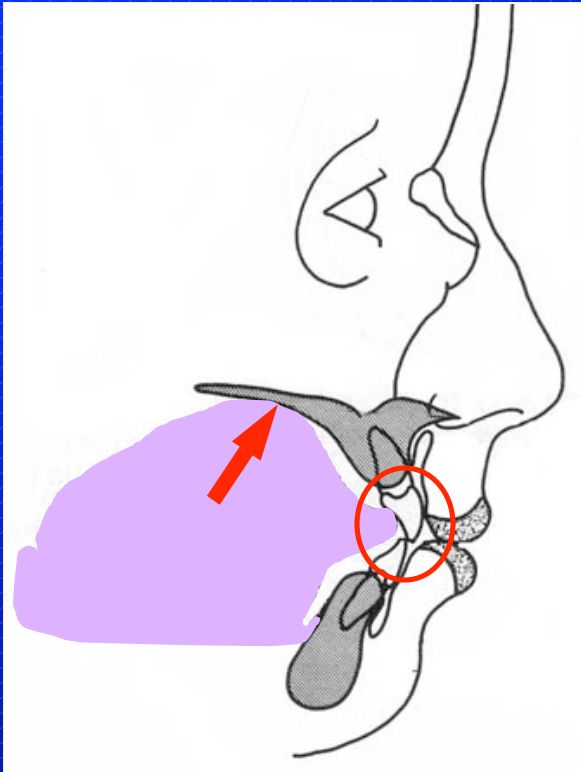


- Tongue thrust
- Pursed lips
- Peri-oral sphincter action
- Mand. thrust →



- Tongue:
 - ◆ away from palate
 - ◆ narrow, elongated
 - ◆ depressed central furrow
- Peri-oral sphincter action
- Separated gum pads

Mature (Somatic) Swallow



- **Tongue:**
 - ◆ humped up
 - ◆ approximates palate
 - ◆ shallow central furrow
 - ◆ peristaltic action
 - ◆ border between teeth
- **↓ Peri-oral sphincter action**
- **No mand. thrust**
- **Momentary inc. contact**

ADULT SWALLOW

✦ SYNONYMS:

- **NORMAL**, MATURE, SOMATIC SWALLOW

✦ FACTS:

- MAY APPEAR AS EARLY AS AGE 3
- CONSIDERED **NORMAL** BY AGE 4-5
- ACHIEVED BY **50%** AT AGE 6

✦ FREQUENCY & DURATION:

- ...

ADULT SWALLOW

✦ FREQUENCY & DURATION

$$Q^2 = \left(\int_{-\infty}^{\infty} e^{-x^2} dx \right) \left(\int_{-\infty}^{\infty} e^{-y^2} dy \right) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} e^{-(x^2+y^2)} dx dy$$

$$\langle p|S \rangle = \frac{1}{\hbar} \int_{-\infty}^{\infty} \langle q|S \rangle e^{-iqp/\hbar} dq \quad \langle q|S \rangle = \frac{1}{\hbar} \int_{-\infty}^{\infty} \langle p|S \rangle e^{iqp/\hbar} dp$$

$$\int_{-\infty}^{\infty} e^{-ax^2+bx+cx} dx = \frac{e^{(b^2-4ac)/(4a)}}{\sqrt{a}} \int_{-\infty}^{\infty} e^{-y^2} dy = e^{(b^2-4ac)/(4a)} \sqrt{\frac{\pi}{a}}$$

$$V_{OAVG}(\alpha) = \frac{E}{2\pi} \int_{\alpha}^{\delta} \sin\theta \cdot d\theta = \frac{E}{2\pi} \times [\cos\alpha - \cos\delta] \quad (6)$$



- **FREQUENCY:** Estimates = 1200-2400x / day
- **Swallowing:** 1x / min. x 1 sec. duration
x 60 min. x 24hr = 1400 sec. / day
- **DURATION** ≈ 1400 sec. / day = **23-25 min.**
- **Variable** (Sleep = 4-8 x / hr)
- **Reality:** 800-1000 sec. / day = **13-16 min.**

TONGUE THRUSTING

(terminology)

✦ “RETAINED” INFANTILE SWALLOW

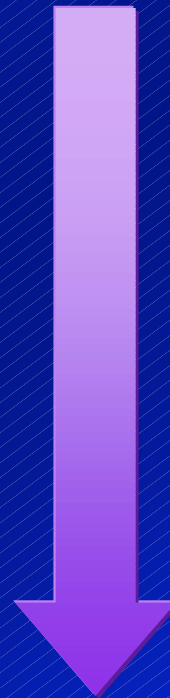
✦ MISNOMER: THRUSTING vs FORCE

✦ “HABIT” vs ABNORMALITY

✓ ✦ DELAYED LEARNING

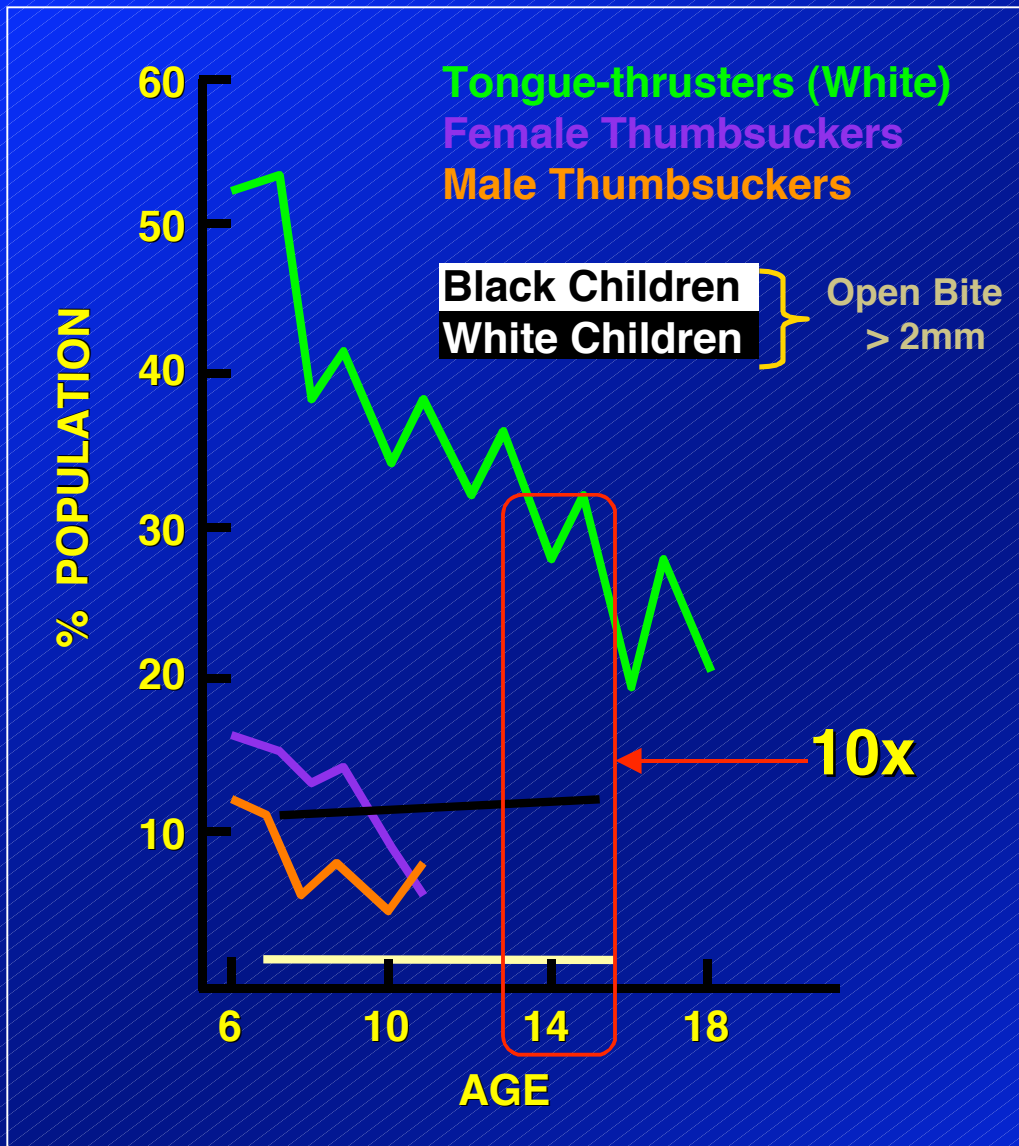
INCIDENCE OF TONGUE THRUSTING

AGE	INCIDENCE	REFERENCE
newborn	97.0%	LEWIS et AL (1965)
1	50-70%	DAVIDSON (1967)
4	<i>most have stopped</i>	” ”
4.9	58-86%	HANSON
5	82.0%	BELL et AL
6	52.3%	FLETCHER et AL (1961)
	35-71%	HANSON
	50%	
8	38.0%	FLETCHER et AL (1961)
9	41.9%	” ”
10	34.0%	” ”
16	23.5%	” ”
18	24.5%	” ”



• 10-15 % NEVER ACHIEVE *ADULT SWALLOW*

Prevalence vs Age



Fletcher et al. 1961

ROLE of the TONGUE in MALOCCLUSION

✦ DURATION

✦ INTENSITY

- LIGHT vs HEAVY PRESSURE
- OPEN BITES: 2 X normal tongue pressure
- PROTRUDING INC.: less pressure against incisors

✦ FREQUENCY

- T. THRUSTERS SWALLOW LESS OFTEN



✦ RESTING POSTURE

TONGUE THRUSTING vs MALOCCLUSION

... SOME CONCLUSIONS

- ✦ T.T. & maloccl. relationship is *unclear*
(WHITE, 1979)
- ✦ Chronic / persistent T.T.
 - may prevent spontaneous self-correction of a maloccl. or exacerbate it.
(AAO, 1991)
- ✦ *Direct* cause-and-effect relationship is questionable
(AAO, 1991)
- ✦ T.T. = *Contributing factor*
in the development of malocclusions



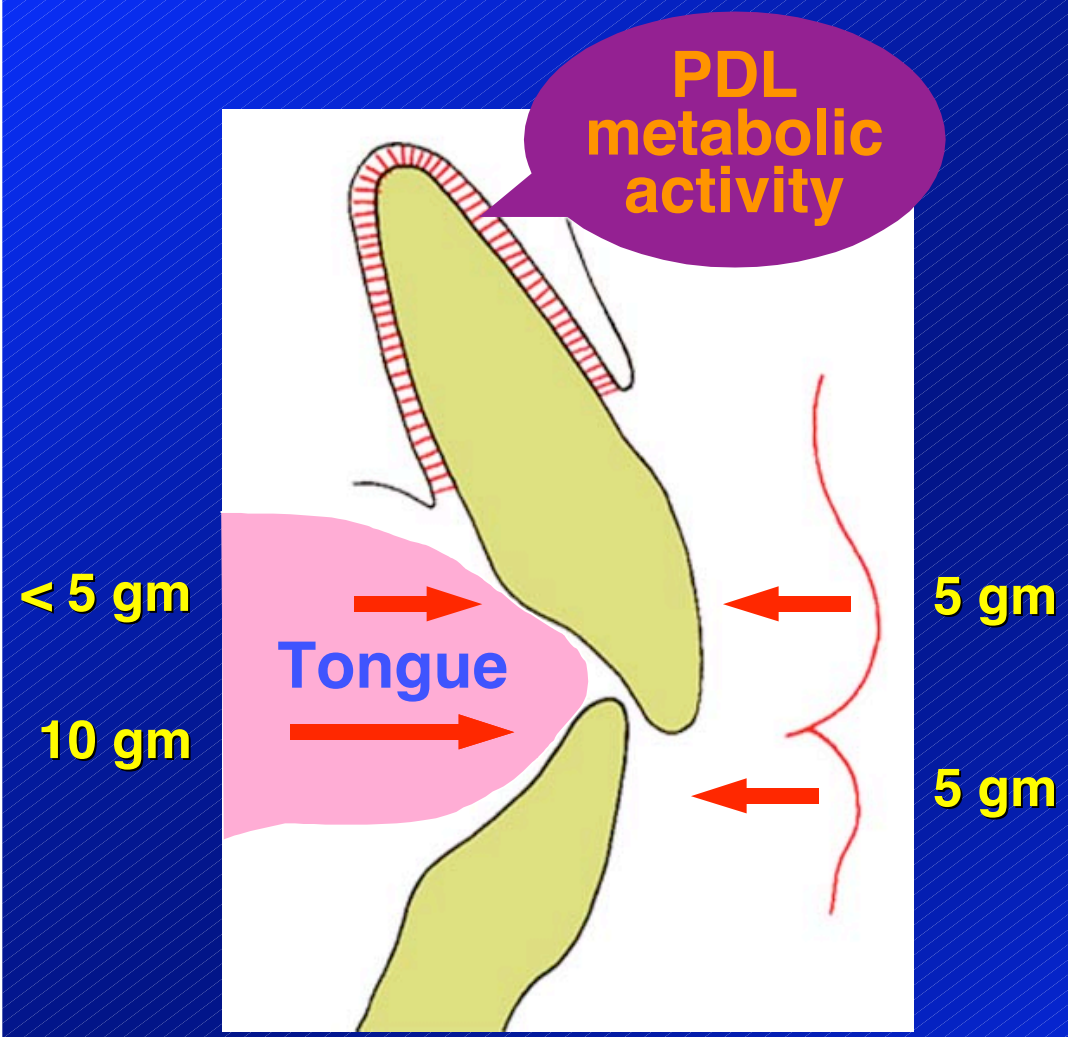
Multifactorial Etiology

GLOSSECTOMY EXPERIMENT CONCLUSIONS

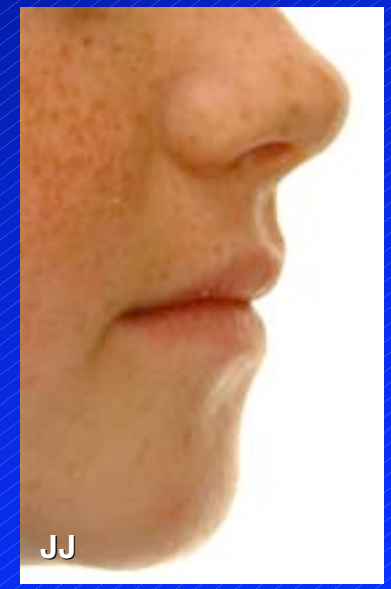
HARVOLD et AL, 1968

- ✦ **TONGUE FUNCTION & POSTURE**
 - greater influence on the mand. arch (stability)
- ✦ **OCCL. & INTERDIGITATION of TEETH**
 - minor influence on arch form
- ✦ **SHAPE OF THE TONGUE**
 - adapts to its surroundings

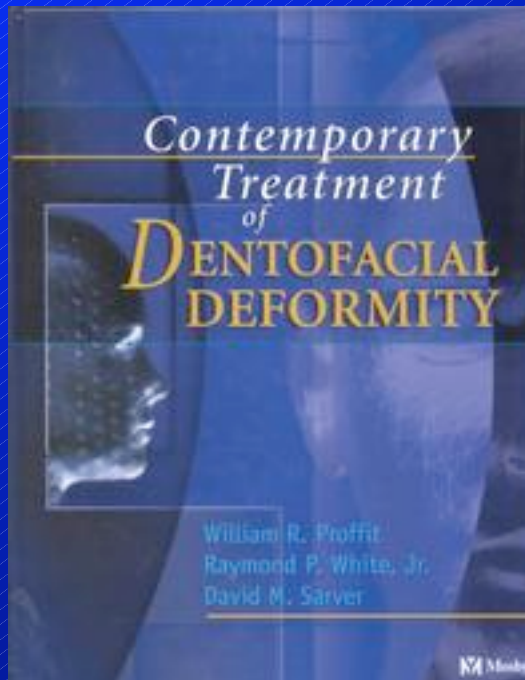
Resting Pressure: Tongue vs Lips



Balanced Forces
 \neq
Equal Forces



Soft Tissue Paradigm



« **Goals and Limitations** of Orthodontic and Orthognatic treatments are **determined** by the **soft tissues** of the mouth and face and not by the teeth and bones »

W. Proffit 2004

MOUTH BREATHING FACTS

✦ RESPIRATORY NEEDS

- = Primary determinant of jaw & tongue posture
(CAN ALTER JAW & TONGUE POSITION)

✦ Newborns = Obligatory nasal breathers

✦ HUMANS = Nasal breathers primarily

✦ TOTAL NASAL OBSTRUCTION

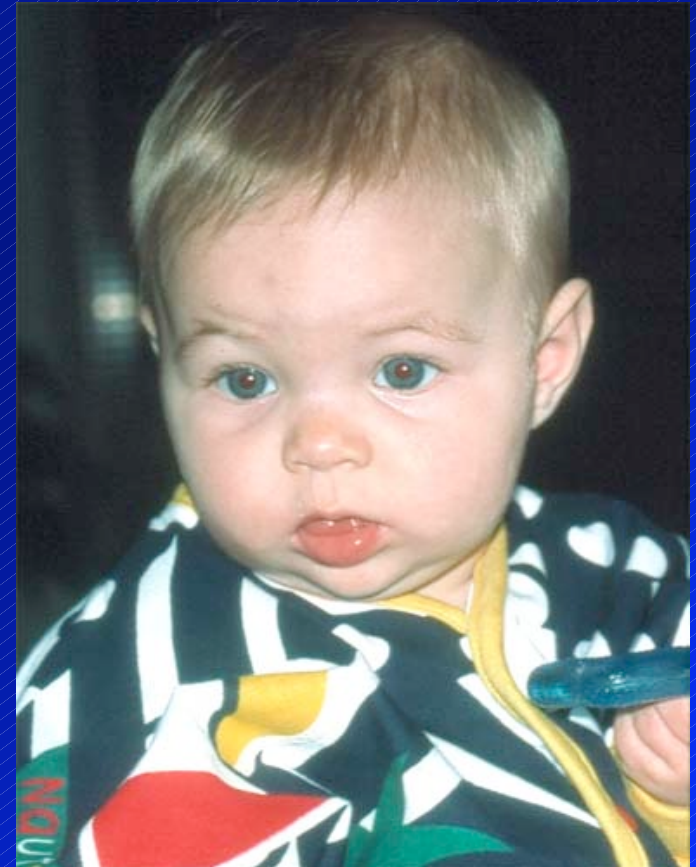
- Very rare in humans

✦ TERMINOLOGY: “*ORONASAL*” RESPIRATION



MOUTH BREATHING: Possible Etiologies

- ✦ ENLARGED T & A
- ✦ STRUCTURAL NASAL DEFECTS
- ✦ NASAL POLYPS
- ✦ **CHRONIC ALLERGIES**
- ✦ INFECTIONS
- ✦ ASTHMA
- ✦ FOREIGN BODIES
- ✦ UNREDUCED FRACTURES
- ✦ AGGRESSIVE SURGICAL TX
(cleft palate)



➡ **Anything causing obstruction may lead to mouth breathing**

Effects of M. Breathing Caused by Nasal Obstruction

(Rhesus monkey experiment - Harvold et AL., 1973)

CONCLUSIONS

✦ CHANGED MODE OF BREATHING

GRADUAL: NASAL  ORAL

✦ DIFFERENT ADAPTATIONS (individual variation)

✦ VARIOUS MALOCCLUSIONS DEVELOPED:

CL II-III, OPB, ANT. XB, SPACING, 2-BITES

• = ADAPTATIONS / COMPENSATIONS

✦ PARTIALLY REVERSIBLE

ROLE of TONSILS & ADENOIDS

✦ IMMUNOLOGY: autovaccination

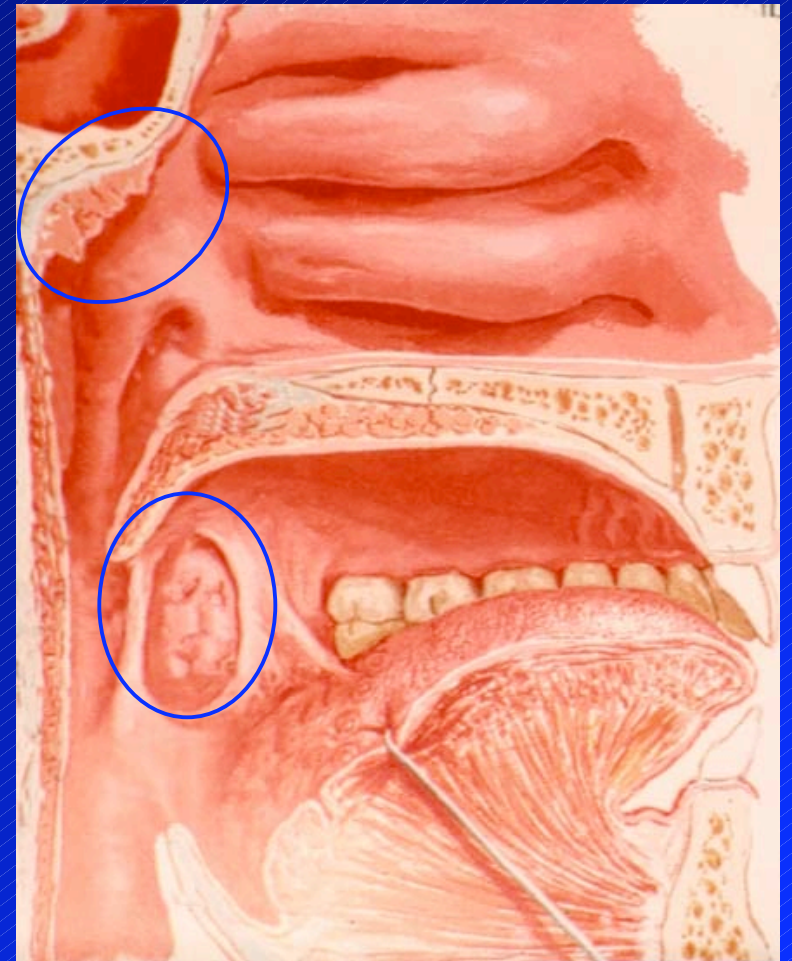
- lymphocytes, antibodies

✦ “GATE - KEEPERS”:

- strategic locations

✦ EARLY PROTECTION:

- 1st few weeks of life
- Tonsils vs Adenoids



CHILDREN WITH ENLARGED ADENOIDS & OBSTRUCTION

(Linder-Aronson et AL, 1970)

- ✦ REDUCED NASAL AIRFLOW
- ✦ STEEPER MAND. PLANE ANGLE
- ✦ MORE RETROGNATHIC MANDIBLES
- ✦ LONGER ANT. FACIAL HEIGHT
- ✦ MAX. CONSTRICTION TENDENCY

PROFFIT, 1986:

- ✦ MAX. CONSTRICTION TENDENCY
- ✦ MORE UPRIGHT INCISORS

TONSILLECTOMY & ADENOIDECTOMY

- ✦ **T&A USED TO BE REMOVED ROUTINELY**
- ✦ **1980's: STILL VERY COMMON**
- ✦ **TREND:**
 - **2 x ADENOIDECTOMY ONLY**
 - **TONSILLECTOMY: SLIGHT INCREASE**
 - **2 SEPARATE PROCEDURES**
- ✦ **RELAPSE:**
 - **ADENOIDS: COMMON BEFORE AGE 3**
 - **TONSILS: LESS FREQUENT**

INDICATIONS FOR T&A REMOVAL

✦ INFECTIONS

- ACUTE & REPETITIVE (T & A)
- CHRONIC (T & A)
- RECURRENT (middle ear)

✦ HYPERTROPHY LEADING TO OBSTRUCTION

✦ FUNCTIONAL DISTURBANCES

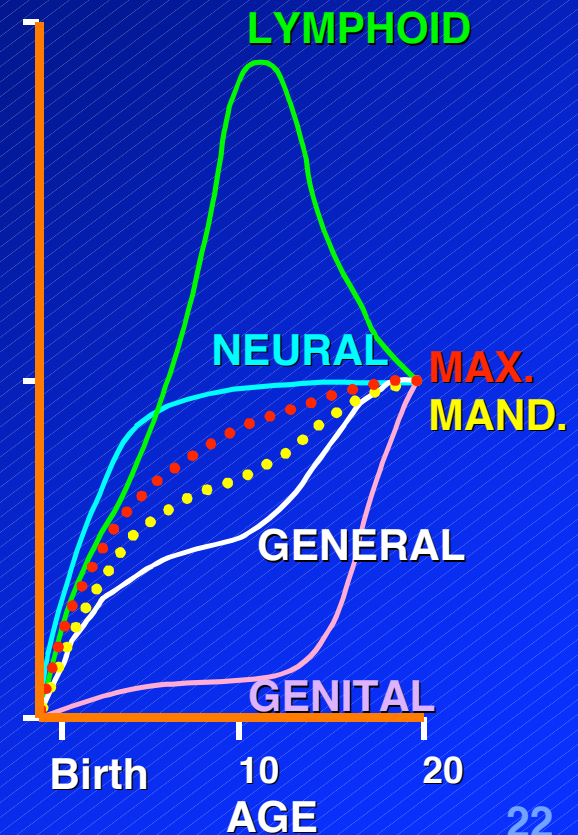
- SWALLOW
- SPEECH
- SLEEP - RESPIRATION

T & A ...FACTS

- ✦ GROWTH PEAK (adenoids): 10-11 \Rightarrow 14-15 yo
- ✦ PUBERTY: involution of lymphoid tissues
- ✦ REGRESSION: Doesn't always occur
- ✦ NASOPHARYNX SIZE:

Increase: 150% (1 \rightarrow 17y)

- ✦ ADENOID RATE $>$ NASOPHARYNX
Obstruction may disappear



Non-Nutritive Sucking Habits (N-NSH) THUMB SUCKING & DIGIT HABITS

✦ INTENSITY (force)

✦ FREQUENCY

✓ ✦ DURATION (treshold)

✦ CHRONOLOGY (age)

- Deciduous vs Permanent Dent.



NON-NUTRITIVE SUCKING HABITS (N-NSH) PREVALENCE

INFANTS

0-1 y

± 100 % (natural)

50-70 %

3-4.5 y

45 %

4-5 y

SHOULD STOP NATURALLY

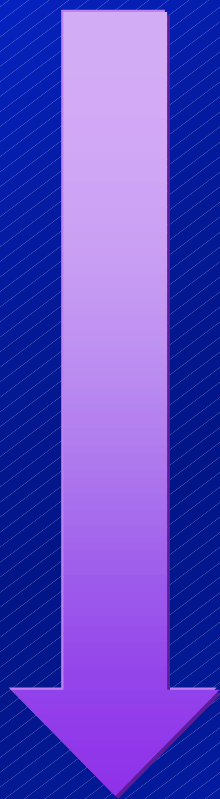
IF PERSISTS = CHRONIC N-NSH

6 y

13.6 %

11 y

5.9 % (females > males)



Digit Habits (NNSH): Possible Sequellae

✦ PRIMARY DENTITION

- Affects mainly the anterior area
- ✓ • Temporary & Reversible



Digit Habits (NNSH): Possible Sequellae

✦ PROLONGED HABITS

- Maxillary arch contraction
- U. INC.: Spacing, Flaring
- L. INC.: Lingual tipping
- Ant. Open Bite & Secondary T.T.



BOTTLE FEEDING vs MALOCCLUSION

(Meyers et Al, 1988)

- ✦ **700 CHILDREN, age 10-12 y**
- ✦ **METHOD & DURATION OF FEEDING**
- ✦ **TYPE OF NIPPLE USED**
- ✦ **PACIFIER USE**
- ✦ **SUCKING HABITS (thumb / finger)**
- ✦ **HIST. OF ORTHO TX (child & parents)**

Findings:

- ✦ Need for Treatment associated with:
 - Bottle feeding (trend)
 - Exposure to bottle = incr. need for Tx (trend)
 - Parental Hx of ortho Tx (genetics): significant
- ✦ **No assoc.** between method of feeding & N-NSH
- ✦ NUK vs other brands: **no proof of a protective effect**

Bottle-F. may contribute to malocclusion by:

- ✦ ALTERING sucking mcx → growing facial bones
- ✦ CREATING an ABNORMAL SWALLOWING PATTERN
- ✦ INCREASING the PREVALENCE of N-NSH

FEEDING METHODS vs ORAL DEVELOPMENT

(breast vs bottle-feeding)

- ✦ **NO *DIRECT* RELATIONSHIP DOCUMENTED**
- ✦ **NO SIGNIF. INFLUENCE ON THE INCIDENCE OF T. THRUSTING**
- ✦ **BREAST-FEEDING ADVANTAGES:**
 - **GREATER O. MUSCULATURE EXERCISE**
 - REQUIRES 60 X MORE ENERGY
 - DIGASTRIC = 2 X STRONGER
 - CONSTANT PULLING = MAND. GROWTH

Westover et al, 1988