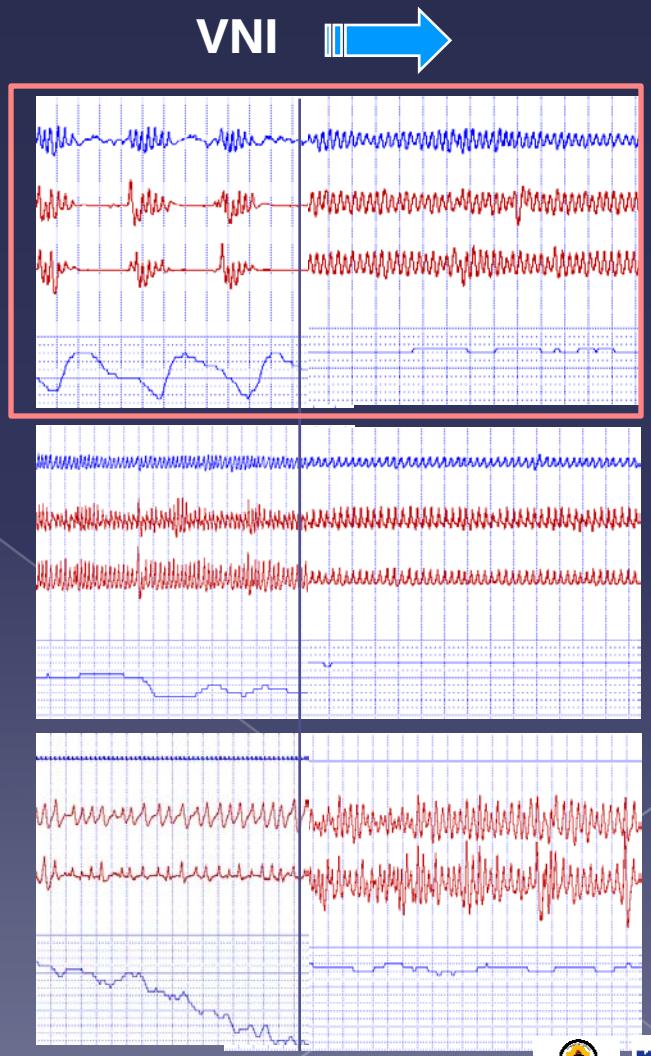
CPAP en el niño pequeño: es posible?

Juan M. Figueroa
Pediatra Neumonólogo

- Sección Neumonología Infantil; Htal. de Clínicas-UBA
- CIRES; Fund.P.Cassará

Ventilación No Invasiva: Efectos

- **Obstrucción de Vías Aéreas Superiores (SAHOS) = CPAP**
- Disfunción Toráxica/ Pulmonar
- Hipoventilación Alveolar Central



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Paris - France

NPPV unloads the respiratory muscles in infants with upper airway obstruction

10 infants with severe upper airway obstruction
mean age 11.5 ± 5.4 months
weight 7.2 ± 0.4 kg

	Spontaneous breathing	Noninvasive CPAP
Respiratory rate	51 ± 18	33 ± 13
Ti/Ttot (%)	60 ± 14	44 ± 9*
Swing Pes (cm H_2O)	35 ± 21	13 ± 4*
Swing Pdi (cm H_2O)	35 ± 19	15 ± 7*
PTPes/min (cm $H_2O.s.min^{-1}$)	793 ± 453	195 ± 118*
PTPdi/min cm $H_2O.s.min^{-1}$)	761 ± 333	245 ± 106*

* p< 0.005

Essouri *et al.* Intensive Care Med 2006;7:329

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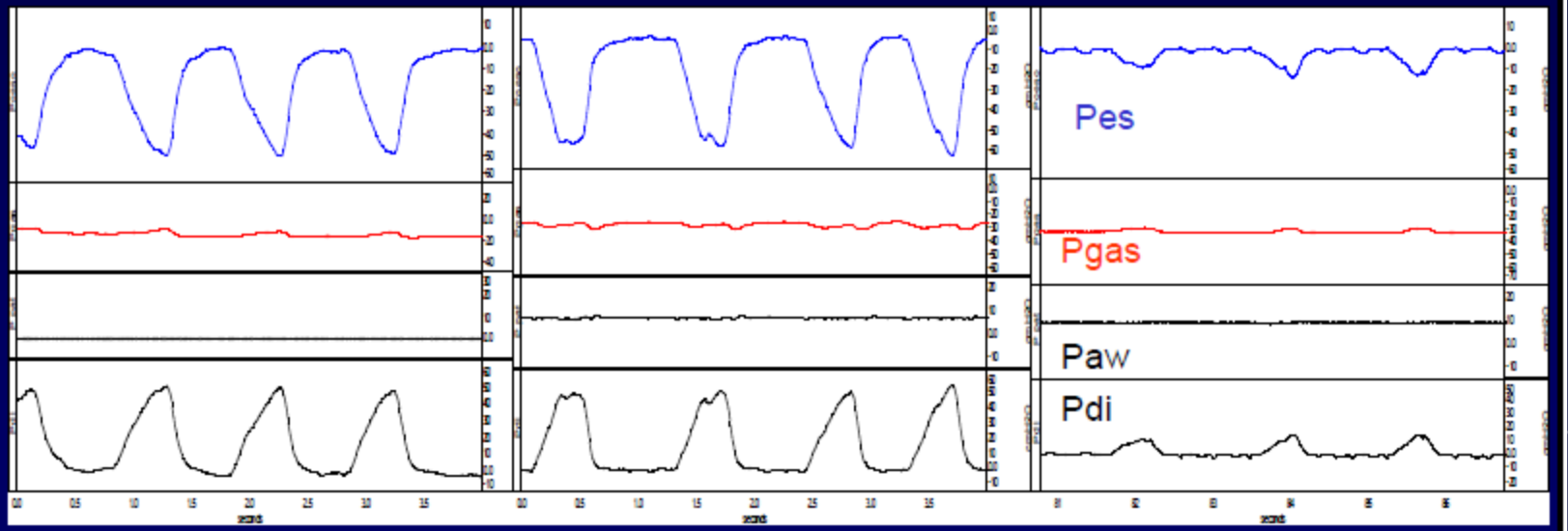
Efficacité de la PPC

Fille âgé de 2 mois, syndrome de Pierre Robin
glossoptose et laryngomalacie

Respiration spontanée

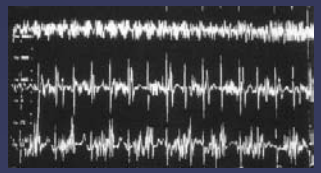
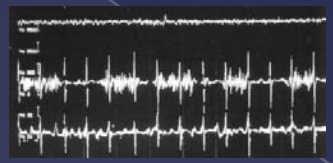
PPC 8 cm H_2O

PPC 10 cm H_2O

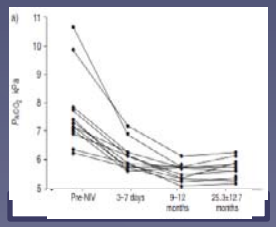


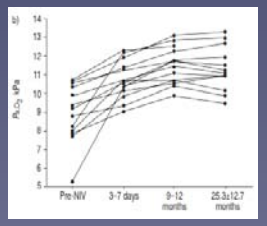
CPAP: Efectos

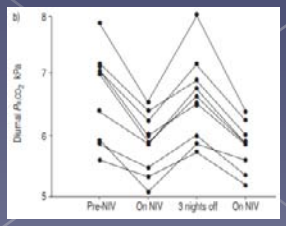
- Apertura de Vías Aéreas Superiores
- Soporte de Vías Aéreas y Torax
- Reducción trabajo músculos respiratorios

- Captura de unidades colapsadas, aumento CRF
- Mejora en manejo de secreciones
- Reseteo del centro respiratorio
- Mejora función respiratoria
- Mejora gases en vigilia







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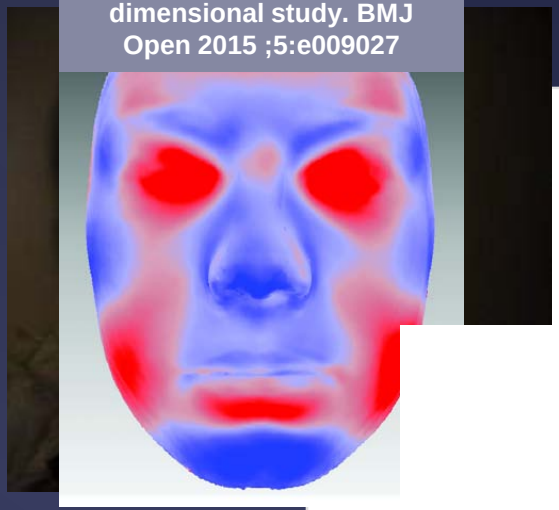
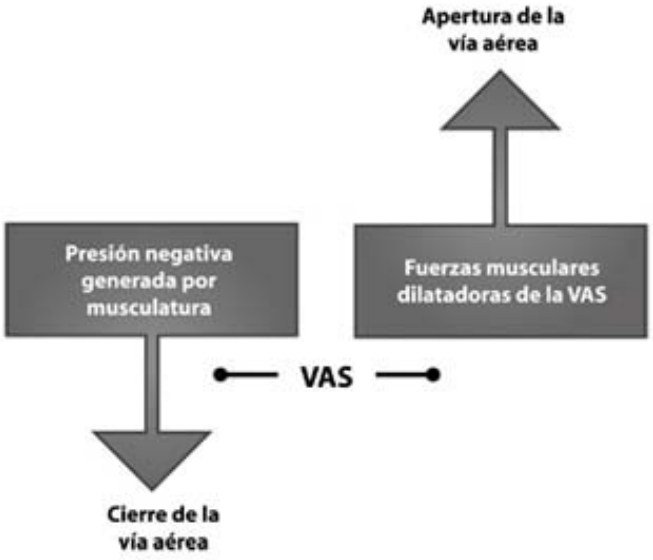
Predisponentes

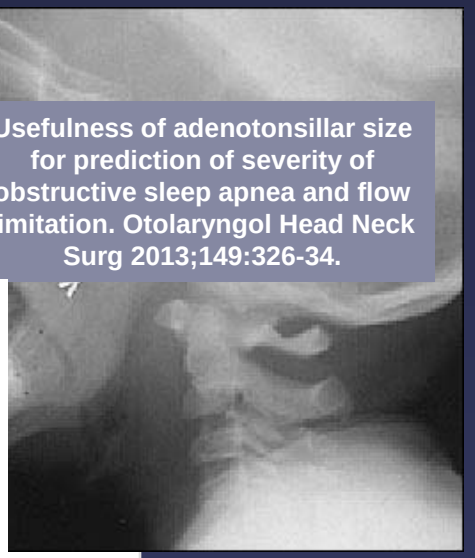
The influence of snoring, mouth breathing and apnoea on facial morphology in late childhood: a three-dimensional study. BMJ Open 2015 ;5:e009027



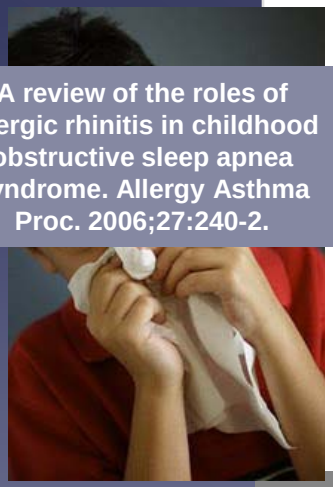
Respiratory and Auditory Cortical Processing in Children with Obstructive Sleep Apnea Syndrome. AJRCCM 2012;



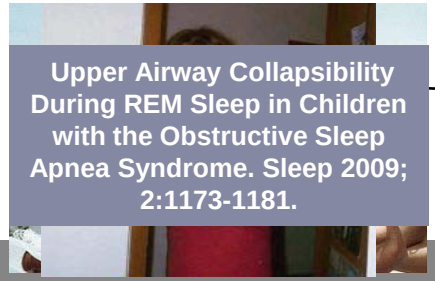
Usefulness of adenotonsillar size for prediction of severity of obstructive sleep apnea and flow limitation. Otolaryngol Head Neck Surg 2013;149:326-34.



A review of the roles of allergic rhinitis in childhood obstructive sleep apnea syndrome. Allergy Asthma Proc. 2006;27:240-2.

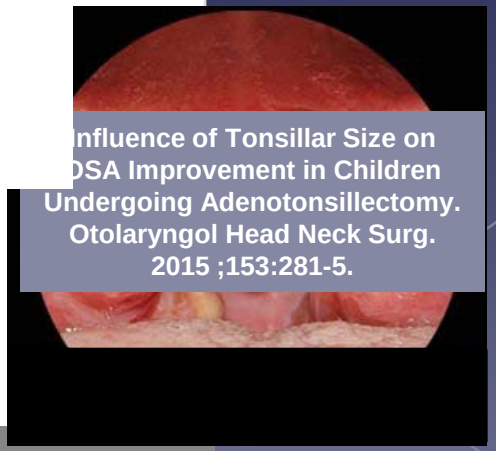


Upper Airway Collapsibility During REM Sleep in Children with the Obstructive Sleep Apnea Syndrome. Sleep 2009; 2:1173-1181.



Histological analysis of palatopharyngeal muscle from children with snoring and obstructive sleep apnea syndrome. Int J Pediatr Otorhinolaryngol 2007;71:283-90.

Influence of Tonsillar Size on OSA Improvement in Children Undergoing Adenotonsillectomy. Otolaryngol Head Neck Surg. 2015 ;153:281-5.



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Tratamiento

* Médico

* Adenoamigdalectomía

* CPAPnasal

* Traqueostomía

* Oxígeno

Filosofía de la Ventilación Aguda

- Parámetros mínimos.
- Destete = desafío.
- Gasto de energía en trabajo respiratorio =

  menor energía disponible para reparación, crecimiento, etc.

Filosofía de la Ventilación Crónica

- Parámetros de reemplazo.
- Reposo respiratorio.
- Energía disponible para reparación,

  crecimiento, etc.

  maximizar la calidad

  de vida.

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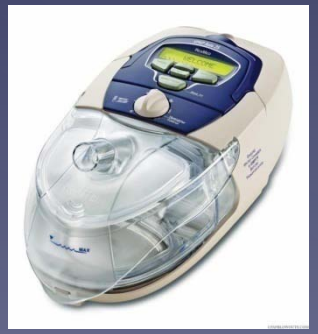
Equipamiento:

- Respiradores regulados por presión.
- Turbina eléctrica.
- Pequeños, portátiles, simples, económicos.
- No requieren aire comprimido.
- Compenzan fugas.



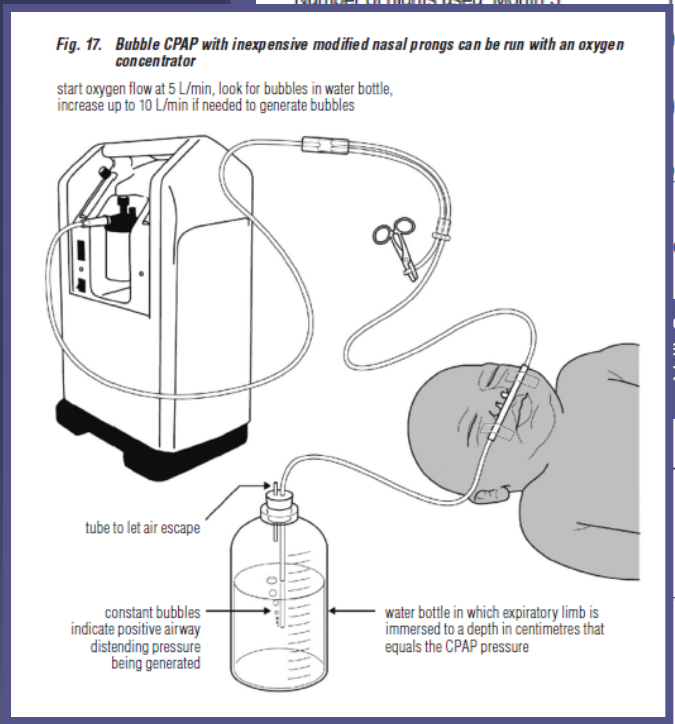
Ventilación No Invasiva en SAOS: CPAP o BiPAP?

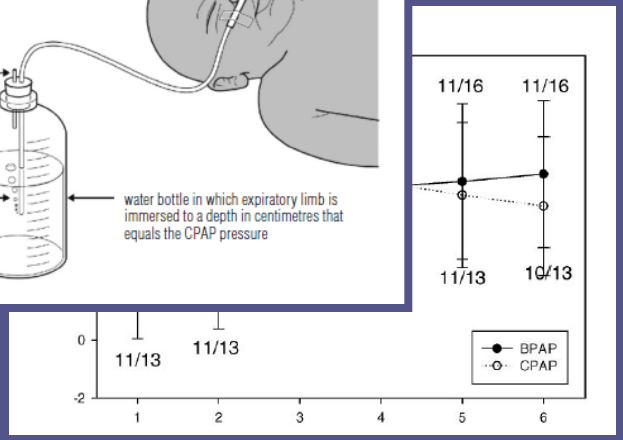
Table 2—Adherence data

	CPAP	Bi-Flex
Number of nights used, Month 1	24 ± 6	22 ± 9
Number of nights used, Month 3	18 ± 10	19 ± 9
	9 ± 120	294 ± 176
	1 ± 135	185 ± 165
	5 ± 147	183 ± 169

cant differences between

of Two Different
apy on Adherence
Clin Sleep Med





Adherence to and Effectiveness of Positive Airway Pressure Therapy in Children With Obstructive Sleep Apnea. *Marcus et al. Pediatrics 2006;117;e442*

REVERSAL OF OBSTRUCTIVE SLEEP APNOEA BY CONTINUOUS POSITIVE AIRWAY PRESSURE APPLIED THROUGH THE NARES

COLIN E. SULLIVAN FAIQ G. ISSA
MICHAEL BERTHON-JONES LORRAINE EVES

THE LANCET, APRIL 18, 1981

CPAP en SAOS: Interfaces

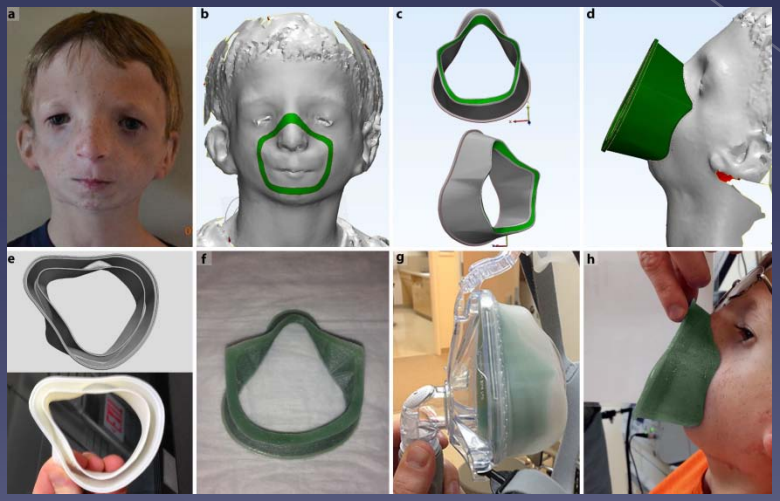
Máscara Nasal: controlar fugas; soporte en puente nasal; si fuga por boca sostenerla cerrada; mantener escapes abiertos

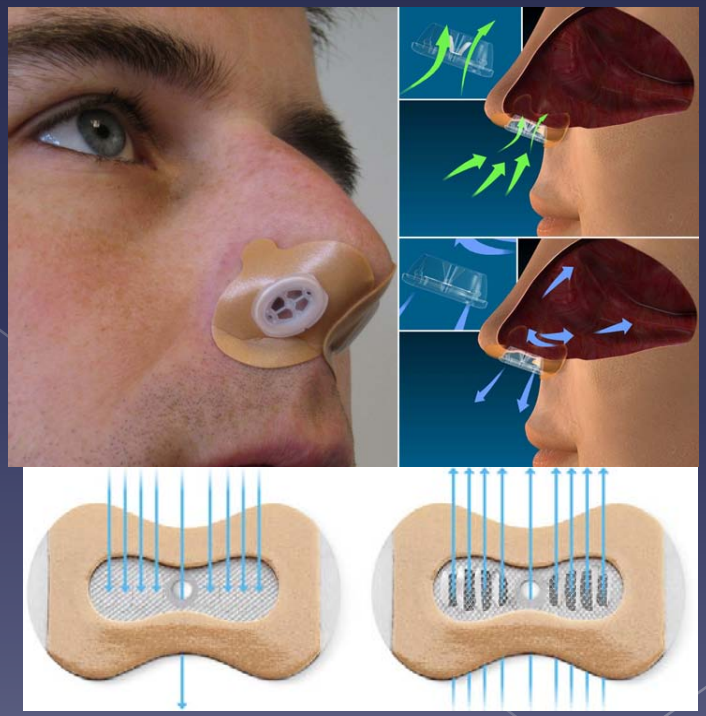
Interfaces
Novedades

NEPAP

Personalized 3D-Printed CPAP Masks Improve CPAP Effectiveness in Children with OSA and Craniofacial Anomalies

Robert J Morrison1, Kyle K VanKoevering1, Hassan B Nasser1, Khaled N Kashlan1, Stephanie K Kline1, Daniel R Jensen2, Sean P Edwards1, Fauziya Hassan1, Helena M Schotland1, Ronald D Chervin1, Steven R Buchman1, Scott J Hollister1, Susan L Garetz1, Glenn E Green1





CPAP en SAOS: Adherencia al Tratamiento

SCIENTIFIC INVESTIGATIONS

NEW RESEARCH

JCSM
Journal of Clinical Sleep Medicine
http://dx.doi.org/10.5664/jcsm.3276

Investigating Reasons for CPAP Adherence in Adolescents: A Qualitative Approach

Priya S. Prashad, M.D., M.S.C.E.[1]; Carole L. Marcus, MB.BCh., F.A.A.S.M.[1]; Jill Maggs, Ed.D., M.Med.Sci.[1]; Nicolas Stettler, M.D., M.S.C.E.[2]; Mary A. Cornaglia[1]; Priscilla Costa, M.S.[1]; Kristina Puzino, B.A.[1]; Melissa Xanthopoulos, Ph.D.[1]; Ruth Bradford[1]; Frances K. Barg, Ph.D., M.Ed.[3]

[1]Sleep Center, The Children's Hospital of Philadelphia, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA; [2]Exponent, Inc. Washington, DC; [3]Department of Family Medicine and Community Health, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA

Study Objectives: Adolescents with obstructive sleep apnea syndrome (OSAS) represent an important but understudied subgroup of long-term continuous positive airway pressure (CPAP) users. The purpose of this qualitative study was to identify factors related to adherence from the perspective of adolescents and their caregivers.

Methods: Individual open-ended, semi-structured interviews were conducted with adolescents (n = 21) and caregivers (n = 20). Objective adherence data from the adolescents' CPAP machines during the previous month was obtained. Adolescents with different adherence levels and their caregivers were asked their views on CPAP. Using a modified grounded theory approach, we identified themes and developed theories that explained the adolescents' adherence patterns.

Results: Adolescent participants (n = 21) were aged 12-18 years, predominantly male (n = 15), African American (n = 16), users of CPAP for at least one month. Caregivers were mainly mothers (n = 17). Seven adolescents had high use (mean use 381 ± 80 min per night), 7 had low use (mean use 30 ± 24 min per night), and 7 had no use during the month prior to being interviewed. Degree of structure in the home, social reactions, mode of communication among family members, and perception of benefits were issues that played a role in CPAP adherence.

Conclusions: Understanding the adolescent and family experience of using CPAP may be key to increasing adolescent CPAP adherence. As a result of our findings, we speculate that health education, peer support groups, and developmentally appropriate individualized support strategies may be important in promoting adherence. Future studies should examine these theories of CPAP adherence.

Keywords: Qualitative, interviews, adolescent, CPAP adherence

Citation: Prashad PS; Marcus CL; Maggs J; Stettler N; Cornaglia MA; Costa P; Puzino K; Xanthopoulos M; Bradford R; Barg FK. Investigating reasons for CPAP adherence in adolescents: a qualitative approach. *J Clin Sleep Med* 2013;9(12):1303-1313.

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CPAP en SAOS: Calentador/Humidificador?

Functional short- and long-term effects of nasal CPAP with and without humidification on the ciliary function of the nasal respiratory epithelium.
Sommer et al. Sleep Breath 2014; 18:85-93.

Independent of airway humidification, nCPAP has moderate effects on short-term ciliary function of the nasal respiratory epithelium. However, a significant increase in ciliary function-both in terms of an increased CBF and a decreased MTT-was detected after long-term use. The effect was more pronounced when humidification was used during nCPAP.

Nasal inflammation in sleep apnoea patients using CPAP and effect of heated humidification.
Koutsourelakis et al. Eur Respir J 2011;37:587-94.

In conclusion, nasal obstruction of OSA patients on CPAP treatment is inflammatory in origin and the addition of heated humidification decreases nasal resistance and mucosal inflammation.

El uso SISTEMATICO de calentador/humidificador reduce los sintomas nasales pero NO mejora la adherencia al tratamiento.

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Comienzo de tratamiento CPAP / BiPAP: estrategia

- Inicio por períodos cortos en vigilia, parámetros mínimos *(4 cm)*
- Uso nocturno parámetros mínimos
- Titulacion tentativa:

  ronquido-oximetria
- Titulación final bajo PSG
- Parámetros habituales: *8 cm*

Monitoreo

- mínimo indispensable
- solo prevención de complicaciones agudas severas

- crecimiento, desarrollo, síntomas...
- control 3-6 meses: oximetria

- **PSG anual**

Oximetría Nocturna

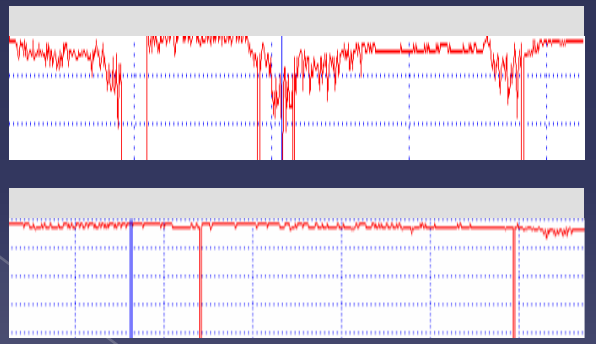
CLINICAL REVIEW

Pediatric OSAS: Oximetry can provide answers when polysomnography is not available

Sleep Medicine Reviews 27 (2016) 96–105

Athanasios Kaditis [a, *], Leila Kheirandish-Gozal [b], David Gozal [b]

In the study by Brouillette et al., the positive predictive value of oximetry for an obstructive AHI >1 episode/h was 97%, but the sensitivity was as low as 40%, regardless of the presence of adenotonsillar hypertrophy or other predisposing risk factors for OSAS [12]. However, almost 50% of children with negative oximetry had obstructive AHI >1 episode/h [12]. When a different threshold is used to define positive oximetry, i.e. at least two clusters of desaturation events and at least one SpO_2 drop below 90%, the sensitivity is much improved (86.6%) along with high values for specificity (98.9%), positive predictive value (98%) and negative predictive value (90.1%) [30].



[30] Velasco Suarez CT, Figueroa Turienzo JM, Len F, Mansilla E. Pulse oximetry recording in children with adenotonsillar hypertrophy: usefulness in the diagnostic of obstructive sleep apnea syndrome. Arch Argent Pediatr 2013;111:196–201.

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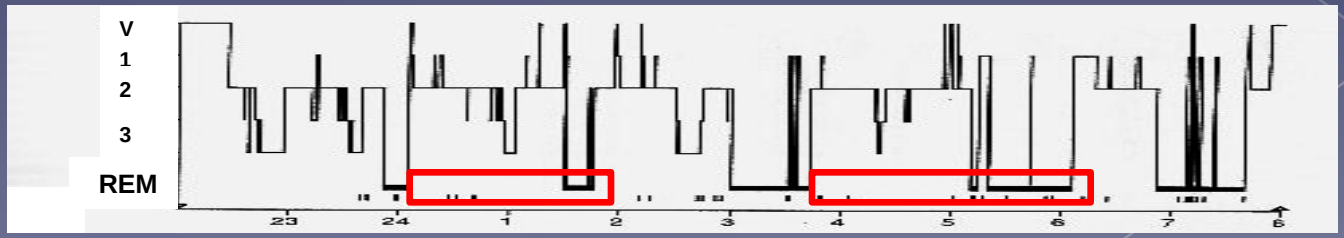
Video

Ciclos de Sueño



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➢ Ronquido, simple?

Snoring, Intermittent Hypoxia and Academic Performance in Primary School Children
Am J Respir Crit Care Med. 2003;168:464-8.

TABLE 2. ADJUSTED ODDS RATIOS FOR POOR ACADEMIC PERFORMANCE IN VARIOUS SCHOOL SUBJECTS STRATIFIED BY FREQUENCY OF SNORING IN STUDY PARTICIPANTS (N = 1,129)

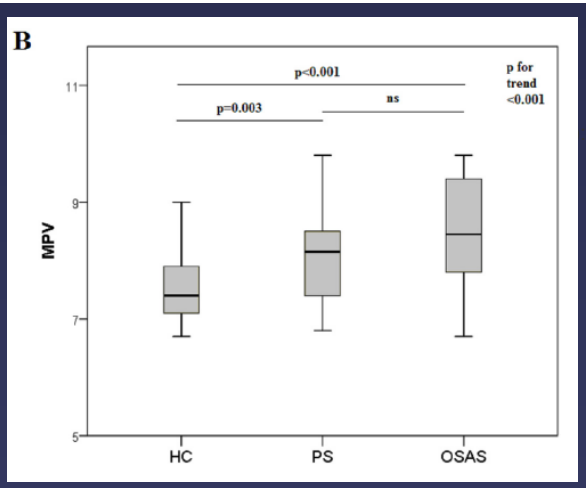
	Snoring Categories			
Poor Academic Performance Area	Never (OR)	Occasionally OR (95% CI; p value)	Frequently OR (95% CI; p value)	Always OR (95% CI; p value)
Mathematics	1.0	1.2 (0.8–1.8; 0.292)	2.4 (1.3–4.7; 0.008)	3.6 (1.3–10.1; 0.017)
Science	1.0	0.8 (0.5–1.3; 0.426)	2.0 (0.9–4.3; 0.075)	4.3 (1.3–14.6; 0.017)
Reading	1.0	0.7 (0.5–1.1; 0.168)	1.8 (0.9–3.8; 0.117)	1.1 (0.4–3.4; 0.817)
Spelling	1.0	1.1 (0.7–1.5; 0.797)	2.0 (1.04–3.8; 0.038)	3.5 (1.2–10.3; 0.020)
Handwriting	1.0	1.0 (0.7–1.6; 0.925)	1.2 (0.6–2.8; 0.601)	1.8 (0.5–5.9; 0.363)

TABLE 3. ADJUSTED ODDS RATIOS FOR POOR ACADEMIC PERFORMANCE IN VARIOUS SCHOOL SUBJECTS STRATIFIED BY FREQUENCY OF SNORING IN STUDY PARTICIPANTS WITHOUT INTERMITTENT HYPOXIA (N = 851)

	Snoring Categories			
Poor Academic Performance Area	Never (OR)	Occasionally (OR [95% CI; p value])	Frequently (OR [95% CI; p value])	Always (OR [95% CI; p value])
Mathematics	1.0	1.1 (0.7–2.0; 0.497)	2.8 (1.2–6.6; 0.016)	3.3 (0.9–12.6; 0.074)
Science	1.0	0.6 (0.4–1.2; 0.142)	1.5 (0.6–4.3; 0.415)	2.9 (0.6–13.1; 0.170)
Spelling	1.0	1.1 (0.7–1.7; 0.782)	2.2 (0.95–5.1; 0.066)	4.5 (1.1–18.1; 0.033)

Mean Platelet Volume, Vitamin D and C Reactive Protein Levels in Normal Weight Children with Primary Snoring and Obstructive Sleep Apnea Syndrome

Anna Maria Zicari[1*], Francesca Occasi[1*], Federica Di Mauro[1], Valeria Lollobrigida[1], Marco Di Fraia[1], Vincenzo Savastano[1], Lorenzo Loffredo[2], Francesco Nicita[1], Alberto Spalice[1], Marzia Duse[1]



Peripheral Blood Leukocyte Gene Expression Patterns and Metabolic Parameters in Habitually Snoring and Non-Snoring Children with Normal Polysomnographic Findings SLEEP 2011;34:153-160

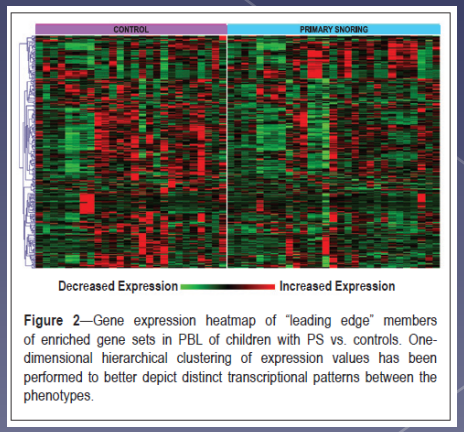


Figure 2—Gene expression heatmap of "leading edge" members of enriched gene sets in PBL of children with PS vs. controls. One-dimensional hierarchical clustering of expression values has been performed to better depict distinct transcriptional patterns between the phenotypes.

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Ventilación No Invasiva Domiciliaria Complicaciones

Severas:

neumotorax

perforación gástrica

aspiración

hipo o hiper CO_2

Menores:

lesiones en piel (puente nasal)

congestión o sequedad nasal

conjuntivitis

HIPOPLASIA CENTROFACIAL

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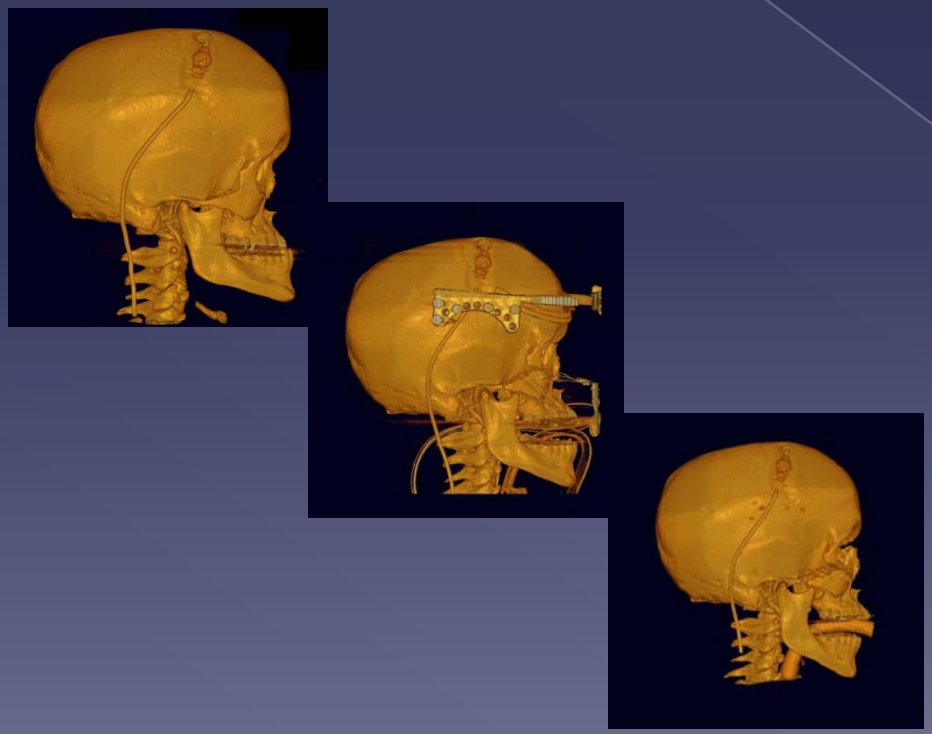
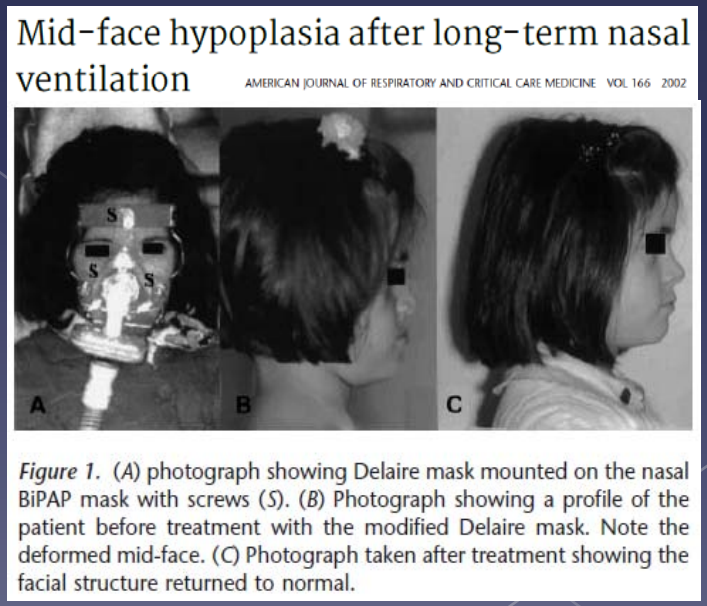
Ventilación No Invasiva Domiciliaria Complicaciones

MIDFACIAL AND DENTAL CHANGES ASSOCIATED WITH POSITIVE AIRWAY PRESSURE IN CHILDREN AND ADOLESCENTS WITH SLEEP-DISORDERED BREATHING. Soleil de Marsche Roberts. Thesis, University of Washington 2014.

AN UNREPORTED RISK IN THE USE OF HOME NASAL CONTINUOUS POSITIVE AIRWAY PRESSURE AND HOME NASAL VENTILATION IN CHILDREN. Li KK, Riley RW, Guilleminault C. *Chest 2000;117:916–918.*





Mid-face hypoplasia after long-term nasal ventilation

AMERICAN JOURNAL OF RESPIRATORY AND CRITICAL CARE MEDICINE VOL 166 2002

Figure 1. (*A*) photograph showing Delaire mask mounted on the nasal BiPAP mask with screws (*S*). (*B*) Photograph showing a profile of the patient before treatment with the modified Delaire mask. Note the deformed mid-face. (*C*) Photograph taken after treatment showing the facial structure returned to normal.

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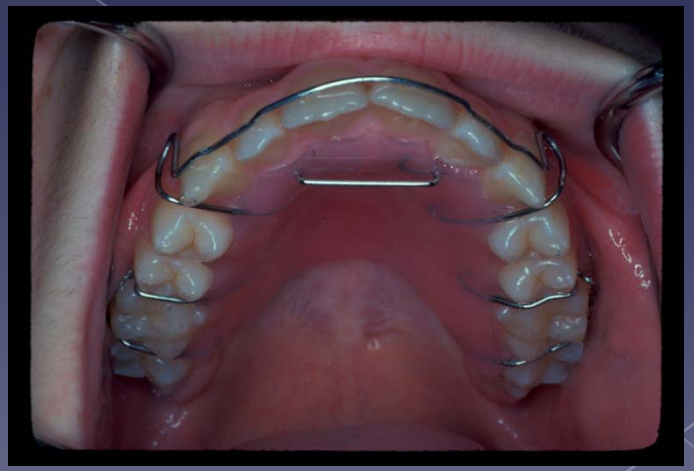
Evolución a largo plazo…

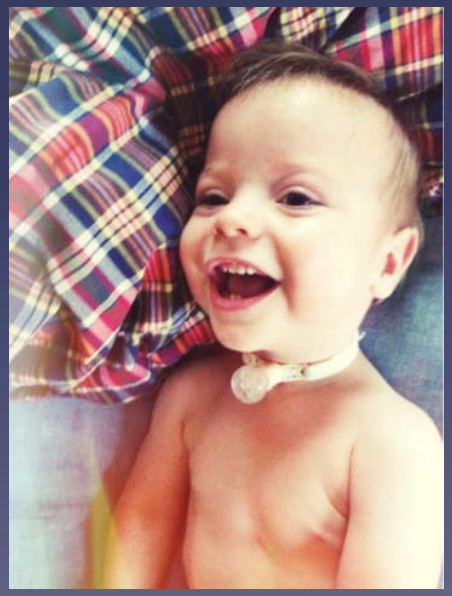
- Recaídas? función y morfología orofacial

  Respiración nasal

  → Odontología + Fonoaudiología ?



- **Pasaje de CPAPI** ⟺ **traqueostomía???**
- confort y deseo del paciente y su familia!!



Gracias por su atención !!

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