



**KK Women's and
Children's Hospital**
SingHealth



1858-2018
Celebrating Our Heritage,
Shaping The Future

Forum for Healthcare Professionals

Inaugural Paediatric Respiratory and Sleep Medicine Symposium

Date : 8 to 10 March 2019

Venue: KKH Auditorium (Training Centre), Women's Tower, Level 1



OSA MANAGEMENT: DENTAL OPTIONS

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SingHealth DukeNUS
ACADEMIC MEDICAL CENTRE

Sleep Centre

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National
Neuroscience Institute



Singapore National
Eye Centre



Polyclinics
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Bright Vision
Hospital

BACKGROUND

ROOF OF MOUTH IS FLOOR OF NOSE

FRONT OF AIRWAY

MAXILLA / MANDIBLE

SOFT PALATE / TONGUE

EPIDEMIOLOGY

SLEEP-DISORDERED BREATHING IN ASIA SINGAPORE / HK CHILDREN

SNORING 28.1%; OSA 2%

HABITUAL SNORING 6.0% [SLEEP BRUXISM 94%] [OSA 20%]

**More prevalent among Chinese
Atopy is the strongest risk factor**

Chng SY et al., 2008
Ng D et al., 2002

BACKGROUND

PIERRE ROBIN SEQUENCE

“A fall of the base of the tongue considered as a new cause of nasopharyngeal respiratory impairment. Pierre Robin Sequence, a translation.”

Robin, 1994

Robin P (1923)
Backward lowering of the root of the tongue causing respiratory disturbances.
Bull Acad Med. 89;647-8

BACKGROUND

SMALL AIRWAY PHENOTYPE:

- Small mandible and chin
- Short chin-throat length
- Steep mandibular lower border
- Downward backward rotated mandible

CRANIOFACIAL PATTERNS RELATED TO SMALLER UPPER AIRWAY: DEFICIENT MANDIBLE & STEEP LOWER BORDER OF MANDIBLE.

Deng J and Gao X. A case-control study of craniofacial features of children with obstructive sleep apnea. *Sleep Breath.* 2012; 16(4):1219–27.

MULTIFACTORIAL

KEY CONTRIBUTORS

- **HIGH COLLAPSIBILITY**
- **LOW MUSCLE RESPONSIVENESS**
- **HIGH LOOP GAIN**
- **LOW AROUSAL THRESHOLD**

OSA is a heterogeneous disorder

Pcrit-anatomy is an important determinant

Nonanatomic traits are also present in most patients with OSA (56%)

Eckert et al., 2013. Am J Respir Crit Care Med. 15; 188(8): 996–1004

BACKGROUND

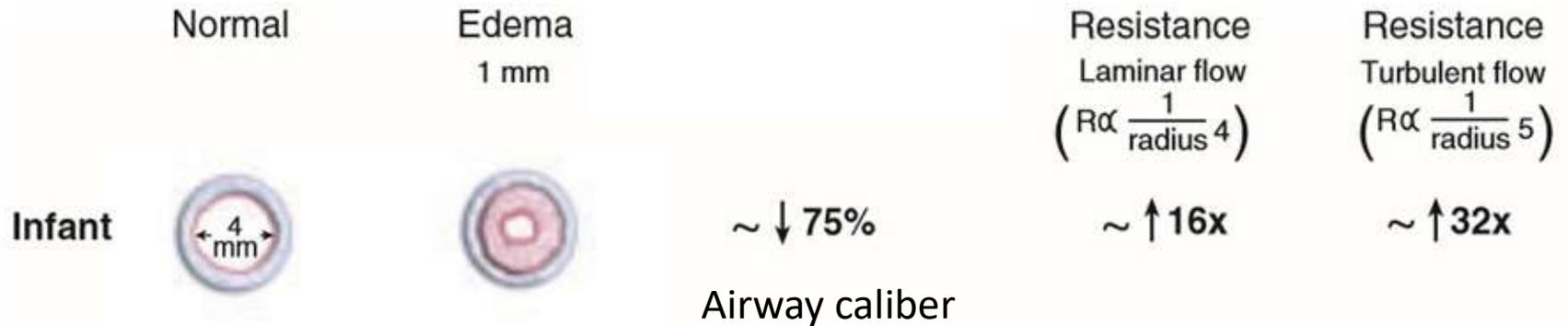
SMALL AIRWAY WIDTH
STRONGLY ASSOCIATED WITH OSA

LOW EVIDENCE OF CRANIOFACIAL
STRUCTURE & OSA. Katyal 2013

POISEUILLE'S LAW

$$\text{FLOW RATE} = \frac{\pi P r^4}{8 \eta l}$$

SMALL AIRWAY IS VULNERABLE



SMALL AIRWAY IS VULNERABLE

SNORING → NEUROPATHY

- Soft tissue oedema
- Progressive nerve lesion
- OSA progression
- Swallowing dysfunction

Friburg, 1999

- Disorganized desmin ($p < 0.0001$)
- Less Schwann cells ($p = 0.001$)
- Lower density of axons within nerve fascicles ($p < 0.02$)

Shah et al., 2018

RISK FACTOR

OBESITY



60% IN AHI VARIANCE

THE SUSPECTS

Chay OM, et al. OSAS in obese Singapore children.
Pediatr Pulmonol. 2000 ; 29(4):284-90.

Ng DK, et al. OSA in children with Down Syndrome.
Singapore Med J. 2006 Sep;47(9):774-9.

THE SUSPECTS

AT RISK

NARROW AIRWAY [NASOPHARYNGEAL & OROPHARYNGEAL]

NARROW MAXILLA

NARROW MANDIBLE

NO ANTEROPOSTERIOR OR VERTICAL PREDICTORS

SHORT TERM RAPID MAXILLARY EXPANSION

- REDUCES MOUTHBREATHING
- NEED BOTH TONSILLECTOMY AND RME

Guilleminault, 2011

ORTHODONTIC APPLIANCES MAY PERMANENTLY MODIFY BREATHING

Villa et al., 2012

RME EFFECTIVE IN REDUCING AHI (6.9)

Machado Jr et al., 2016

INCREASED RISK

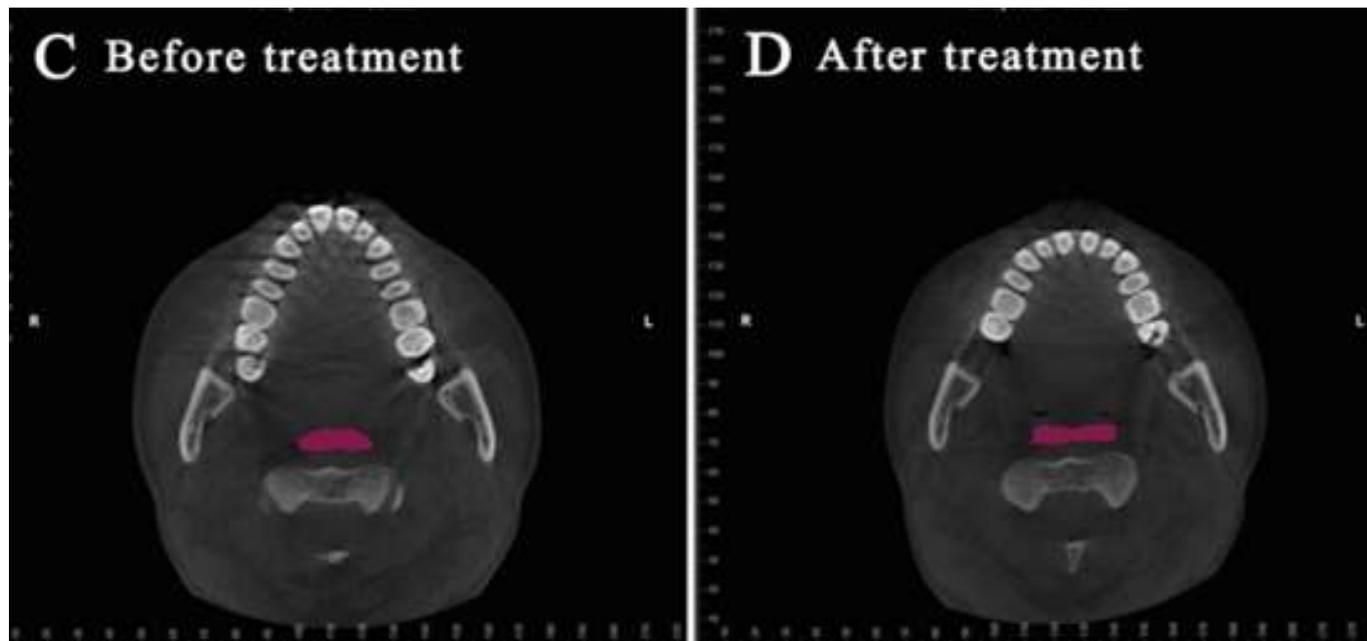
Airway compressed in A-P dimension

Untreated matched controls compared with extraction orthodontic treatment

Zhang J et al.

Upper Airway Changes after Orthodontic Extraction Treatment in Adults: A Preliminary Study using Cone Beam Computed Tomography.

PLOS ONE DOI:10.1371/journal.pone.0143233 Nov 20, 2015



INCREASED RISK

Retraction of lower incisors and airway reduction in velopharynx, glossopharynx and hypopharynx

Hyoid moved posteroinferiorly

Wang Q et al. Changes of pharyngeal airway size and hyoid bone position following orthodontic treatment of Class I bimaxillary protrusion. Angle Orthodontist. 2012; 82:115-21.



INCREASED RISK

Reduced volume of oral cavity and oropharynx
Downward backward mandibular rotation
Reduced retroglossal airway
28% AP and 12.8% in volume

Effect of orthognathic surgery
on the posterior airway space (PAS). Lye KW.
Ann Acad Med Singapore. 2008; 37:677-82.

MYOFUNCTIONAL THERAPY

REDUCES AHI IN 62% CHILDREN [AHI - 14.3]

IMPROVED OXYGEN SATURATION [+ 4.2%]

SNORING REDUCED [- 10% TST]

MYOFUNCTIONAL THERAPY IS AN ADJUNCT TO OTHER OSA TREATMENT

Camacho et al., 2015



CLINICAL PRACTICE GUIDELINE

Diagnosis and Management of Childhood Obstructive Sleep Apnea Syndrome

Symptoms and Signs of OSAS

History

- Frequent snoring (≥ 3 nights/wk)
- Labored breathing during sleep
- Gasps/snorting noises/observed episodes of apnea
- Sleep enuresis (especially secondary enuresis)
- Sleeping in a seated position or with the neck hyperextended
- Cyanosis
- Headaches on awakening
- Daytime sleepiness
- Attention-deficit/hyperactivity disorder
- Learning problems

Physical examination

- Underweight or overweight
- Tonsillar hypertrophy
- Adenoidal facies
- Micrognathia/retrognathia
- High-arched palate
- Failure to thrive
- Hypertension

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Diagnosis and Management of Childhood Obstructive Sleep Apnea Syndrome

Carole L. Marcus, Lee Jay Brooks, Kari A. Draper, David Gozal, Ann Carol Halbower, Jacqueline Jones, Michael S. Schechter, Stephen Howard Sheldon, Karen Spruyt, Sally Davidson Ward, Christopher Lehmann and Richard N. Shiffman

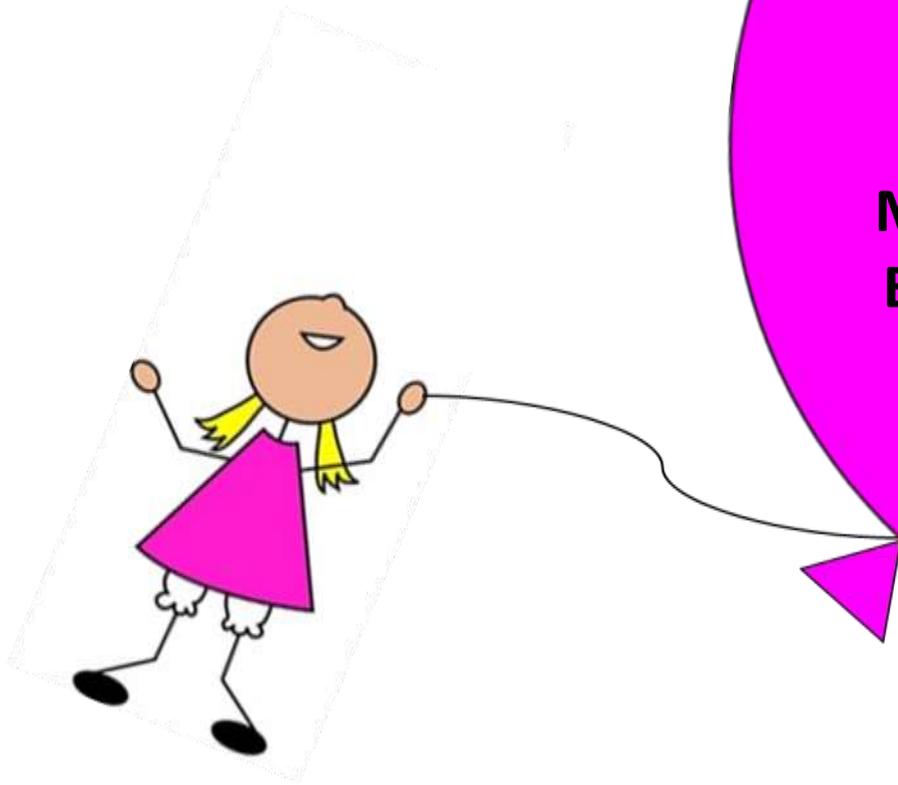
Pediatrics; originally published online August 27, 2012;

DOI: 10.1542/peds.2012-1671

- IMPROVE CHILDHOOD OSA DETECTION - SCREENING
- PSG OR HST
- ADENOTONSILLECTOMY
- MONITOR POST-OP
- RE-EVALUATE FOR FURTHER TREATMENT
WEIGHT LOSS, NASAL STEROIDS, CPAP, ADJUNCTS

IT TAKES A TEAM TO GET IT RIGHT

STEPWISE APPROACH



Team Management

SCREEN FOR SNORING

PSG

CPAP

MANAGE WEIGHT & RHINITIS

EXCISE ADENOIDS & TONSILS

JAW EXPANSION

JAW GROWTH

thank you

tusind tak
謝謝 dakujem vám
ngiyabonga
dziękuję
merci
baie dankie
धन्यवाद molte grazie
gracias
obrigada
obrigado
takk
dank u
mahalo
teşekkür ederim
شكرا
gràcies
tänan
tack så mycket
suksema
danke
teşekkür edire