7ᵐᵒ Congreso Argentino de Neumonología Pediátrica

El laboratorio pulmonar en la práctica clínica
Miércoles 18,9:30hs

Pruebas de función pulmonar
y tos crónica

Virginia D'Alessandro

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Por un niño sano
en un mundo mejor

Objetivos

- Breve introducción sobre la TOS

- Estudios funcionales según la edad y patología

Introducción: TOS (1)

- Es un mecanismo de defensa para eliminar de la vía aérea partículas extrañas

- 3 fases: inspiración, compresión y expulsión

- Estímulos sensoriales de las vías respiratorias alcanzan el tronco cerebral por vía vagal

'Normal' or 'expected' cough

Non-specific cough

Specific cough
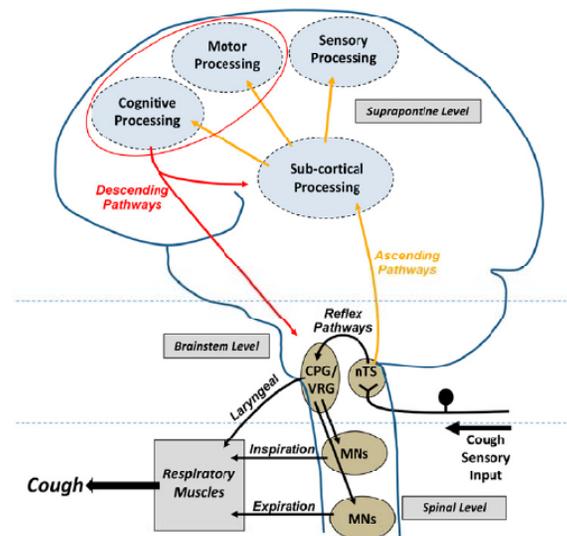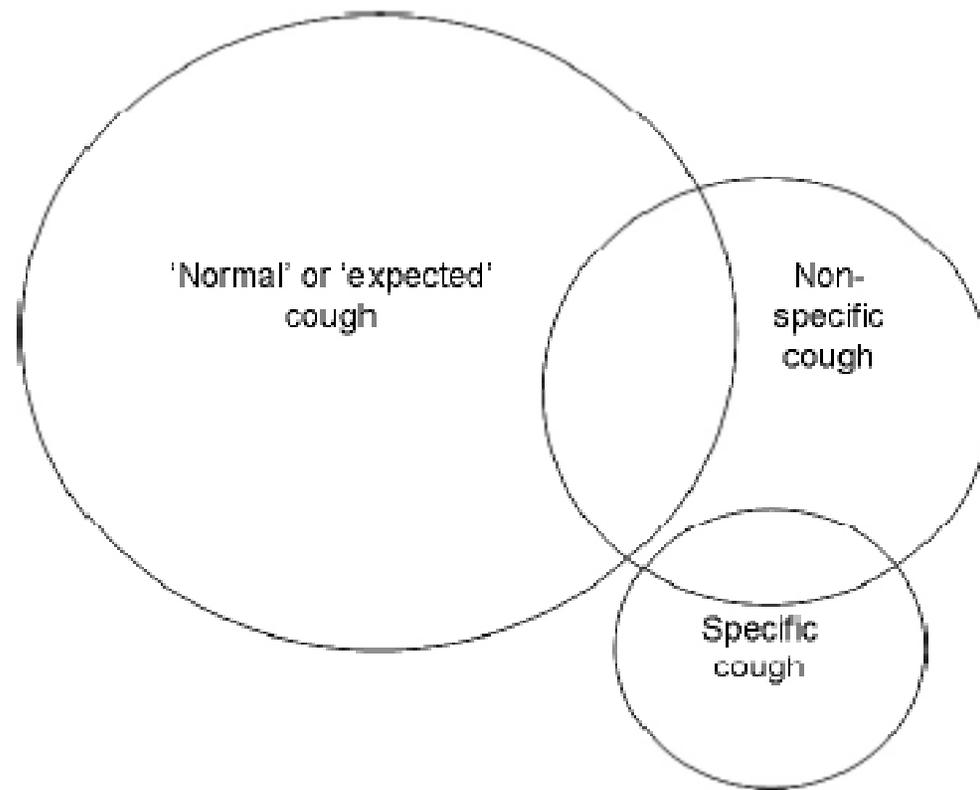
Chang AB: **Causes, assessment and measurement in children.** In *Cough: Causes, Mechanisms and Therapy* Edited by: Chung FK, Widdicombe JG, Boushey HA. London: Blackwell Science; 2003:57-73.

Etiología de tos crónica en niños

Infecciosas	Virus, Clamydia, Pertussis, Mycoplasma, TBC
Obstrucción crónica	Asma, Bronquiectasias, FQ, SPPV
Parénquima pulmonar	Enfermedades intersticiales, sarcoidosis, sme de hipersensibilidad
Compresión extríseca	Anillos vasculares, adenopatías, tumores, cardiomegalia
Cardiopatías congénitas	Con hiperflujo
Obstrucción endoluminal	Cuerpo extraño
Malformaciones broncopulmonares	
Esofágicas	REG, fístula traqueoesofágica
Fármacos	ACE, β bloqueantes
Irritantes de la vía aérea	Tabaquismo, químicos
Vía aérea superior	Rinitis, rinosinusitis

Evaluación

- Clínica
- Estudios complementarios: Pruebas de función pulmonar

❑ Antecedentes personales

Síntomas neonatales
Sibilancias asociadas a la alimentación y/o vómitos
Esteatorrea
Estridor

❑ Antecedentes familiares

Sibilancias
Tos
Dificultad para respirar
Disnea

❑ Naturaleza de los síntomas

Intensidad
Frecuencia
Estacionalidad
Variabilidad diaria- Síntomas nocturnos
Factores predisponentes y/o agravantes

❑ Características de los síntomas

Concurrencias a sala de emergencia
Internaciones
UCIP

❑ Características de las crisis

Dosis
Formas de administración
Respuestas
Efectos adversos

❑ Tratamiento farmacológico

❑ Impacto de la enfermedad en el niño y su familia

Actividad física
Ausentismo escolar
Trastornos del sueño

Lactantes

- Pruebas funcionales en lactantes (PFL) se han realizado con fines de investigación

- Personal capacitado y entrenado

- Alta frecuencia de enfermedades respiratorias crónicas en la infancia, PFL están ausentes en muchos centros pediátricos en el mundo

Novedades en PFL en EPC

■ Asma /Sibilancias recurrentes

■ Displasia Broncopulmonar

■ Fibrosis Quística

■ Otras patologías

Asma/Sibilancias

Lung function and clinical risk factors for asthma in infants and young children with recurrent wheeze

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A Clinical Index to Define Risk of Asthma in Young Children with Recurrent Wheezing

JOSÉ A. CASTRO-RODRÍGUEZ, CATHARINE J. HOLBERG, ANNE L. WRIGHT, and FERNANDO D. MARTINEZ

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Table 1 Comparison of wheezy and healthy children: background characteristics and lung function results

| Background details	High risk† wheezy children (n = 17)	Low risk† wheezy children (n = 33)	All wheezy children (n = 50)	Healthy controls (n = 30)	Mean difference (95% CI) All wheezy – healthy children	p Value
Gestational age (weeks)	38.9 (1.1)	39.0 (0.9)	39.0 (1.0)	39.6 (1.0)	−0.6 (−1.0 to −0.09)	0.02
Birth weight (kg)	3.4 (0.5)	3.3 (0.4)	3.3 (0.4)	3.3 (0.4)	0.02 (−0.2 to 0.2)	0.8
Birth weight z score	0.3 (0.9)	0.1 (0.8)	0.1 (0.9)	−0.2 (0.8)	0.3 (−0.1 to 0.7)	0.1
Male (n (%))	9 (53)	23 (70)	32 (64)	18 (60)	4 (−17 to 25)	0.7§
Maternal smoking during pregnancy (n (%))	6 (35)	8 (24)	14 (28)	5 (17)	11 (−9 to 28)	0.2§
At time of test						
Postnatal age (weeks)	60.6 (16.9)	64.6 (16.6)	63.2 (16.6)	55.0 (17.0)	8.1 (0.4 to 15.9)	0.04
Weight (kg)	11.2 (2.2)	11.0 (1.6)	11.1 (1.8)	9.7 (1.2)	1.4 (0.7 to 2.2)	0.0001
Weight z score	0.7 (1.6)	0.3 (1.1)	0.4 (1.3)	−0.3 (1.0)	0.7 (0.2 to 1.3)	0.01
Length (cm)	79.8 (5.6)	79.9 (5.4)	79.8 (5.4)	76.7 (4.6)	3.2 (0.8 to 5.5)	0.01
Length z score	1.0 (1.4)	0.6 (1.2)	0.7 (1.2)	0.5 (1.2)	0.2 (−0.3 to 0.8)	0.4
Lung function indices						
$FEV_{0.5}$ z score	−1.8 (1.0)*	−1.1 (1.1)**	−1.4 (1.1)***	−0.4 (1.0)****	−1.0 (−1.5 to −0.5)	0.0001
FEF_{25-75} z score	−2.2 (1.1)*	−1.6 (0.8)**	−1.80 (0.9)***	−1.00 (0.8)****	−0.8 (−1.2 to −0.4)	0.0001
FEF_{75} z score	−1.7 (1.2)*	−1.3 (0.7)**	−1.4 (0.9)***	−0.8 (0.8)****	−0.6 (−1.0 to −0.2)	0.0001
FVC z score	−1.2 (1.0)*	−0.5 (1.0)**	−0.7 (1.1)***	−0.03 (1.3)****	−0.7 (−1.2 to −0.1)	0.01
V'_{maxFRC} z score	−2.2 (1.0)	−1.7 (1.0)	−1.9 (1.0)	−1.5 (0.9)	−0.4 (−0.9 to 0.1)	0.1
Respiratory rate (bpm)	30.4 (8.3)	29.7 (6.0)	29.9 (6.8)	30.2 (5.6)	−0.3 (−3.2 to 2.7)	0.9
Vt/kg (ml)	10.0 (1.5)	9.8 (1.1)	9.9 (1.2)	9.9 (1.5)	−0.1 (−0.7 to 0.6)	0.9
t_{PTEF}/t_E	0.24 (0.1)	0.26 (0.1)	0.25 (0.1)	0.29 (0.1)	−0.03 (−0.1 to 0.01)	0.2
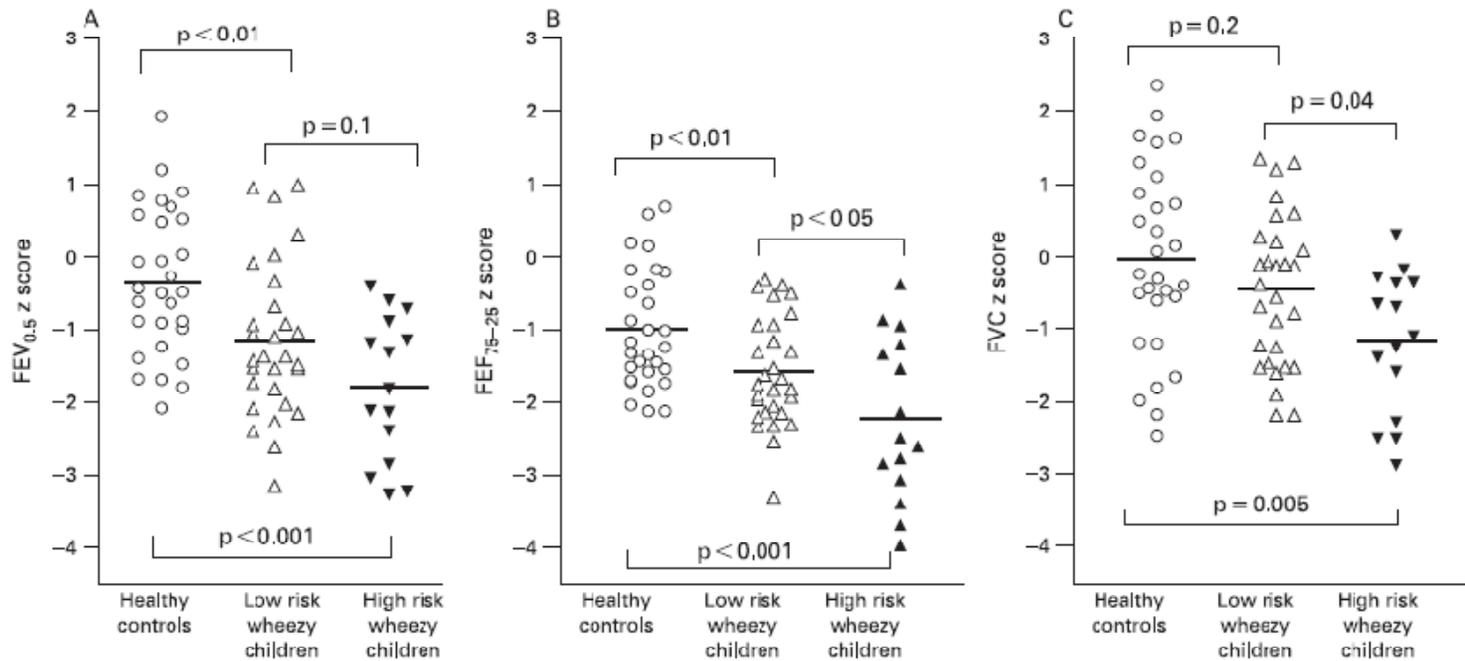
Figure 2 Comparison of FEV$_{0.5}$, FEF$_{75-25}$ and FVC z scores in healthy controls and wheezy subgroups. Results from individual children are shown, with mean values (indicated by the horizontal bar) for each subgroup. For mean difference and 95% CI of the difference between the subgroups, please refer to table 2. FEV$_{0.5}$, forced expiratory volume at 0.5 s; FEF$_{25-75}$, average forced expired flow over the mid 50% of FVC; FVC, forced vital capacity.

**Conclusiones:** Este estudio demostró que los flujos forzados a volúmenes pulmonares aumentados (no V'$_{maxFRC}$, VT, t$_{PTEF}$/t$_E$) estuvieron disminuidos durante los dos primeros años de vida en los lactante sibilantes recurrentes. En los niños con API+ presentaron CVF y FEF $_{25-75}$ más bajos que el grupo control sin factores de riesgo (*p 0.01, p 0.001*).

Neonatal bronchial hyperresponsiveness precedes acute severe viral bronchiolitis in infants

Bo L. K. Chawes, MD, PhD,[a]* Porntiva Poorisrisak, MD, PhD,[a]* Sebastian L. Johnston, MD, PhD,[b] and Hans Bisgaard, MD, DMSc[a]   *Copenhagen and Gentofte, Denmark, and London, United Kingdom*
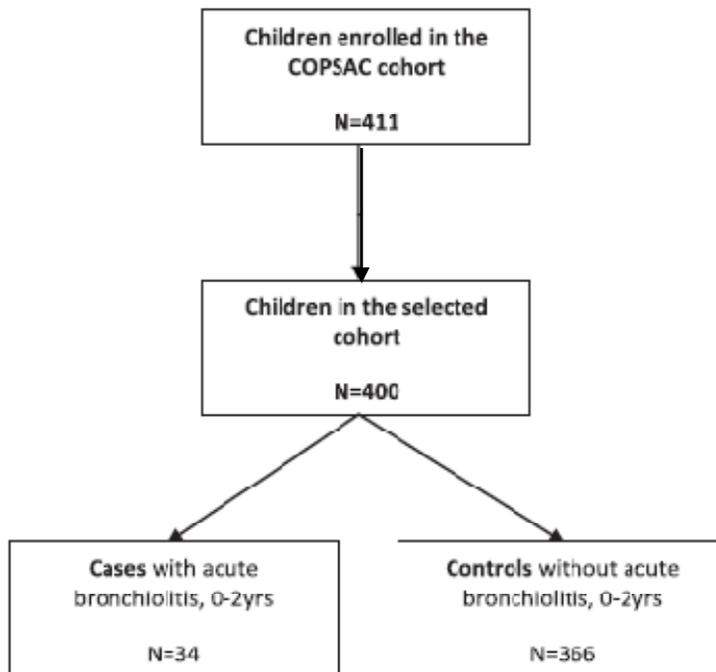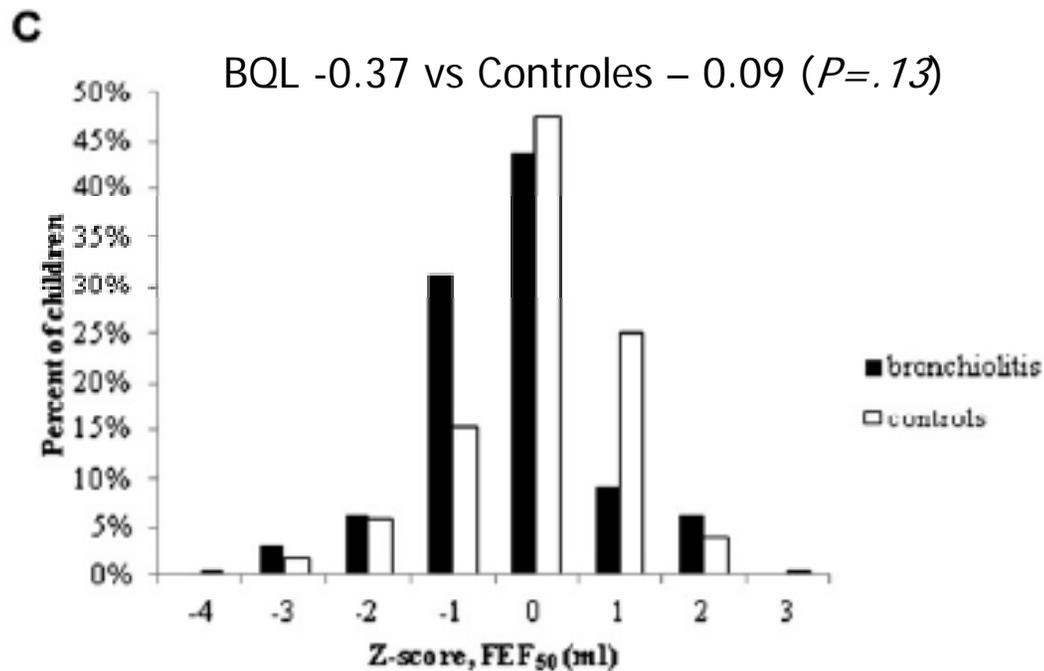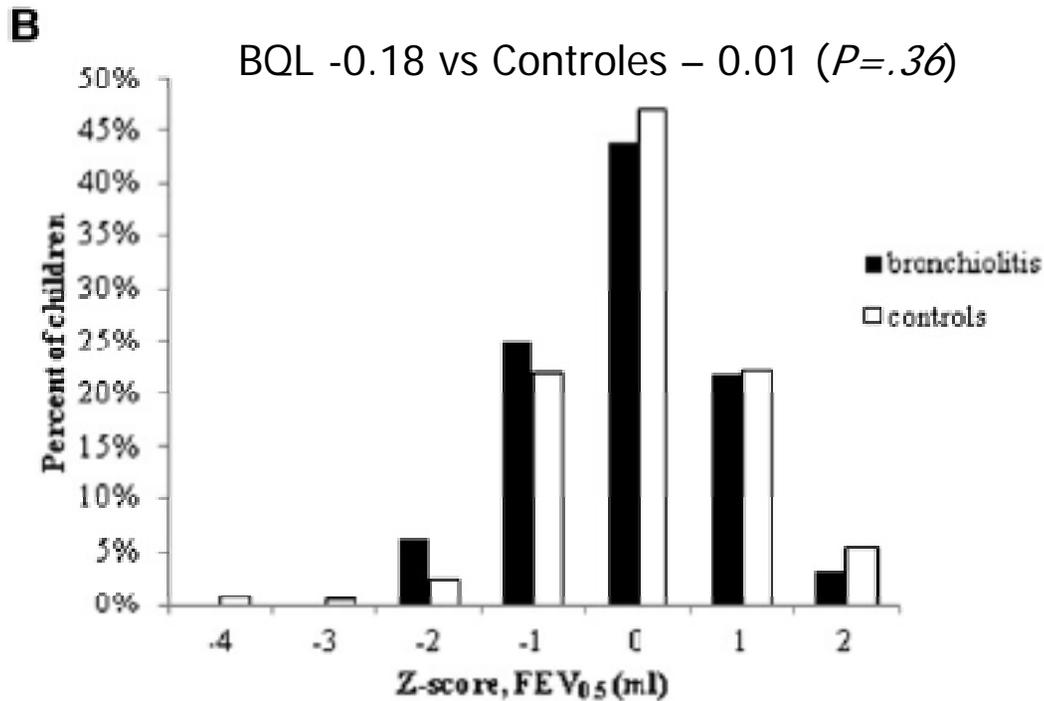
- Al mes de edad: RVRTC

- Metacolina

- Hiperreactividad bronquial: $PtcO_2$

- PD_{15}: Caída en un 15% de $PtcO_2$

TABLE I. Baseline characteristics of the study group

	Primary end point		Secondary end points			P value
	Control subjects (n = 366)	Bronchiolitis cases* (n = 34)	RSV-induced bronchiolitis cases (n = 23)	Non–RSV-induced bronchiolitis cases† (n = 9)	Asthma-like cases (n = 11)	Bronchiolitis cases vs control subjects
Baseline characteristics						
Sex						
Male (no.)	64.7% (22)	48.4% (177)	—	—	—	.07¶
Anthropometrics						
BMI at birth (cm/kg²), median (IQR)	12.5 (11.6-13.7)	12.8 (12.0-13.7)	—	—	—	.25#
Environment						
Smoking, 3rd trimester (no.)	35.3% (12)	13.1% (48)	—	—	—	.005¶
Alcohol, 3rd trimester (no.)	14.7% (5)	18.6% (68)	—	—	—	.58¶
Cat at birth (no.)	17.7% (6)	14.8% (52)	—	—	—	.65¶
Dog at birth (no.)	14.7% (5)	13.6% (48)	—	—	—	.86¶
Older siblings at birth (no.)	52.9% (18)	42.4% (155)	—	—	—	.23¶
Household income at birth (no.)						.50‡‡
Low, <53,000€	30.3% (10)	29.6% (101)	—	—	—	
Medium, 53,000€-80,000€	54.6% (18)	46.6% (159)	—	—	—	
High, >80,000€	15.2% (5)	23.8% (81)	—	—	—	
Paternal history of asthma (no.)	24.2% (8)	16.5% (59)	—	—	—	.26¶
Age at start of day care (d), median (IQR)	296 (230-349)	341 (240-417)	—	—	—	.08#
Solely breast-fed (d), median	120 (72-179)	122 (89-155)	—	—	—	.47#

Children with acute severe bronchiolitis reacted to lower doses of methacholine compared with the control group (median PD_{15} [$PtcO_2$] dose in cases vs control subjects, 0.13 vs 0.33 μmol; $P = .01$; Fig 1,A).

	Primary end point		Secondary end points			P value
DENND1B genotype (rs2786098)	—		—	—		.17**
AA	3.5% (1)	4.2% (14)	—	—	—	
AB	13.8% (4)	27.5% (91)	—	—	—	
BB	82.7% (24)	68.3% (226)	—	—	—	
Atopic intermediary markers						
Allergic sensitization‡ (18 mo [no.])	9.1% (3)	12.0% (38)	0% (0)	22.2% (2)	20.0% (2)	.78††
Blood eosinophil count (18 mo [10^9/L]), median (IQR)	0.27 (0.18-0.43)	0.21 (0.13-0.32)	0.26 (0.18-0.43)	0.21 (0.15-0.38)	0.41 (0.22-0.48)	.03#
Total IgE (18 mo [kU/L]), median (IQR)	15.3 (6.3-29.5)	8.2 (3.9-17.1)	15.5 (6.3-28.0)	10.2 (4.7-30.2)	7.0 (5.2-30.9)	.03#
Episodes of troublesome lung symptoms,§ median (IQR)	2 (1-6)	1 (1-2)	1 (1-5)	6 (3-7)	2 (1-4)	.0005§§
Eczema (0-2 y [no.])	38.2% (13)	38.4% (131)	30.4% (7)	66.7% (6)	40.0% (4)	.98¶
Episode characteristics						
Fever at diagnosis‖ (no.)	—	59% (20)	57% (13)	56% (5)	36% (4)	—
Auscultation						
Crepitations (no.)	—	41% (14)	44% (10)	33% (3)	27% (3)	—
Rhonchi (no.)	—	85% (29)	78% (18)	100% (9)	91% (10)	—
Hospitalization (no.)	—	62% (21)	83% (19)	22% (2)	36% (4)	—
Days hospitalized, median (range)	—	3 (1-15)	4 (1-15)	2 (2-2)	2 (1-4)	—

B BQL -0.18 vs Controles – 0.01 (*P=.36*)

C BQL -0.37 vs Controles – 0.09 (*P=.13*)

🞢 **<u>Conclusiones:</u>**

◼ La HRB en RN incrementa el riesgo de BQL aguda severa.

◼ HRB en RN factor de riesgo

Displasia Broncopulmonar

Lung Function Among Infants Born Preterm, With or Without Bronchopulmonary Dysplasia

Manuel Sanchez-Solis, MD,[1] Luis Garcia-Marcos, MD,[1]* Vicente Bosch-Gimenez, MD,[2] Virginia Pérez-Fernandez, MS,[3] Maria D. Pastor-Vivero, MD,[1] and Pedro Mondéjar-Lopez, MD[1]

- 75 niños (43 con DBP y 32 sin DBP)

- PN < 1500 gr

- FVC, $FEV_{0.5}$, FEF_{50}, FEF_{75}, FEF_{85}, FEF_{25-75}, $FEV_{0.5}/FVC$, V'_{maxFRC}

- Z scores

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TABLE 1— Demographic Characteristics of Infants With and Without Bronchopulmonary Dysplasia (mean and SD for numerical variables; and absolute number and percentage for gender and tobacco smoke exposure)

	All infants (N = 75)	With BPD[1] (N = 43)	Without BPD (N = 32)	P-value between groups of BPD diagnosis
Male gender		23 (53.4)	21 (65.6)	0.291
Gestational age (weeks)	27.9 (2.33)	**26.7 (1.7)**	**29.6 (2.0)**	**<0.001**
Natural conception	71 (94.7)	41 (95.3)	30 (93.7)	0.760
Corrected age (months)	7.0 (5.9)	7.5 (5.7)	6.3 (6.3)	0.379
Neonatal weight (z-score)	−0.016 (1.2)	0.06 (1.0)	−0.115 (1.4)	0.547
Mother smoked in pregnancy	20 (26.7)	9 (20.9)	11 (34.4)	0.193
Current tobacco smoke exposure	31 (41.3)	15 (34.9)	16 (50.0)	0.189
Mechanical ventilation (days)	N.A	16.4 (15.4)	N.A	N.A.
V'maxFRC (z-score)	−1.47 (0.9)	−1.59 (0.8)	−1.30 (1.0)	0.170
FVC (z-score)	−0.98 (1.0)	−1.16 (0.9)	−0.73 (1.1)	0.078
$FEV_{0.5}$ (z-score)	−1.35 (0.9)	**−1.57 (0.7)**	**−1.05 (1.1)**	**0.018**
$FEV_{0.5}$/FVC (z-score)	−0.44 (0.8)	−0.48 (0.8)	−0.38 (0.8)	0.579
FEF_{50} (z-score)	−1.85 (0.8)	**−2.06 (0.6)**	**−1.56 (1.0)**	**0.010**
FEF_{75} (z-score)	−1.20 (1.0)	**−1.48 (0.8)**	**−0.82 (1.2)**	**0.007**
FEF_{85} (z-score)	−0.63 (0.8)	**−0.84 (0.6)**	**−0.35 (1.1)**	**0.012**
FEF_{25-75} (z-score)	−2.12 (1.1)	**−2.46 (0.7)**	**−1.68 (1.3)**	**0.001**

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TABLE 2—Multiple Regression Analysis of the Relationship Between Bronchopulmonary Dysplasia and Lung Function Measurements in the Whole Population and Stratified by Gender

	Whole population[3]			Male gender[4]			Female gender[4]		
	β^1	95% CI[2]	P-value	β^1	95% CI[2]	P-value	β^1	95% CI[2]	P-value
FVC z-score	−0.498	−1.107;0.110	0.107	−0.511	−1.373;0.350	0.237	−0.152	−1.269;0.966	0.782
$FEV_{0.5}$ z-score	−0.612	−1.168;−0.056	0.031	−0.780	−1.515;−0.045	0.038	0.106	−0.965;1.177	0.841
$FEV_{0.5}$/FVC z-score	−0.083	−0.574;0.406	0.734	−0.296	−0.933;0.341	0.352	0.471	−0.434;1.376	0.293
FEF_{50} z-score	−0.683	−1.186;−0.180	0.009	−0.880	−1.560;−0.200	0.013	0.108	−0.692;0.909	0.782
FEF_{75} z-score	−0.634	−1.267;0.002	0.049	−0.985	−1.766;−0.204	0.0150	−0.0380	−1.437;1.360	0.955
FEF_{85} z-score	−0.758	−1.245;−0.270	0.003	−0.688	−1.372;−0.004	0.049	−0.894	−1.835;0.046	0.061
FEF_{25-75} z-score	−0.943	−1.569;−0.308	0.004	−1.212	−2.060;−0.365	0.006	−0.040	−1.147;1.067	0.941
VmaxFRC	0.384	0.938;0.169	0.171	0.162	0.807;0.481	0.612	0.978	2.239;0.283	0.122

■ <u>Conclusiones:</u> Los bebés prematuros de sexo masculino con DBP tuvieron flujos espiratorios más bajos durante los dos primeros años, en comparación con bebés prematuros varones sin DBP.

Development of lung function in very low birth weight infants with or without bronchopulmonary dysplasia: Longitudinal assessment during the first 15 months of corrected age

Gerd Schmalisch[1,2*], Silke Wilitzki[1], Charles Christoph Roehr[1], Hans Proquitté[1] and Christoph Bührer[1]

- 55 RNPT de < 1500 gr

- 29 DBP

- Variables: Parámetros a volumen corriente, mecánica pulmonar y V'_{maxFRC}

- Fx pulmonar: 3 veces

Table 1 Patient characteristics in the neonatal period, shown as means with SDs (in brackets) or as numbers with percentages (%).

	Without BPD N = 26	With BPD N = 29	p-value
Gestational age (weeks)	29.08 (2.12)	26.41 (2.19)	< 0.001
Birth weight (g)	1124.1 (248.3)	815.7 (243.1)	< 0.001
Birth weight < 1,000 g	7 (27%)	25 (86%)	< 0.001
Fetal lung maturation[1]	14/19 (74%)	12/17 (71%)	1.000
Surfactant administration[1]	18/20 (90%)	18/20 (90%)	1.000
Mechanical ventilation	15 (58%)	29 (100%)	< 0.001
Mechanical ventilation for ≥ 7 d	2 (8%)	16 (55%)	< 0.001

Body Weight-Related Tidal Breathing Parameters
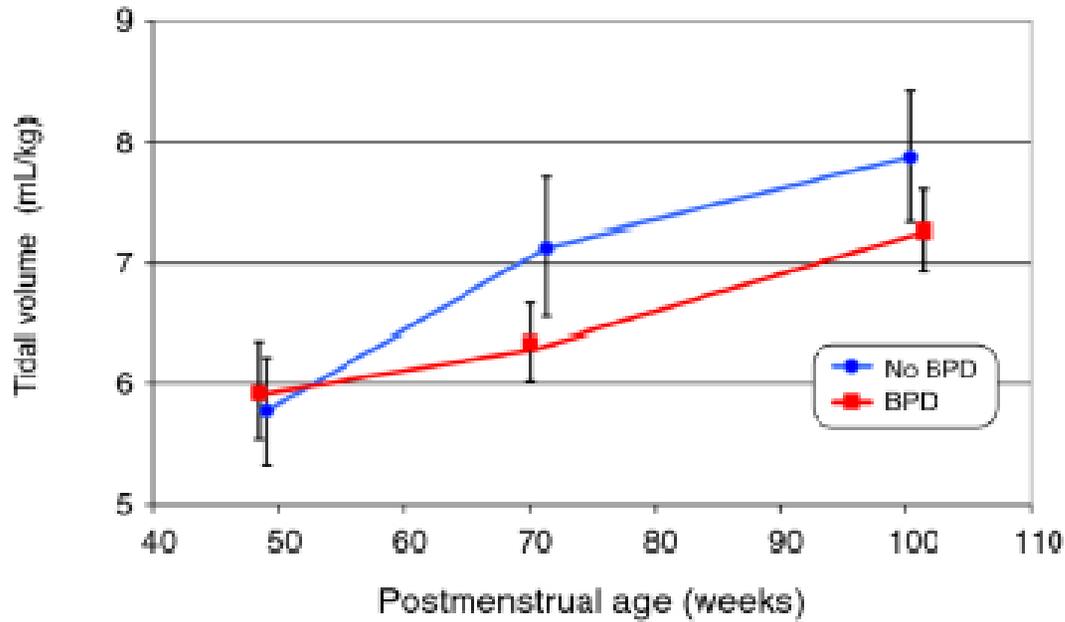
COVARIATES
$p_{GA} = 0.003$
$p_{BW} = 0.011$

MAIN EFFECTS
A: $p_{PMA} < 0.001$
B: $p_{BPD} = 0.123$

INTERACTION
$p_{AB} = 0.049$
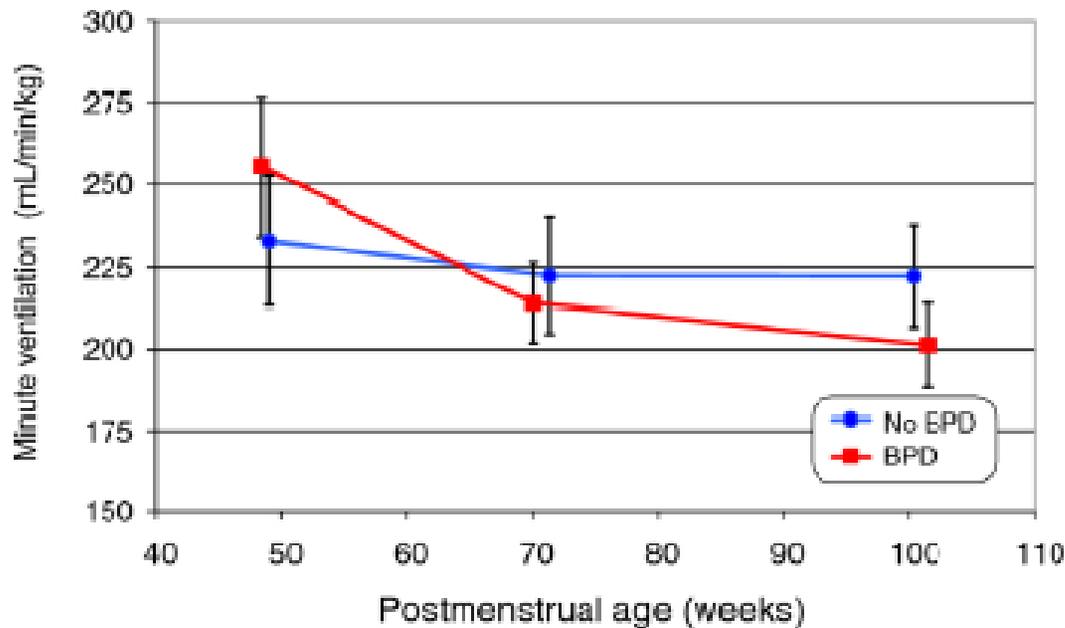
COVARIATES
$p_{GA} = 0.024$
$p_{BW} = 0.046$
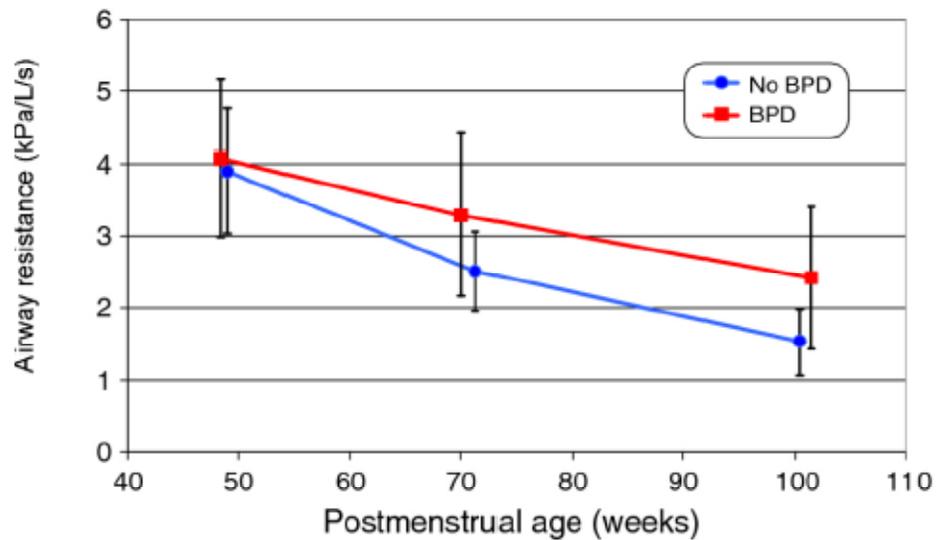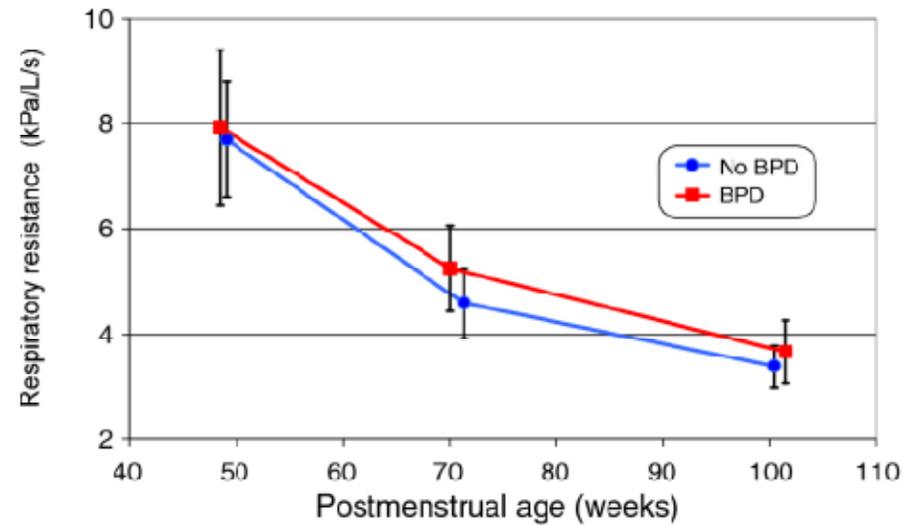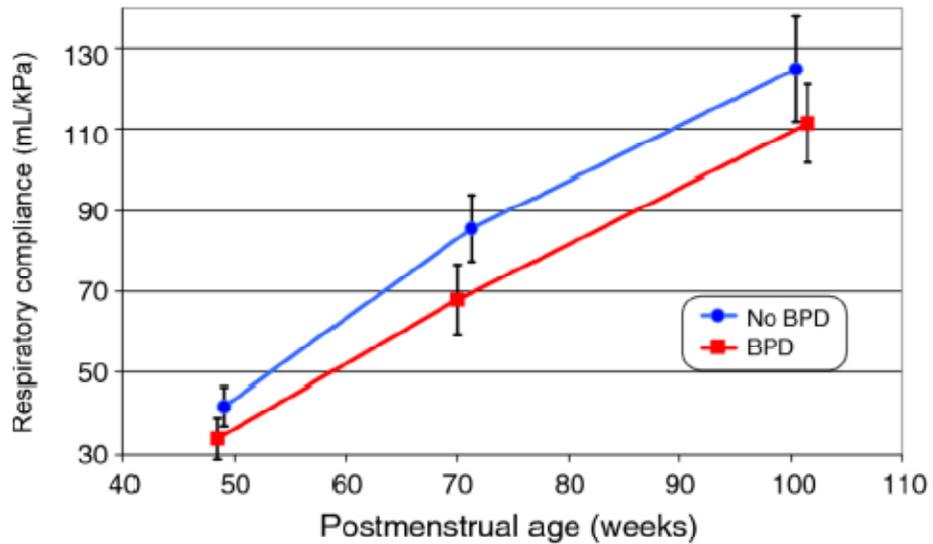
MAIN EFFECTS
A: $p_{PMA} < 0.001$
B: $p_{BPD} = 0.929$

INTERACTION
$p_{AB} = 0.025$

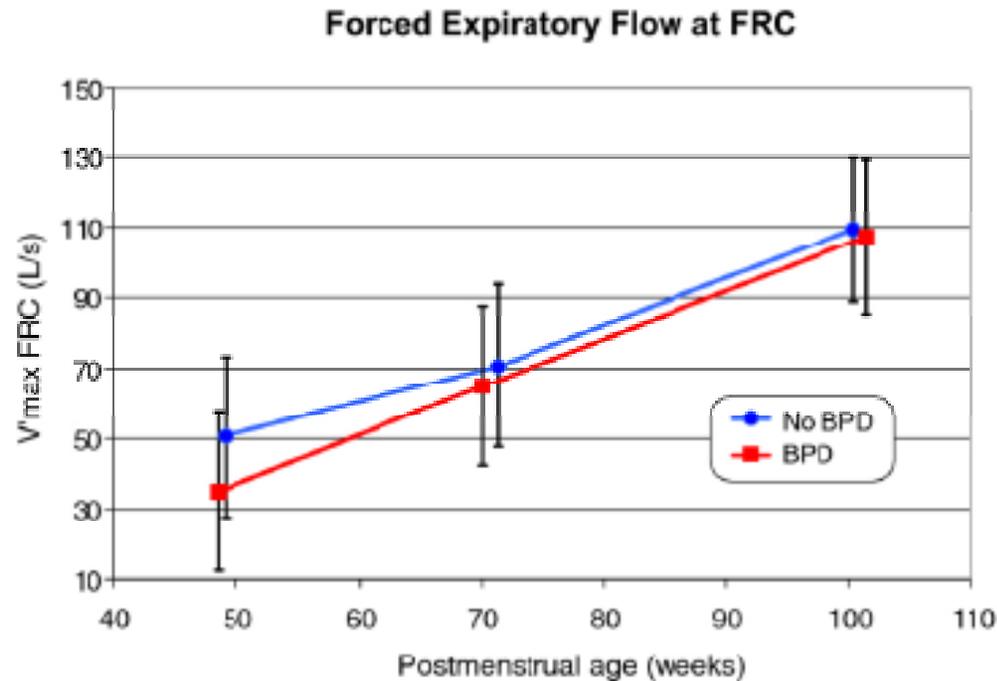# Mecánica respiratoria

Forced Expiratory Flow at FRC

Conclusiones: Con el crecimiento somático los parámetros funcionales respiratorios de bebés prematuros con DBP permanecen por detrás de los bebés prematuros sin DBP. Después del alta hospitalaria sería interesante una evaluación longitudinal para detectar aquellos que no logren una recuperación completa.

Malformaciones pulmonares

Lung Function of Infants with Congenital Lung Lesions in the First Year of Life

Marjolein Spoel[a]   Kees P. van de Ven[a]   Harm A.W.M. Tiddens[b]   Wim C.J. Hop[c]

Rene M.H. Wijnen[a]   Dick Tibboel[a]   Hanneke Ijsselstijn[a]

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Table 1. Patient characteristics

Variables	Total	Observation group	Surgical group	p value
Number	30	17	13	
Males	21 (70)	13 (76)	8 (62)	0.385
Gestational age, weeks	39.1 (38.0–41.0)	39.6 (37.1–41.6)	40.0 (34.7–41.7)	0.950
Birth weight, g	3,490 (3,000–4,505)	3,585 (2,450–4,200)	3,730 (2,925–4,505)	0.601
Type lung lesion				0.887
CAM	17 (57)	10 (59)	7 (54)	
BPS	9 (30)	5 (29)	4 (31)	
CLE	3 (10)	2 (12)	1 (8)	
BC	1 (3)	0	1 (8)	
Duration ventilation, days	0 (0–40)	0 (0–10)	2 (0–40)	<0.001
Conventional	0 (0–38)	0 (0–10)	2 (0–38)	<0.001
HFO ventilation	0 (0–11)	0	0 (0–11)	0.016
Duration oxygen supply, days	4 (0–42)	0 (0–10)	5 (0–42)	<0.001

- V'maxFRC y CRF

- 6 y 12 meses de edad

CFR
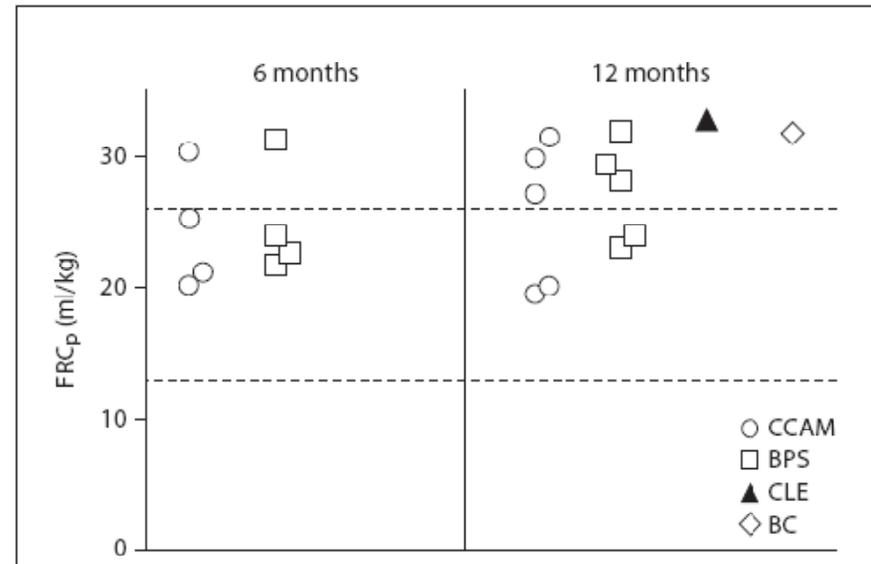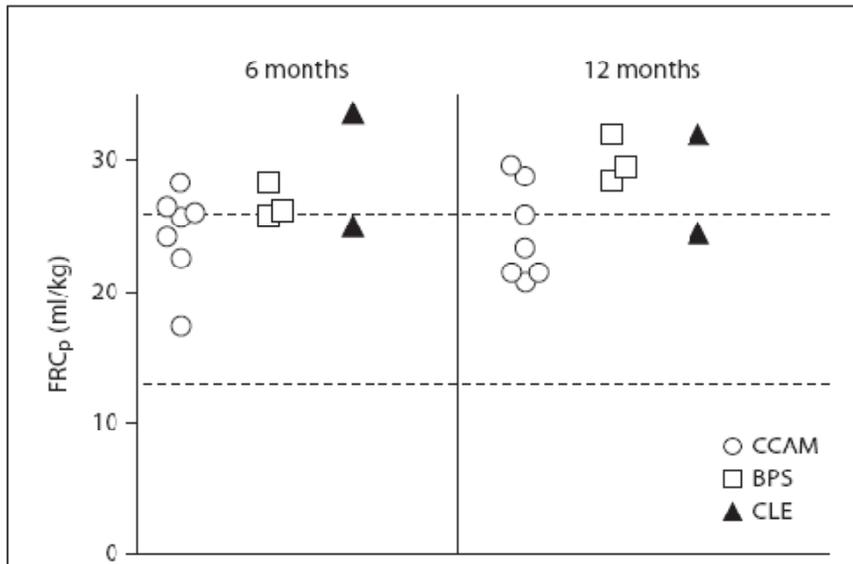
V'maxFRC

⊕ **Conclusiones:** No encontraron diferencias en los parámetros de fx pulmonar entre ambos grupos
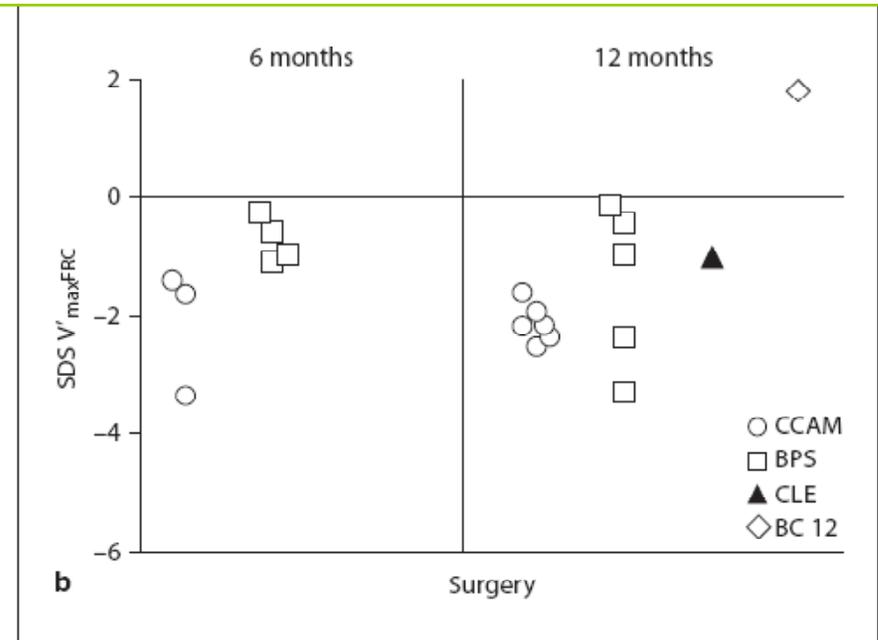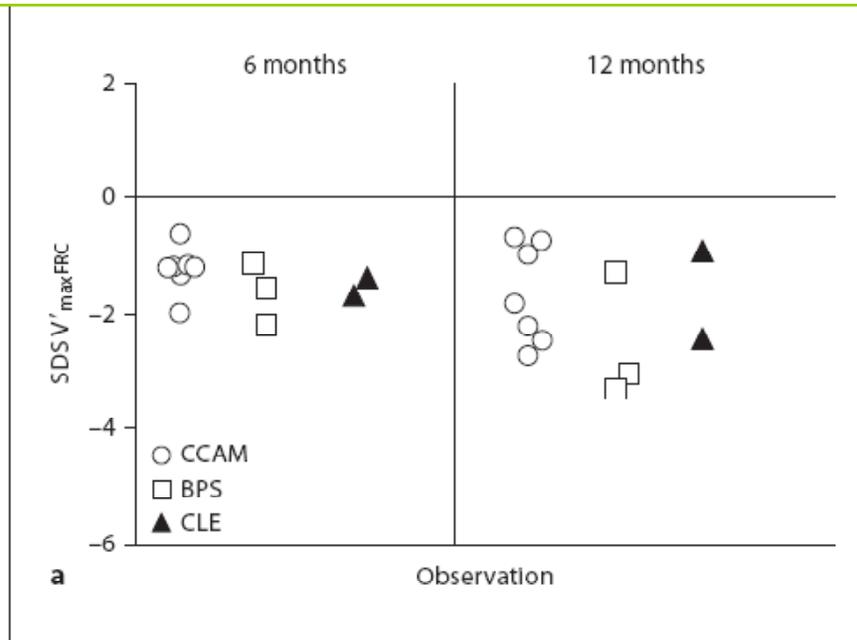
Fibrosis Quística

ORIGINAL ARTICLE

Lung function is abnormal in 3-month-old infants with cystic fibrosis diagnosed by newborn screening

Chudleigh,[1]

Wallis,[1]

Ah-Fong Hoo,[1] Lena P Thia,[2] The Thanh Diem Nguyen,[2] Andrew Bush,[3] Jane Sooky Lum,[2] Deeba Ahmed,[2] Ian Balfour Lynn,[3] Siobhan B Carr,[4] Richard J Chavasse,[5] Kate L Costeloe,[6] John Price,[7] Anu Shankar,[8] Colin Hilary A Wyatt,[7] Angela Wade,[9] Janet Stocks,[2] on behalf of the London Cystic Fibrosis Collaboration (LCFC)

- 3meses de edad
- LCI
- CFR_{plet}, C_{rs}, R_{rs}
- $FEV_{0.5}$, FVC, FEF_{75}, FEF_{25-75} — Jaeger Baby Body®

Fx pulmonar anormal: Fuera del 95% del límite normal

(ej. -1.96 z score $FEV_{0.5}$)

**Table 3** Comparison of lung function in 71 infants with cystic fibrosis and 54 healthy controls

Variables according to test order	n	Infants with CF	n	Healthy controls	Δ (95% CI) CF − controls	p Values
Multiple breath washout						
LCI, z-score*	70	0.90 (1.38)	51	0.39 (0.88)	0.51 (0.10 to 0.91)	0.016
FRC_{MBW}, z-score*	70	0.15 (0.95)	51	−0.23 (0.86)	0.38 (0.05 to 0.71)	0.023
Tidal breathing						
Respiratory rate, z-score†	71	−0.01 (1.43)	54	0.02 (1.21)	−0.03 (−0.50 to 0.44)	0.897
Tidal volume, z-score†	71	0.20 (1.19)	54	−0.22 (1.09)	0.42 (0.01 to 0.82)	0.044
t_{PTEF}/t_E, z-score†	71	0.22 (1.05)	54	0.41 (1.0)	−0.19 (−0.56 to 0.18)	0.312
Passive mechanics						
C_{rs}, z-score†	47	0.22 (1.48)	41	0.14 (0.96)	0.08 (−0.44 to 0.60)	0.763
R_{rs}, z-score†	47	0.52 (0.94)	41	0.28 (1.04)	0.24 (−0.18 to 0.66)	0.237
Plethysmography						
FRC_{pleth}, z-score†	56	0.77 (1.15)	47	−0.08 (1.03)	0.85 (0.43 to 1.28)	<0.001
ΔFRC z-scores (pleth − MBW)	55	0.68 (1.10)	45	0.19 (0.92)	0.48 (0.08 to 0.88)	0.018
Raised volume technique						
$FEV_{0.5}$, z-score‡	68	−1.17 (1.20)	52	−0.25 (0.80)	−0.92 (−1.29 to −0.56)	<0.001
FVC, z-score‡	68	−0.45 (1.07)	52	0.15 (0.71)	−0.60 (−0.92 to −0.28)	<0.001
FEF_{25-75}, z-score‡	68	−1.11 (1.38)	52	−0.46 (1.08)	−0.66 (−1.10 to −0.21)	0.004
FEF_{75}, z-score‡	68	−0.74 (1.19)	52	−0.22 (1.11)	−0.53 (−0.95 to −0.11)	0.015
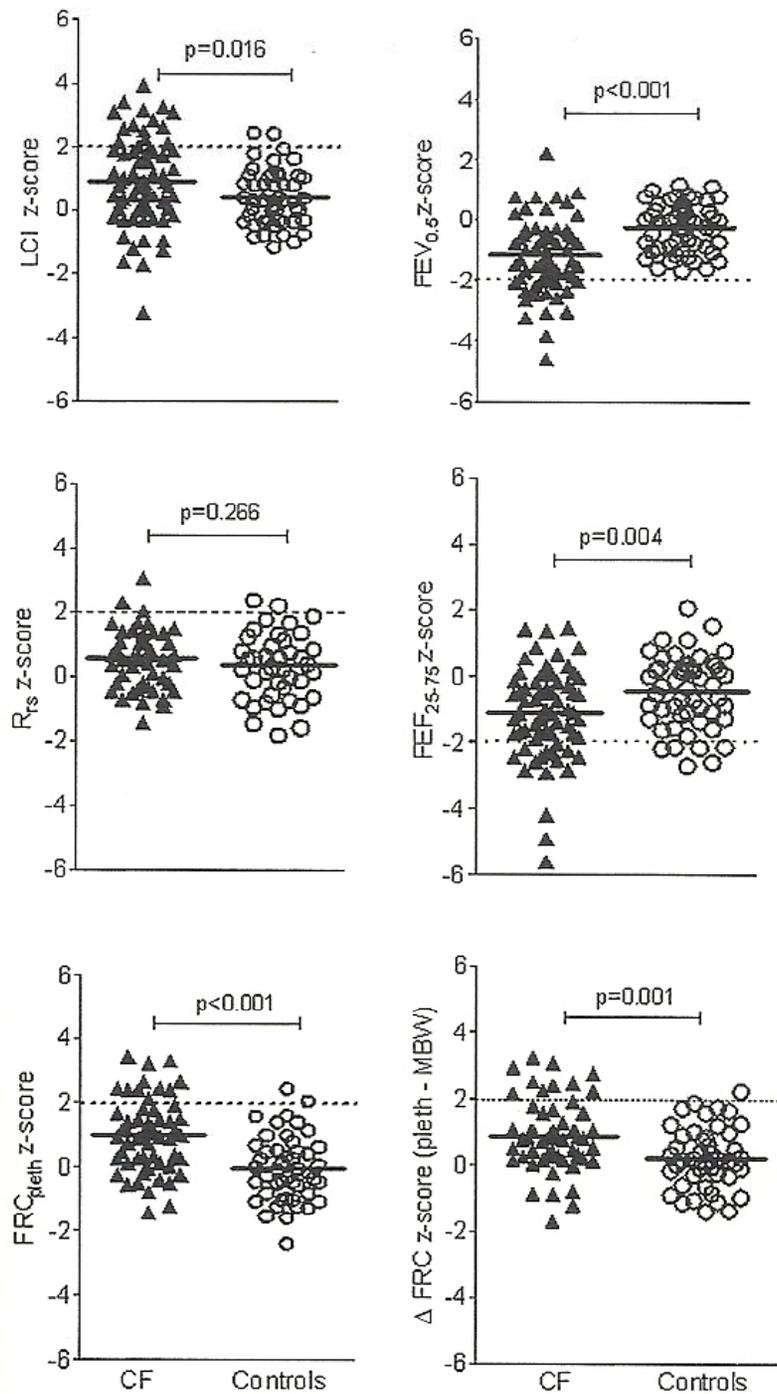
Conclusiones: A pesar del diagnóstico temprano en bebés con FQ detectados por PN se observó fx pulmonar anormal a los 3 meses de edad (insuflación pulmonar y disminución de los flujos espiratorios)

El seguimiento de esta cohorte es de importancia para determinar si persisten estas alteraciones durante el primer año de vida.

Thorax 2012;67(10):874-881

Evaluation and use of childhood lung function tests in cystic fibrosis

Janet Stocks, Lena P. Thia, and Samatha Sonnappa

KEY POINTS

- Considerable evidence exists to support use of LFTs as objective outcomes in clinical research involving infants and young children with CF.

- Newly diagnosed infants with CF have airflow obstruction at diagnosis, even in the absence of overt respiratory symptoms.

- The raised volume thoracoabdominal compression technique is useful in assessing airway disease from forced expiratory maneuvers in infants with CF and, with suitable adaptations, technically acceptable spirometry results can be obtained in children from 3 years of age.

- The LCI, derived during tidal breathing by MBW of an inert tracer gas is applicable at all ages and is much more sensitive to early CF lung disease than spirometric outcomes.

- New global 'all-age equations' are now available to allow seamless interpretation of spirometric results from 3 to 90 years of age, which should facilitate comparison of outcomes within and between centers worldwide.
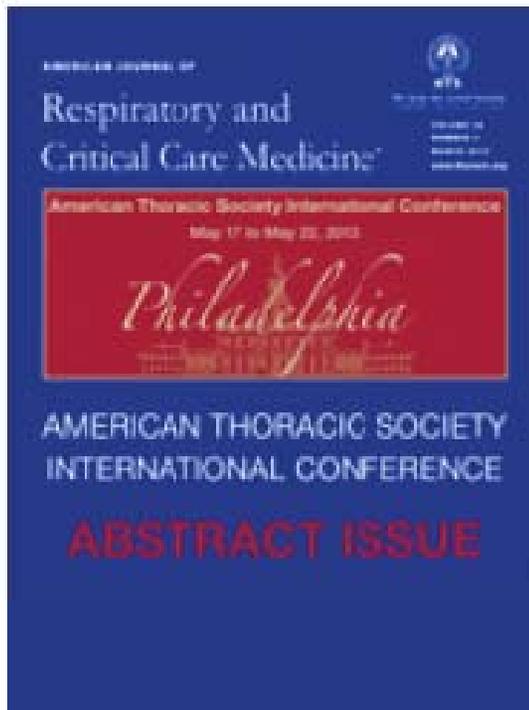
Correlation Between Lung Function And Nutritional Outcomes In Infants With Chronic Lung Disease

V. D'Alessandro[1], F. Renteria[2], S. Prates[2], G. Diez[2],
[1]Children's Hospital, La Plata, Argentina, [2]CHILDREN'S HOSPITAL, LA PLATA, Argentina

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Rationale

Its is a well known fact that an adequate nutrition constitutes a basic pillar in infants chronic lung disease treatment. However there still few evidence in the literature showing specific quantitative relationships between nutrition and chronic lung diseases in children.

Objective

To study the correlation between lung function and nutritional status in a sample of children up to 3 year old suffering from chronic lung disease.

Methods

Cross sectional study. We studied children under 3 year old with chronic lung disease: Group 1 Bronchopulmonary Dysplasia (BPD), Group 2 Postviral Chronic Lung Disease (PCLD), Group 3 Esophageal Atresia (EA) and Group 4 Cystic Fibrosis (CF). We evaluated Maximal Expiratory Flow at FRC (V'maxFRC) using rapid thoracic compression with Jaeger* equipment, and nutritional parameters such as z score height / age (z H/A), z score weight / age (z W/A) and z score weight / height (z W/H). The outcomes were analyzed using Pearson correlation.

Results

The total sample included 74 children (Table 1.). Mean values obtained were: V'maxFRC 181.2 ml / sec, z score V'maxFRC -1.20, z H/A -2.13, z W/A -1.25 and z W/H -0.13. Positive correlation was observed between z score W/H and z score V'maxFRC for all groups. For CF and PCLD it was found a significant correlation of about 50%, whereas it was lower for DBP and EA. The differences were statistically significant only in CF (p 0.01).

Table 1. Correlation between z score W/H and z score V'maxFRC in all groups

	Z score V'maxFRC
DBP (n=17) z W/H	0.25
PCLD (n=12) z W/H	0.48
EA (n=19) z W/H	0.12
CF (n=27) z W/H	0.50*

* p 0.01

Conclusions

The tested sample showed positive correlation between z score of W/H and z score V'maxFRC for all groups. Highest correlation was observed in the CF group being significant at the 1% level, followed by PCLD, DBP and EA.

Conclusiones

- FP en lactantes con tos crónica es un método de estudio utilizado con fines de investigación y epidemiológicos

- Está trabajando para obtener nuevos valores de referencia, dada la amplia variabilidad

- Estandarización en los protocolos de estudio

Espirometría en preescolares
vs
Enfermedad Pulmonar crónica

An Official American Thoracic Society Workshop Report: Optimal Lung Function Tests for Monitoring Cystic Fibrosis, Bronchopulmonary Dysplasia, and Recurrent Wheezing in Children Less Than 6 Years of Age

Margaret Rosenfeld, Julian Allen, Bert H. G. M. Arets, Paul Aurora, Nicole Beydon, Claudia Calogero, Robert G. Castile, Stephanie D. Davis, Susanne Fuchs, Monika Gappa, Per M. Gustaffson, Graham L. Hall, Marcus H. Jones, Jane C. Kirkby, Richard Kraemer, Enrico Lombardi, Sooky Lum, Oscar H. Mayer, Peter Merkus, Kim G. Nielsen, Cara Oliver, Ellie Oostveen, Sarath Ranganathan, Clement L. Ren, Paul D. Robinson, Paul C. Seddon, Peter D. Sly, Marianna M. Sockrider, Samatha Sonnappa, Janet Stocks, Padmaja Subbarao, Robert S. Tepper, Daphna Vilozni; on behalf of the American Thoracic Society Assembly on Pediatrics Working Group on Infant and Preschool Lung Function Testing

Revisión de estudios de espirometría en Fibrosis Quística, DBP y Sibilancias recurrentes en edad preescolar

Fibrosis Quística (FQ)

- **Niños con FQ: Espirometría aceptables con anormalidades en la fx pulmonar leves (Z score)**

- **Menos sensible para la detección de cambios tempranos que LCI**

1. Kozlowska WJ. Lung function from infancy to the preschool years after clinical diagnosis of cystic fibrosis. *Am J Respir Crit Care Med 2008;178:42–49.*
2. Marostica PJ. Spirometry in 3- to 6-year-old children with cystic fibrosis. *Am J Respir Crit Care Med 2002;166:67–71.*
3. Nielsen KG. Serial lung function and responsiveness in cystic fibrosis during early childhood. *Am J Respir Crit Care Med 2004;169:1209–1216.*
4. Vilozni D. Spirometry in early childhood in cystic fibrosis patients. *Chest 2007;131:356–361.*
5. Mayer OH. Lung function in 3–5-year-old children with cystic fibrosis. *Pediatr Pulmonol 2008; 43:1214–1223.*
6. Aurora P. Lung clearance index at 4 years predicts subsequent lung function in children with cystic fibrosis. *Am J Respir Crit Care Med 2011;183:752–758.*

ESPIROMETRIA EN PACIENTES PREESCOLARES CON FIBROSIS QUISTICA (FQ)

D 104

Prates, S; D'Alessandro, V; Rentería, F; Segal E.
Centro Provincial de Fibrosis Quística. Hospital "Sor María Ludovica".
14 N° 1631. La Plata (CP1900).
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INTRODUCCIÓN
La espirometría juega un rol fundamental en la evaluación y el seguimiento de la afectación pulmonar en niños mayores, adolescentes y adultos con FQ.Sin embargo, existen pocos datos referentes a niños en edad preescolar.

OBJETIVOS
Evaluar la función pulmonar con espirometría en preescolares con FQ.
Población: Pacientes con FQ entre 2 y 6 años de edad, clínicamente estables, asistidos en el Centro Provincial de Fibrosis Quística de la Pcia de Buenos Aires.

MATERIALES Y MÉTODOS
Estudio transversal. Se incluyeron 45 pacientes con FQ y 42 controles sanos. Se empleó un equipo Medical Graphics 1070. Se consideraron maniobras aceptables si las curvas flujo volumen obtenidas reunían estos criterios: -rápido ascenso hasta pico flujo, descenso gradual hacia el eje del volumen y tiempo espiratorio (TE) mínimo de 1,5 segundos. Cada paciente realizó 3 curvas aceptables con una diferencia de CVF entre una y otra maniobra de 5% o menos. Se seleccionó para el análisis la curva con la mayor suma de CVF y VEF_1. Se evaluó: CVF, VEF_1, FEF_{25-75} VEF_1/CVF, $VEF_{0,5}$/CVF y TE. En el grupo con FQ se determinó si hubo diferencias significativas en cuanto a: sexo, suficiencia pancreática, pesquisa neonatal (PN), *Pseudomonas Aeruginosa* en secreciones bronquiales y mutación genética.

RESULTADOS
32 de 45 niños con FQ (71%) y 31 de 42 controles (73%) realizaron las maniobras satisfactoriamente. Los niños con FQ presentaron menor CVF, VEF_1, $FEF_{25-75\%}$ que los controles sanos y las diferencias fueron significativas
($p < 0.05$) para mayores de 4 años. En el grupo con FQ, los diagnosticados por PN y los varones tuvieron VEF_1 y FEF_{25-75} mayores
($p<0.001$).

X	Edad (años)	Talla (cm)	CVF (L)	VEF_1 (L)	FEF_{25-75} (L/s)	VEF_1/CVF	$VEF_{0,5}$/CVF	TE (seg)
Sanos	4.62	108	1,05	0,99	1,53	95	78.14	2.1
FQ	4.71	105	0,89	0,80	1,12	91	75.66	1.7

CONCLUSIONES
Nuestro grupo de pacientes con FQ tuvo menor función pulmonar que los sanos de la misma edad; hubo diferencias significativas según sexo y diagnóstico por pesquisa o síntomas. La espirometría puede emplearse en preescolares con FQ como método de evaluación de la enfermedad pulmonar.

Displasia Broncopulmonar (DBP)

- Escasez de datos sobre espirometría preescolar en niños con DBP

- No hay datos que demuestren que la espirometría sea útil en esta población

- Obstáculo: Función cognitiva de los niños con DBP

1. Sinkin RA. School-age follow up of prophylactic versus rescue surfactant trial: Pulmonary, neurodevelopmental, and educational outcomes. *Pediatrics 1998; 101:E11*.

2. Burns YR, Danks M, O'Callaghan MJ, Gray PH, Cooper D, Poulsen L, Watter P. Motor coordination difficulties and physical fitness of extremely-low-birthweight children. *Dev Med Child Neurol 2009;51: 136–142*.

Sibilancias recurrentes

- Espirometría puede ser útil en establecer la fx pulmonar basal y determinar la rta BDP

- Datos escasos acerca de la prevalencia de rta BDP

- Los estudios han encontrado que un aumento postBD entre el 12-15% en $VEF_{0.5}$, $VEF_{0.75}$, VEF_1 en niños con diagnóstico clínico asma

- FEF_{25-75} no se recomienda

Vilozni D, The role of computer games in measuring spirometry in healthy and "asthmatic" preschool children. *Chest 2005;128: 1146–1155.*
Dundas I, Chan EY, Bridge PD, McKenzie SA. Diagnostic accuracy of bronchodilator responsiveness in wheezy children. *Thorax 2005;60: 13–16.*

Otros métodos de evaluación

- Técnica de interrupción

- Técnica de oscilación forzada

- Técnica de lavado de gases inertes

Evaluación de la medición de las resistencias pulmonares por técnica de interrupción

Assessing the measurement of airway resistance by the interrupter technique

Dra. Yolanda Zuriarrain Reyna[a], Lic. Alejandro López Neyra[a],
Lic. Verónica Sanz Santiago[a], Enf. Esmeralda Almería Gil[a] y Lic. José Ramón Villa Asensi[a]

Escolar-Adolescencia

Asma

Name:
ID: AMARILLO8214   Date: 3-May-05

Race: Caucasian   Height: 150.40 cm Weight: 38.4 kg   Sex: M

BSA: 1.28   Age: 12 yr

Room: Technician: ESTELA

Dr. :

		PRE-BRONCH			POST-BRONCH		
		Actual	Pred.	%Pred.	Actual	%Pred.	%Chng

LUNG MECHANICS

		Actual	Pred.	%Pred.
FVC	(L)	2.62	2.78	94
FEV1	(L)	2.34	2.42	97
FEV1/FVC	(%)	89	87	
FEF 25%	(L/sec)	5.08	4.93	103
FEF 50%	(L/sec)	3.89	3.58	109
FEF 75%	(L/sec)	1.48	1.93	76
FEF MAX	(L/sec)	5.51	5.14	107
FEF 25-75%	(L/sec)	3.28	2.76	119
FEF 75-85%	(L/sec)	1.00		
FIVC	(L)	1.97		
FIF 50%	(L/sec)	1.72		
FEF 50%/FIF 50%		2.27	.9-1.0	
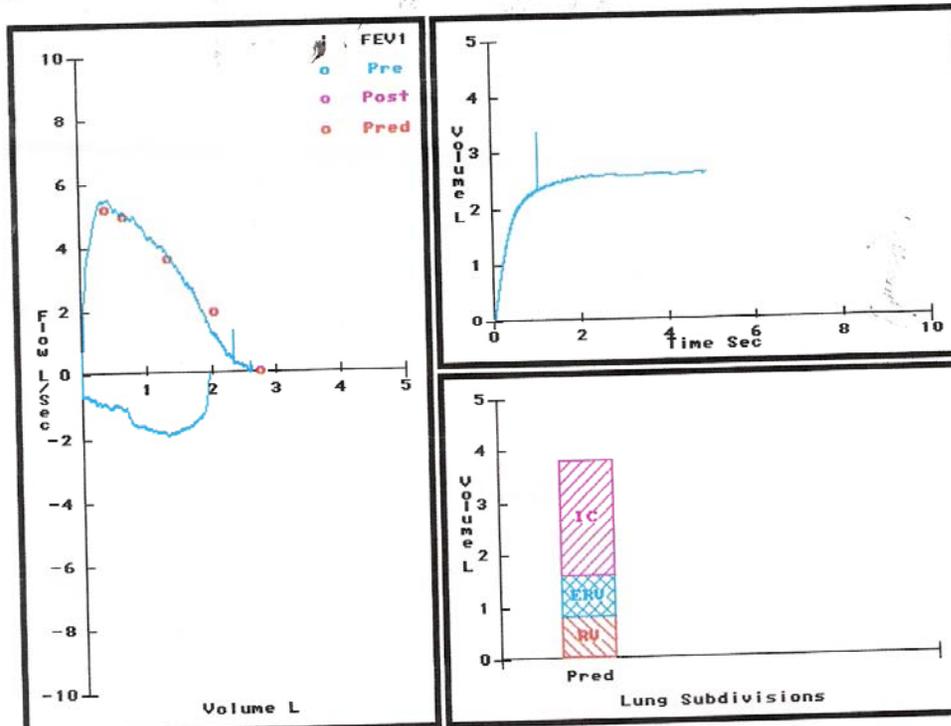
Name: ID: AMARILLO 8183   Date: 2-Jun-0

Race: Caucasian   Height: 170.00 cm Weight: 58.5 kg   Sex: F

Room: BSA: 1.68   Age: 17 yr

Dr. :   Technician:

		PRE-BRONCH			POST-BRONCH		
		Actual	Pred.	%Pred.	Actual	%Pred.	%Chng
LUNG MECHANICS							
FVC	(L)	3.50	4.07	86	3.63	89	4
FEV1	(L)	2.44	3.50	70	2.57	73	5
FEV1/FVC	(%)	70	86		71		1
FEF 25%	(L/sec)	4.87	6.32	77	5.52	87	13
FEF 50%	(L/sec)	1.96	4.88	40	2.24	46	15
FEF 75%	(L/sec)	0.60	2.20	27	0.79	36	32
FEF MAX	(L/sec)	7.66	6.64	115	8.26	124	8
FEF 25-75%	(L/sec)	1.54	4.17	37	1.82	44	18
FEF 75-85%	(L/sec)	0.41			0.56		37
FIVC	(L)	2.60			2.62		1
FIF 50%	(L/sec)	3.17	4.23	75	3.69	87	16
FEF 50%/FIF 50%		0.62	1.15		0.61		-2
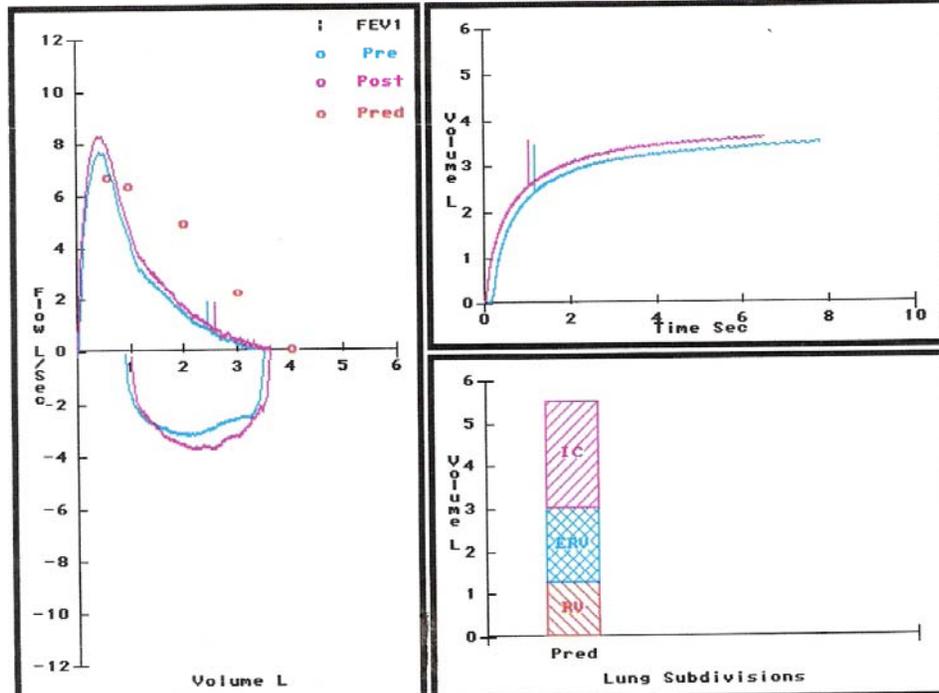
Secuela Pulmonar Posviral

Pulmonary function of a paediatric cohort of patients with postinfectious bronchiolitis obliterans. A long term follow-up

Aleja...r[1]

La función pulmonar permaneció disminuída en 12 años

Table 1 Study population of patients with postinfectious bronchiolitis obliterans

N	46
Male (%)	54
Age at diagnosis (months)*	14±3
CT scan with mosaic perfusion (%)	56
Adenovirus infectious detected (%)	55
Age (years) at initial lung function*	9.5±3
Duration of follow-up (years)*	12.5±3.5
No of spirometries	196
Spirometries per patient*	4.4±2.3
Z score BMI*	−0.5±1.3

*Mean±SD.
BMI, body mass index.

**Table 2** Initial lung function of patients with postinfectious bronchiolitis obliterans

| Variable	Values
FVC (z score)	−3.8±1
FEV_1 (z score)	−4.3±1
FEV_1/FVC (z score)	−2.2±1
FEF_{25-75} (z score)	−3.7±1
TLC (%)	120±26
RV (%)	309±103
RV/TLC	55±13

Values are expressed as mean±SD.
FEF, forced expiratory flow; FEV, forced expiratory volume in 1 s; FVC, forced vital capacity; RV, residual volume; TLC, total lung capacity.
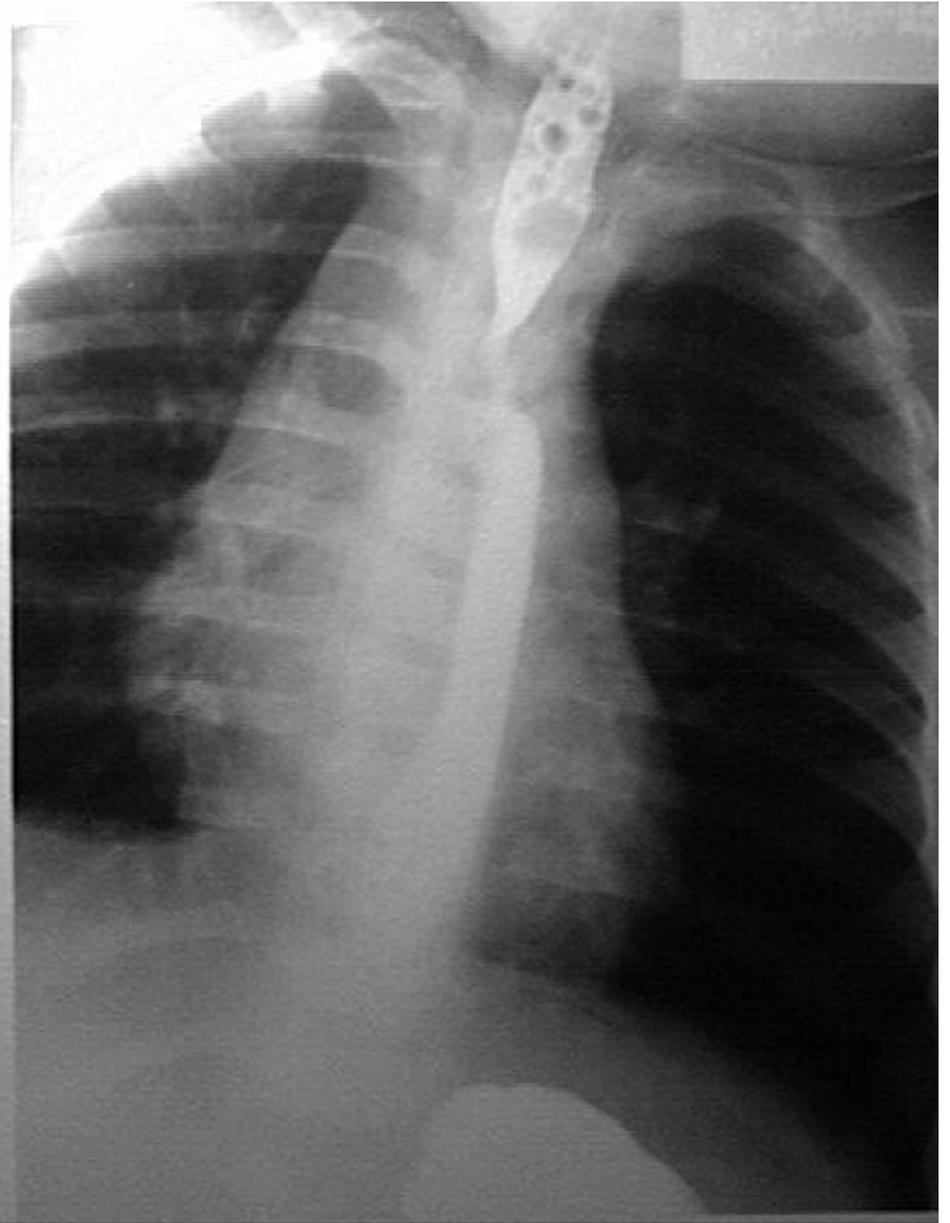
CC: 8 años de edad con parálisis cerebral, tos crónica y reiteradas internaciones por neumonías.
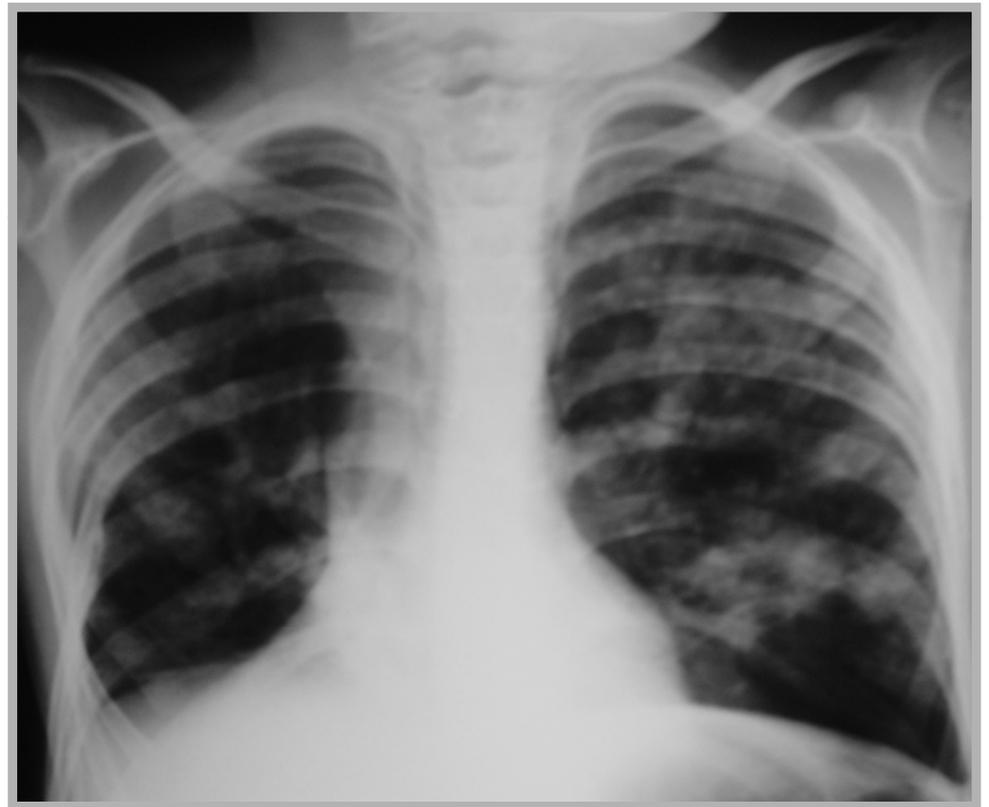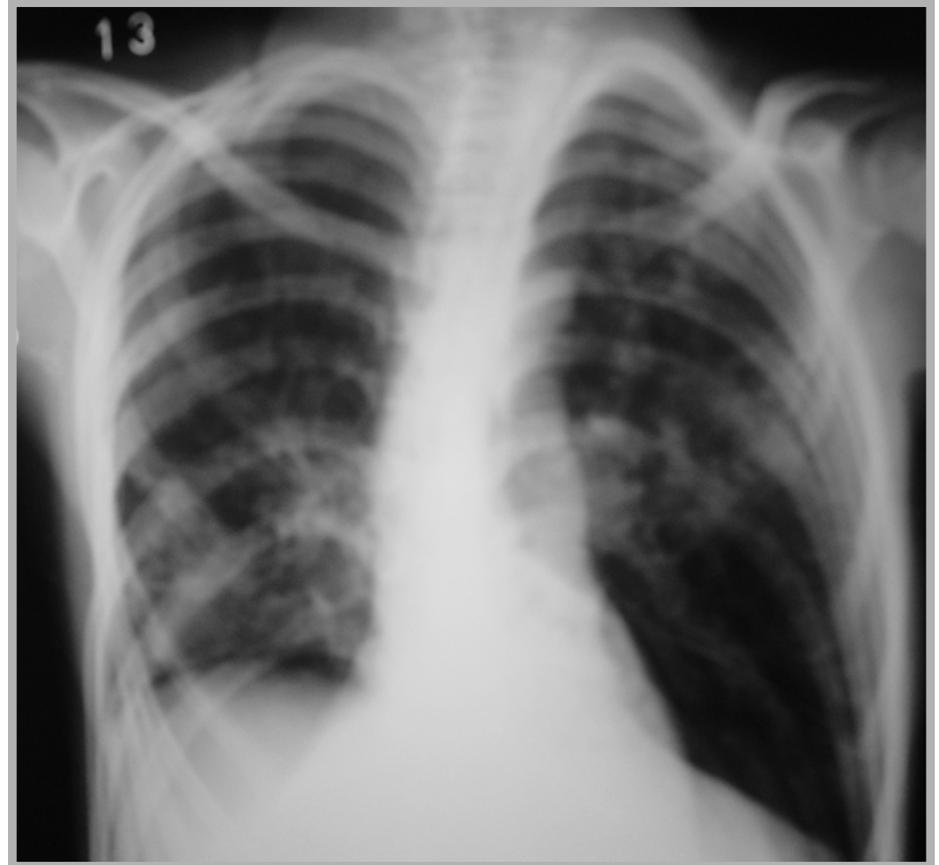
Secuela neurológica-Sme aspirativo
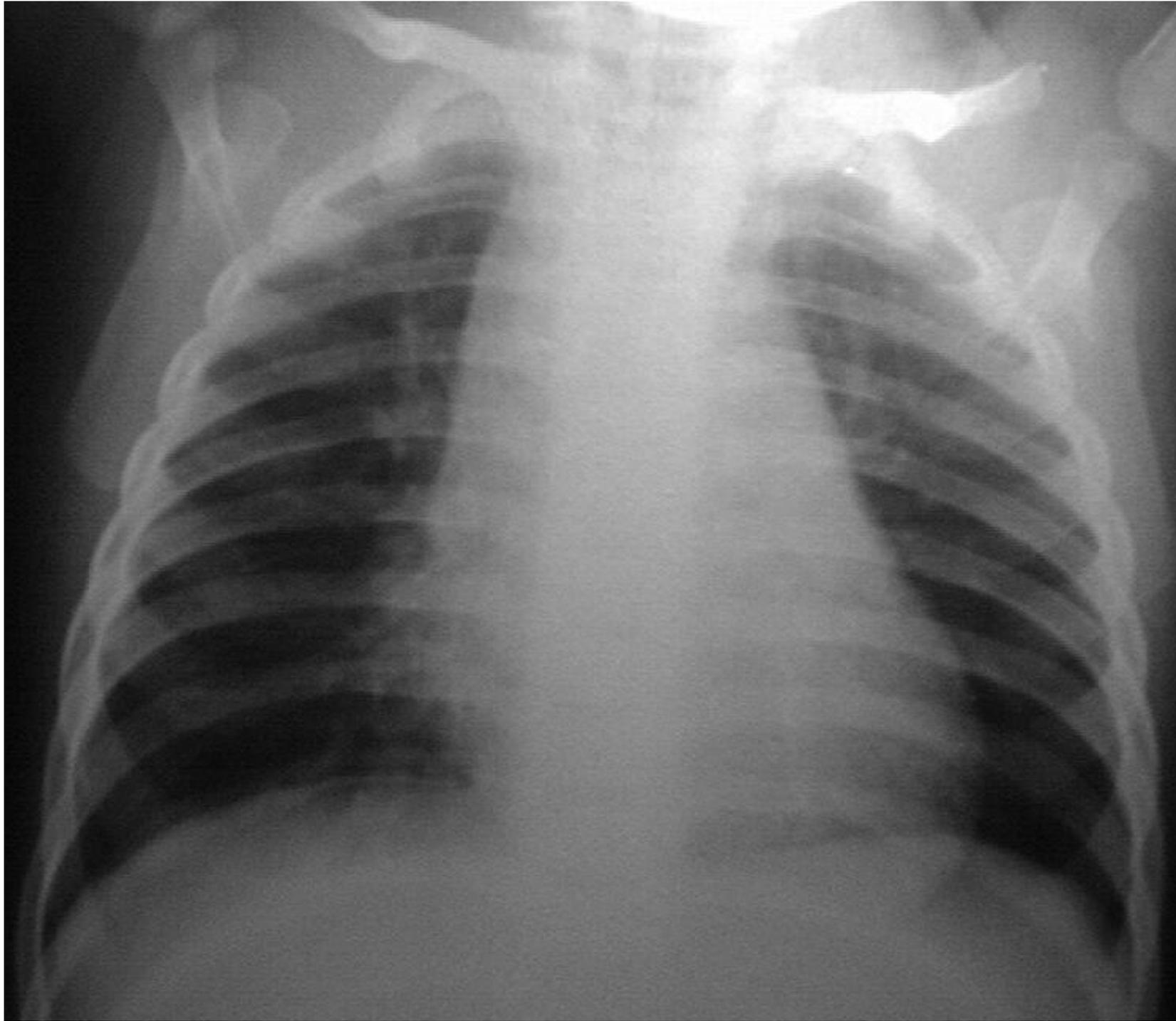
Anillo vascular

Volúmenes Pulmonares

- Diferenciación de patrones restrictivos y obstructivos.

- Medición de atrapamiento aéreo e hiperinsuflación.

- Respuesta al tratamiento

  - CRF/ CPT/ VR

  - VR/CPT

Difusión de CO (DLCO)

DLCO disminuida

Enfermedad obstructiva pulmonar

Enfisema

Fibrosis quística

Enfermedad intersticial pulmonar

Fibrosis pulmonar

Sarcoidosis

Lupus eritematoso sistémico

Artritis reumatoidea

Dermatomiositis

Enfermedad mixta del tejido conectivo

Enfermedades cardiovasculares

Estenosis mitral

Hipertensión pulmonar primaria

Tromboembolia pulmonar aguda o crónica

Otras

Enfermedades asociadas con anemia

Insuficiencia renal crónica

DLCO aumentada

Enfermedades asociadas con policitemia

Hemorragia pulmonar

Asma

Conclusiones

- Las pruebas de función pulmonar en pacientes con tos crónica son herramientas de ayuda para el diagnóstico y seguimiento

- Su utilidad dependerán según la edad y colaboración del niño