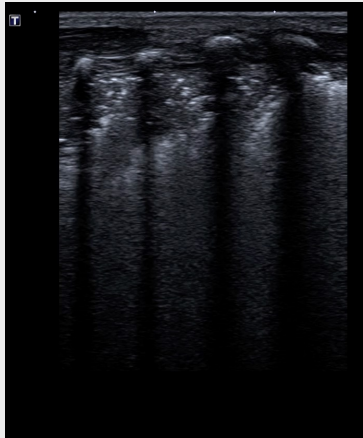




Hospital Universitario
Puerta del Mar



Almudena Alonso Ojembarrena.
H.U. Puerta del Mar, Cádiz
(Spain)

Ecografía pulmonar en el destete de ventilación mecánica

IMPORTANCIA DEL FRACASO DE EXTUBACIÓN

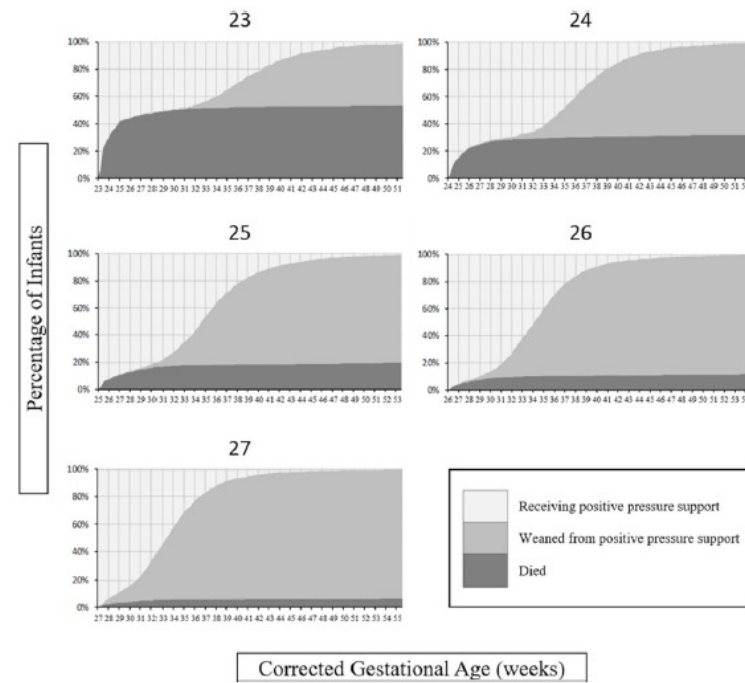
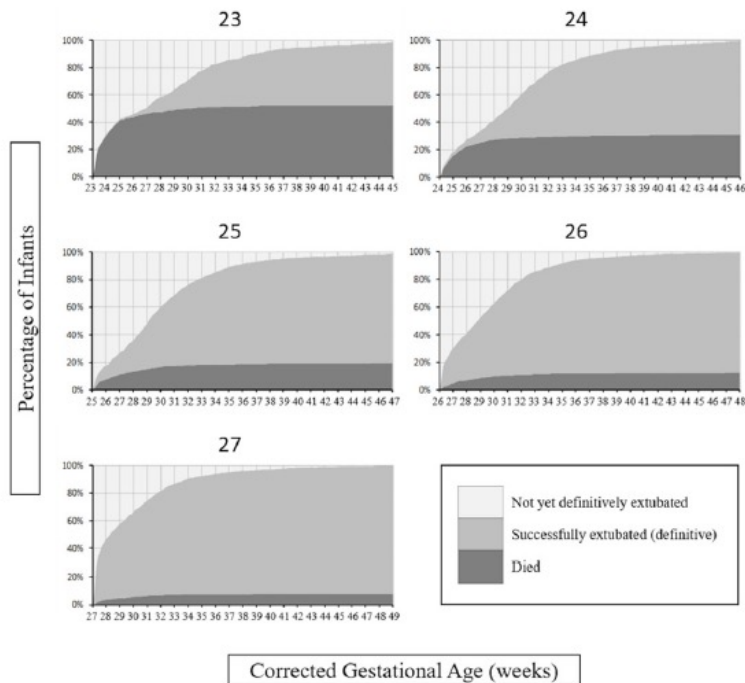
1. Utilizar VM es muy frecuente en recién nacidos

Duration of and trends in respiratory support among extremely preterm infants

ADC 2020

Dany E Weisz ^{1,2}, Eugene Yoon,³ Michael Dunn,^{1,2} Julie Emberley,⁴ Amit Mukerji ⁵, Brooke Read,⁶ Prakeshkumar S Shah,^{2,3,7} on behalf of the Canadian Neonatal Network Investigators

8881 pacientes
23-27 semanas



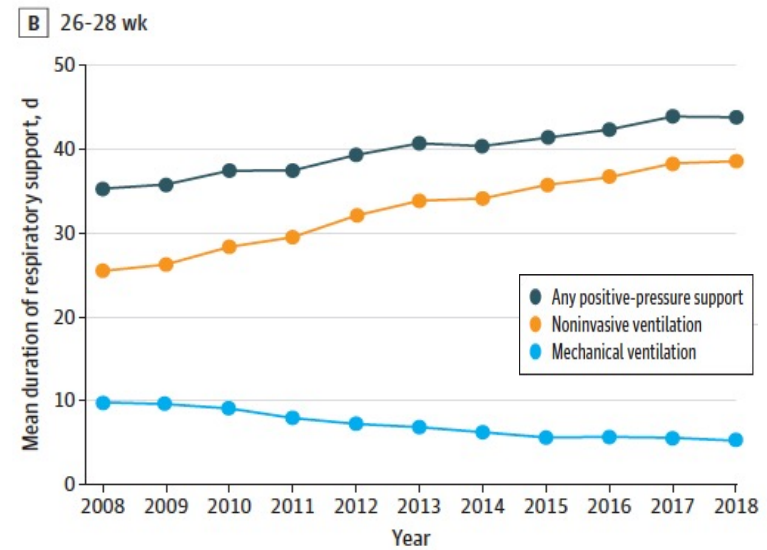
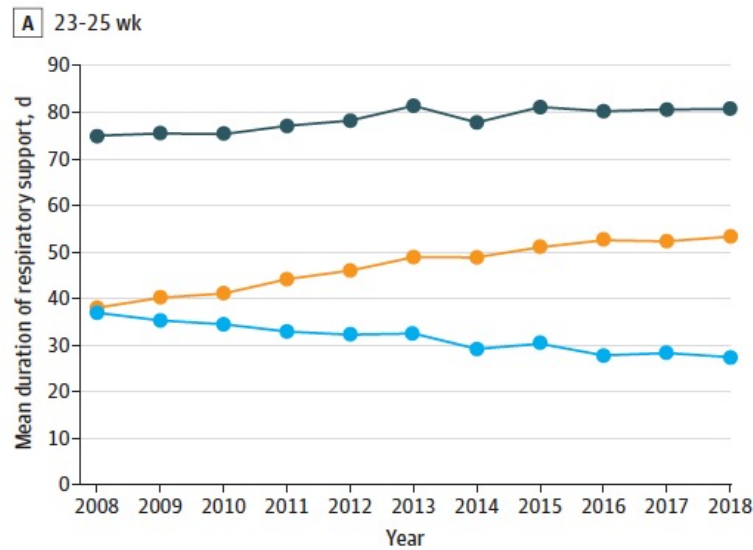
Changes in Use of Respiratory Support for Preterm Infants in the US, 2008-2018

2021

259311 pacientes

< 35 semanas

L. Dupree Hatch III, MD, MPH; Reese H. Clark, MD; Waldemar A. Carlo, MD; Ann R. Stark, MD; E. Wesley Ely, MD, MPH; Stephen W. Patrick, MD, MPH, MS



IMPORTANCIA DEL FRACASO DE EXTUBACIÓN

1. La VM es muy frecuente en recién nacidos
2. El fracaso de extubación es más frecuente que en otras edades

<1250g: 45-50%

Shalish et al. Ped Research 2018

Niños: 4-5%

Baisch et al. Pediatr Crit Care Med 2005

Adultos: 10%

Miltiades et al. Crit Care Med 2017

IMPORTANCIA DEL FRACASO DE EXTUBACIÓN

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3. No hay test que prediga el éxito de la extubación

[JAMA Pediatr.](#) 2020 Feb; 174(2): 178–185.

Published online 2019 Dec 20.

doi: 10.1001/jamapediatrics.2019.4868: 10.1001/jamapediatrics.2019.4868

PMCID: PMC6990705

PMID: [31860014](#)

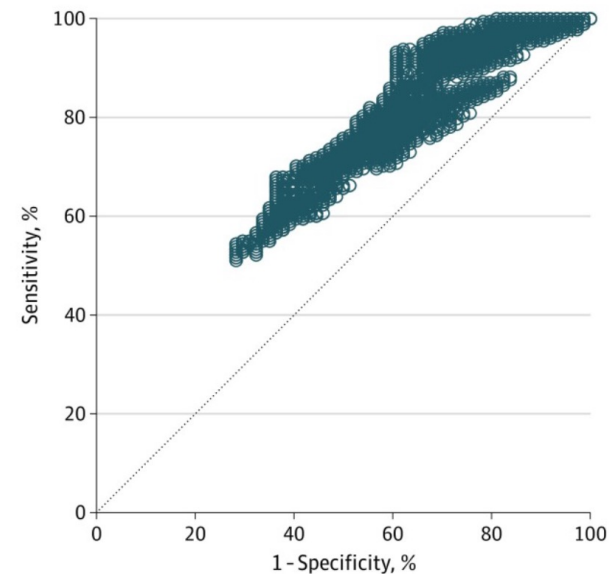
259 RN menores 1250g

Assessment of Extubation Readiness Using Spontaneous Breathing Trials in Extremely Preterm Neonates

5 UCI-neonatales

[Wissam Shalish](#), MD,¹ [Lara Kanbar](#), MSc,² [Lajos Kovacs](#), MD,³ [Sanjay Chawla](#), MD,⁴ [Martin Keszler](#), MD,⁵
[Smita Rao](#),¹ [Samantha Latremouille](#), MSc,¹ [Doina Precup](#), PhD,⁶ [Karen Brown](#), MD,⁷ [Robert E. Kearney](#), PhD,² and
[Guilherme M. Sant'Anna](#), MD, PhD^{✉1}

41602 combinaciones de
eventos clínicos para definir
TEST POSITIVO



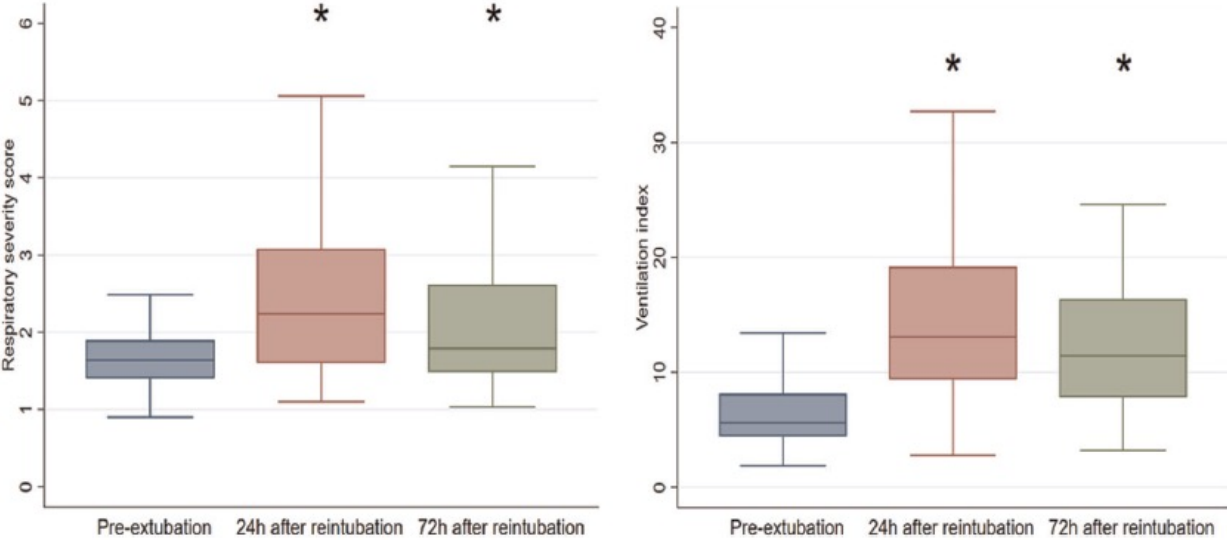
IMPORTANCIA DEL FRACASO DE EXTUBACIÓN

1. La VM es muy frecuente en recién nacidos
2. El fracaso de extubación es más frecuente que en otras edades
3. No hay test que prediga el éxito de la extubación
4. Con la reintubación empeoramiento respiratorio

Respiratory setback associated with extubation failure in extremely preterm infants

Ped Pulmonol 2021

Dhruv Gupta MD¹ | Rachel G. Greenberg MD, MB, MHS² | Girija Natarajan MD³ |
Sanket Jani MD³ | Amit Sharma MD¹ | Michael Cotten MD, MHS² |
Ronald Thomas PhD³ | Sanjay Chawla MD³



IMPORTANCIA DEL FRACASO DE EXTUBACIÓN

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4. Con la reintubación empeoramiento respiratorio
5. Peor pronóstico a medio plazo si extubaciones repetidas fallidas

Published in final edited form as:

JAMA Pediatr. 2015 November ; 169(11): 1011–1017. doi:10.1001/jamapediatrics.2015.2401.

Effects of Multiple Ventilation Courses and Duration of Mechanical Ventilation on Respiratory Outcomes in Extremely Low-Birth-Weight Infants

Erik A. Jensen, MD, Sara B. DeMauro, MD, MSCE, Michael Kornhauser, MD, Zubair H. Aghai, MD, Jay S. Greenspan, MD, and Kevin C. Dysart, MD

Exposure	Adjusted OR ^a (95% CI)			
	BPD	Discharged on Oxygen	Tracheostomy	Death
Duration of mechanical ventilation, d				
≤7	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]
8–21	2.73 (2.16–3.45)	1.35 (1.00–1.81)	0.97 (0.06–17.01)	0.60 (0.46–0.77)
22–35	4.62 (3.37–6.35)	2.13 (1.54–2.95)	3.02 (0.25–36.88)	0.33 (0.21–0.51)
≥36	8.69 (6.58–11.48)	3.28 (2.40–4.47)	6.30 (0.52–76.41)	0.11 (0.08–0.17)
No. of ventilation courses				
1	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]
2	1.88 (1.54–2.31)	1.41 (1.08–1.85)	2.73 (0.45–16.73)	0.75 (0.56–0.99)
3	2.56 (1.99–3.28)	1.62 (1.26–2.10)	1.10 (0.14–8.82)	0.68 (0.48–0.96)
≥4	3.81 (2.88–5.04)	1.58 (1.14–2.19)	2.27 (0.34–14.94)	0.66 (0.49–0.91)

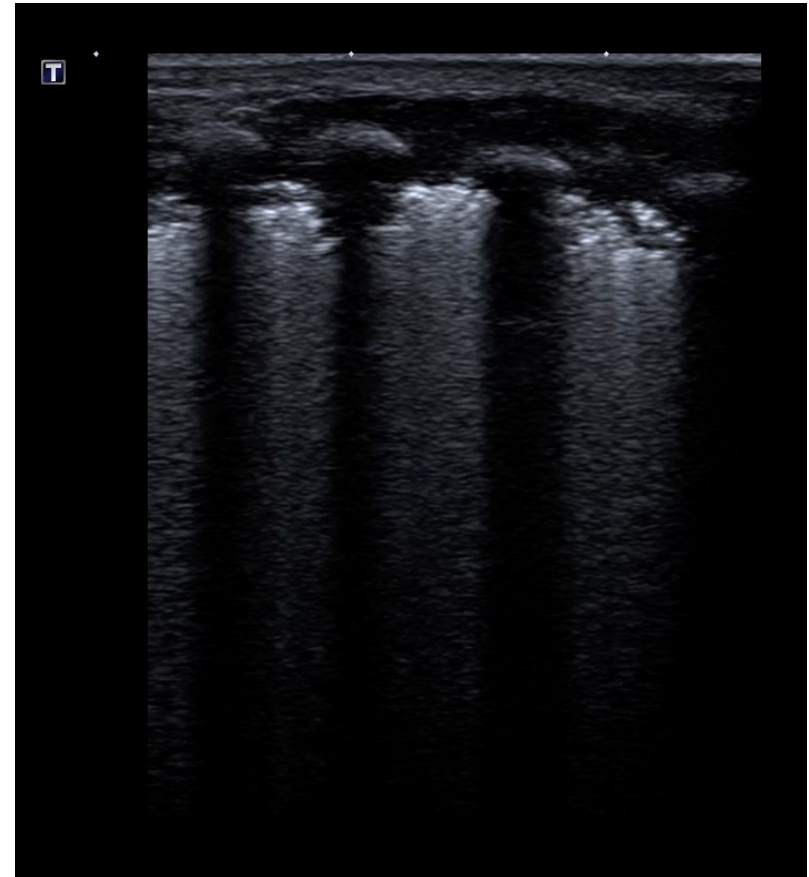
Abbreviations: BPD, bronchopulmonary dysplasia; OR, odds ratio.

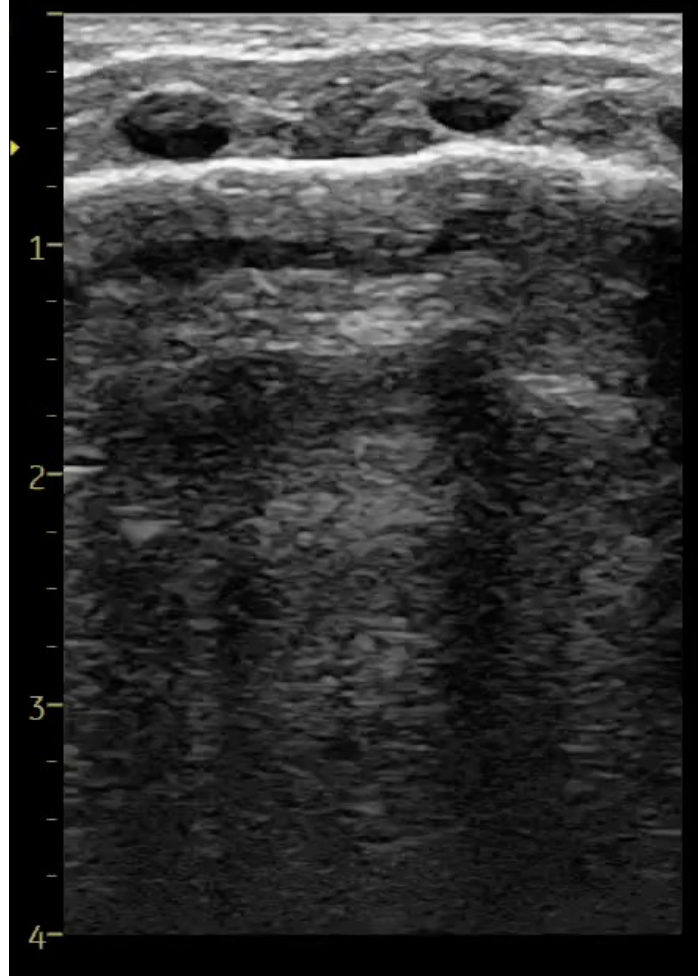
IMPORTANCIA DEL FRACASO DE EXTUBACIÓN

1. La VM es muy frecuente en recién nacidos
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4. Con la reintubación empeoramiento respiratorio
5. Peor pronóstico a medio plazo si extubaciones repetidas fallidas
6. ¡¡PERO A MÁS DÍAS DE VM MÁS DBP Y OXIGENO DOMICILIARIO!!

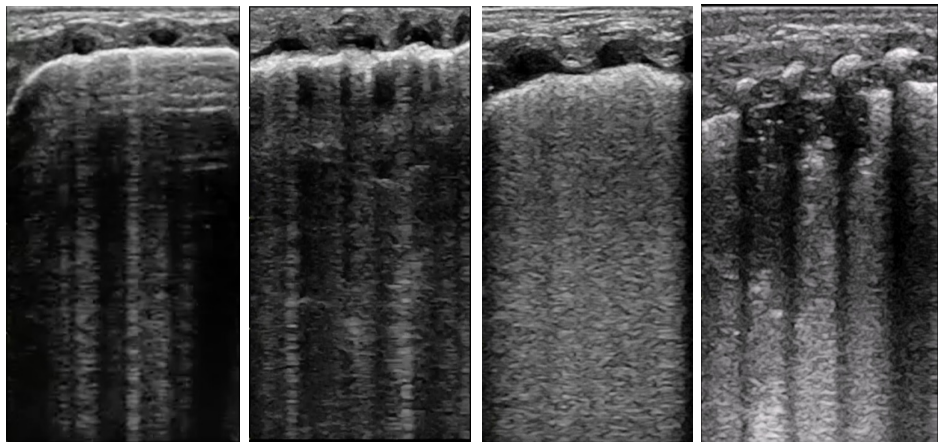
¿ECOGRAFÍA TORÁCICA?

- Síndrome distrés respiratorio
- Displasia broncopulmonar
- Ecografía diafragmática
- Combinación





SISTEMA PUNTUACIÓN PULMONAR ECOGRÁFICO

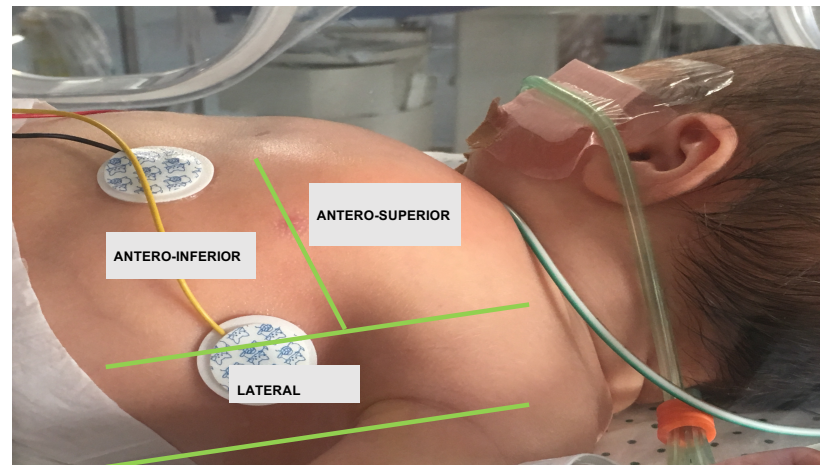


0

1

2

3



0-18

ECOGRAFÍA PULMONAR EN SDR

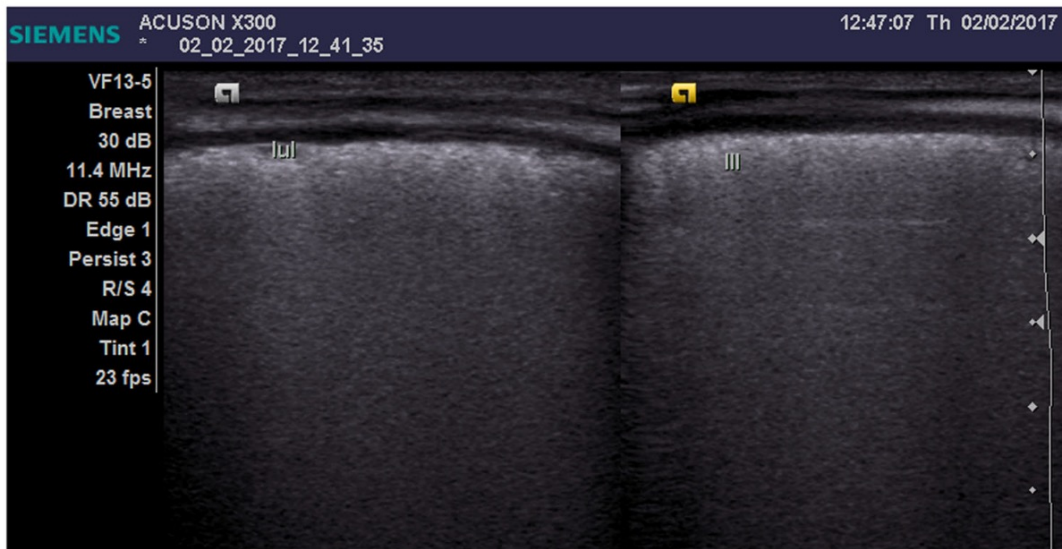
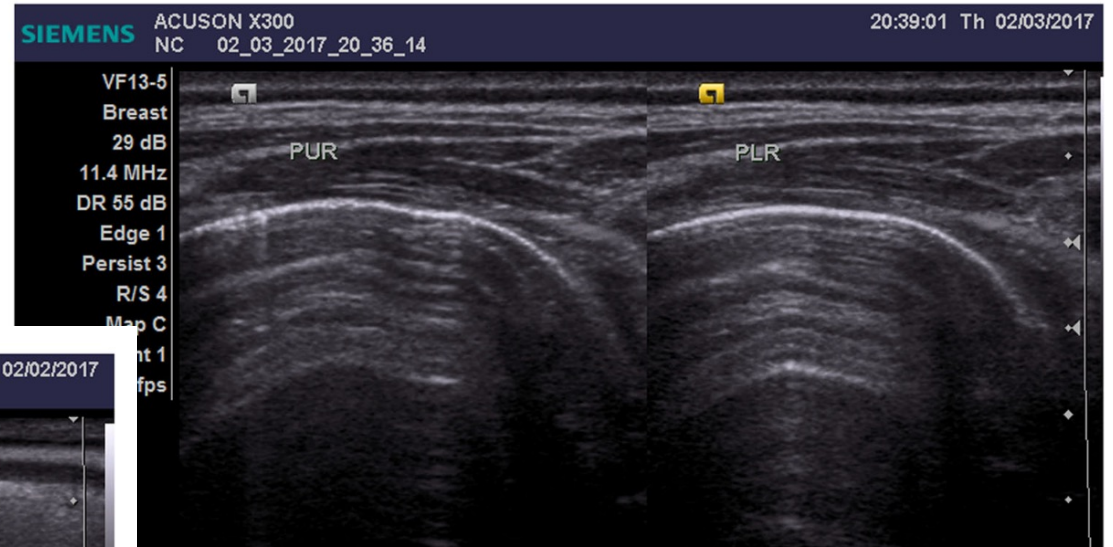
TABLE 1 Variables in neonates with failed and succeeded extubation

Variables	Succeeded extubation (n = 62)	Failed extubation (n = 18)	P
Age, d	13.2 ± 3.2	16.2 ± 4.5	.002*
Gestational age, wk	35 ± 3.8	32.9 ± 4.5	.045*
Sex (male: female)	36:26	10:8	.85
Weight (kg)	3.3 ± 0.4	3.1 ± 0.4	.02*
NICU length of stay, d	6.7 ± 2.2	9.9 ± 3.3	<.001*
Duration of MV, d	5.3 ± 1.8	8.1 ± 2.5	<.001*
Mortality	2 (3.2%)	3 (16.7%)	.03*
LUS before extubation	3.4 ± 1.5	7.2 ± 1.8	<.001*
LUS 6 h after extubation	3.6 ± 1.4	7.8 ± 1.6	<.001*
Pre-extubated PH	7.38 ± 0.04	7.39 ± 0.03	.424
Pre-extubated PCO ₂	38.9 ± 7.8	36.1 ± 7.3	.177
Pre-extubated HCO ₃	24.8 ± 2.4	24.6 ± 2.2	.751
Diagnosis:	RDS: 26 (41.9%) meconium: 22 (35.5%) Pneumonia: 14 (22.6%)	8 (44.4%) 7 (38.9%) 3 (16.7%)	.970

ECOGRAFÍA PULMONAR EN SDR

Éxito tras extubación

Fracaso de extubación



El Amrousy et al. Ped Pulmonol 2020.

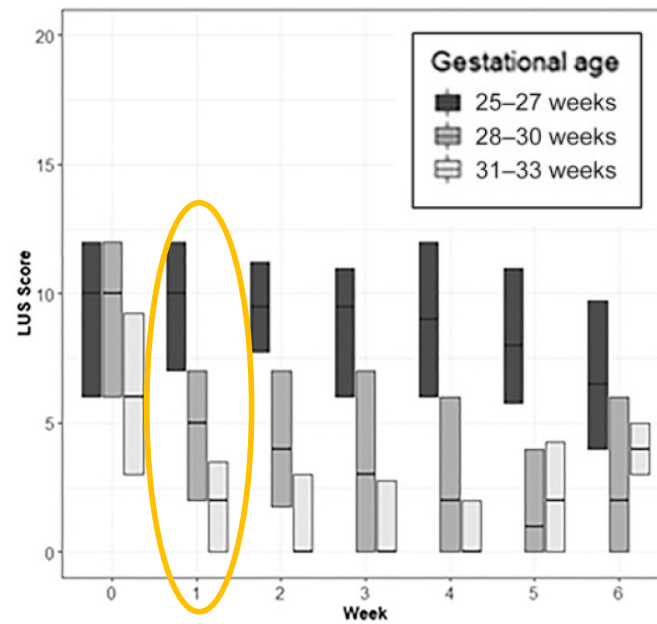
ECOGRAFÍA PULMONAR EN SDR

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El Amrousy et al. Ped Pulmonol 2020.

PROGRESO DESDE EL NACIMIENTO



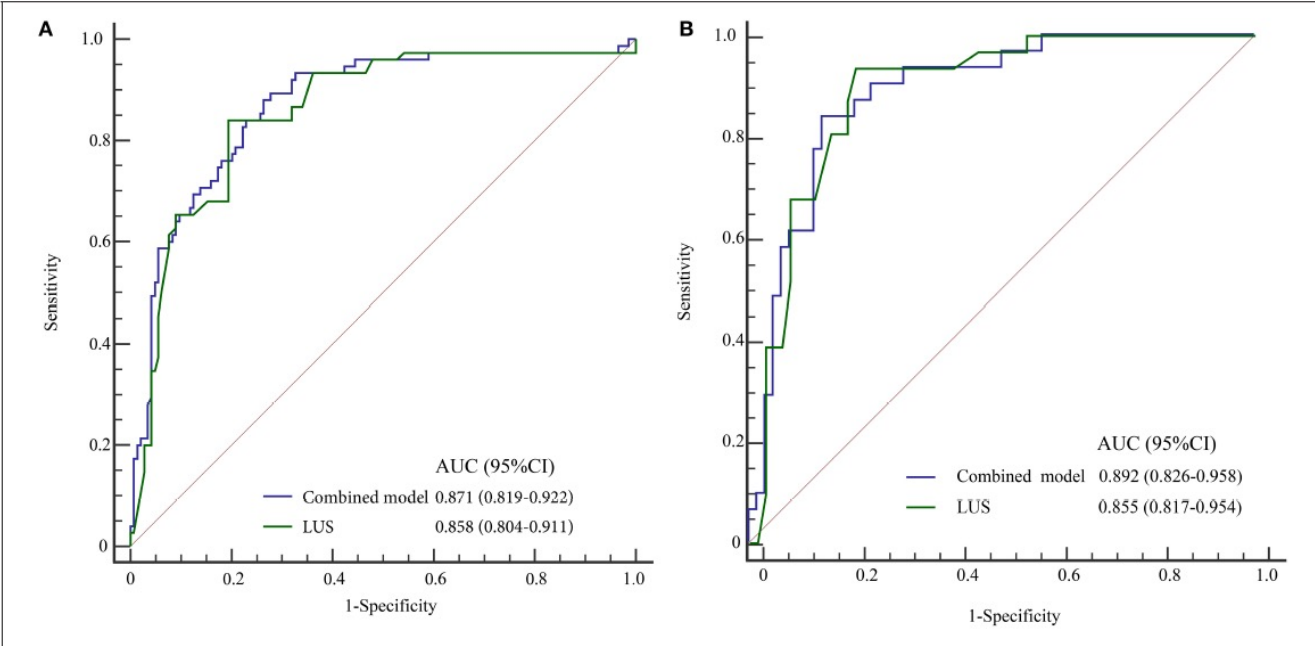
Raimondi et al. Pediatrics 2021

ECOGRAFÍA PULMONAR EN SDR

TABLE 2 | Univariate logistic regression analysis for the extubation failure.

Variables	Extubation success (n = 145)	Extubation failure (n = 75)	Statistics	P
Gestational age, weeks, $\bar{x} \pm s$	33.60 \pm 3.57	31.65 \pm 2.99	t = 4.04	<0.001
Gender, n (%), $\bar{x} \pm s$			$\chi^2 = 0.224$	0.636
Male	92 (63.45)	50 (66.67)		
Female	53 (36.55)	25 (33.33)		
Nationalities, n (%)			–	0.115
Han	145 (100.00)	73 (97.33)		
Uyghur	0 (0.00)	2 (2.67)		
Body length, cm, $\bar{x} \pm s$	42.26 \pm 4.91	36.27 \pm 3.91	t = 9.84	<0.001
Birth weight, kg, M(Q ₂₅ , Q ₇₅)	1.58 (1.24, 2.00)	0.99 (0.92, 1.19)	Z = –8.699	<0.001
Breathing, beats/min, $\bar{x} \pm s$	49.94 \pm 5.27	50.57 \pm 5.38	t = –0.84	0.401
O _i , $\bar{x} \pm s$	3.76 (2.81, 4.90)	3.65 (2.91, 5.57)	Z = 0.782	0.434
PaO ₂ , mmHg, $\bar{x} \pm s$	80.57 \pm 19.89	77.64 \pm 20.59	t = 1.02	0.307
PaCO ₂ , mmHg, $\bar{x} \pm s$	39.64 \pm 9.01	43.04 \pm 9.38	t = –2.61	0.010
RSBI, $\bar{x} \pm s$	87.92 \pm 5.27	88.54 \pm 4.87	t = –0.85	0.397
Duration of MV, h, M(Q ₂₅ , Q ₇₅)	122.0 (66.0, 183.0)	165.0 (81.0, 255.0)	Z = 1.865	0.062

ECOGRAFÍA PULMONAR EN SDR

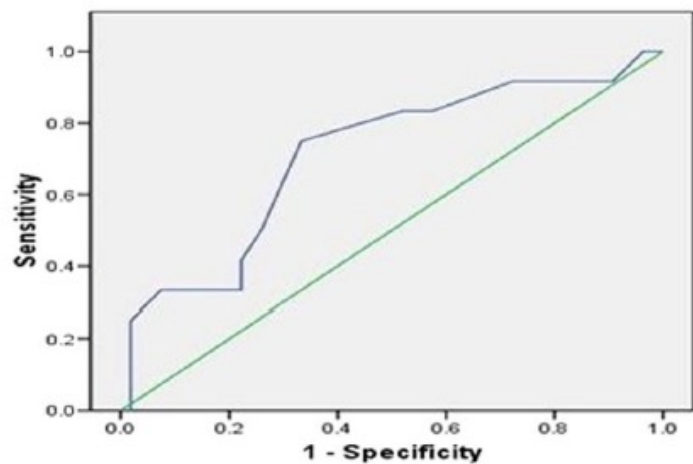


LIANG et al. *Frontiers in Ped* 2021

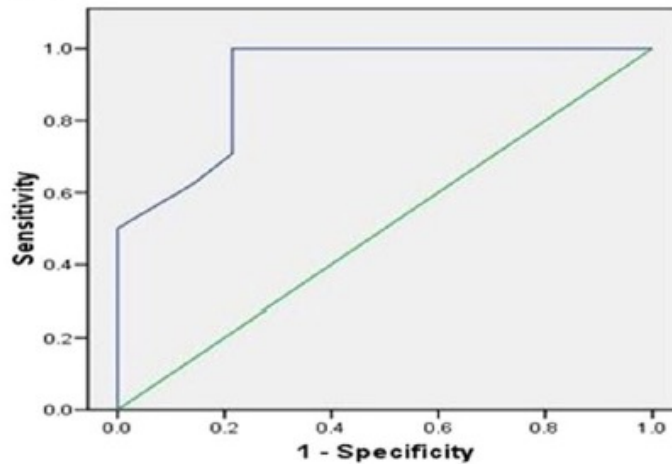
ECOGRAFÍA PULMONAR EN SDR

- Tres días de vida
- Siete días de vida
- Índice de excentricidad

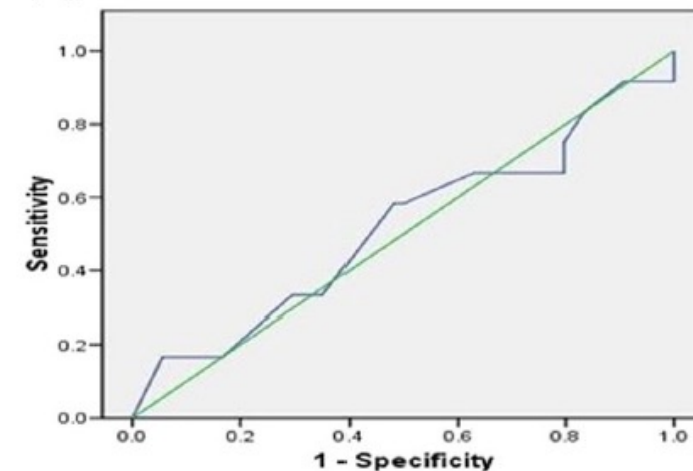
(A)



(B)



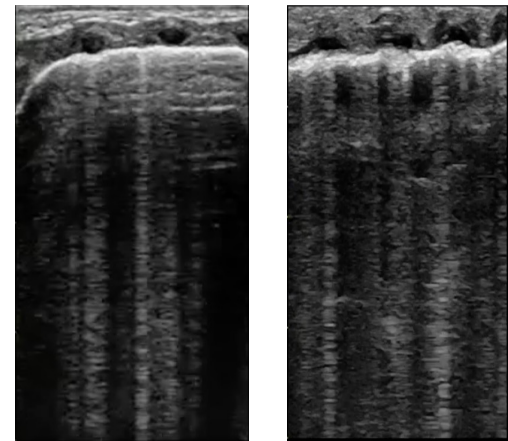
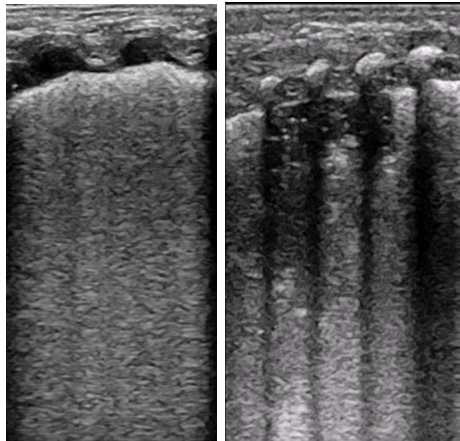
(C)



ECOGRAFÍA PULMONAR EN SDR

TOMA et al. Ro Med J 2021

Lung ultrasound pattern	Extubation failure		Total
	Failure (re-intubated)	Successful extubation	
Abnormal	3 (75%)	3 (14.3%)	6 (24%)
Normal	1 (25%)	18 (85.7%)	19 (76%)
Total	4 (16%)	21 (84%)	25 (100%)



CASO CLÍNICO

RNPT 27 sem, 1100g peso

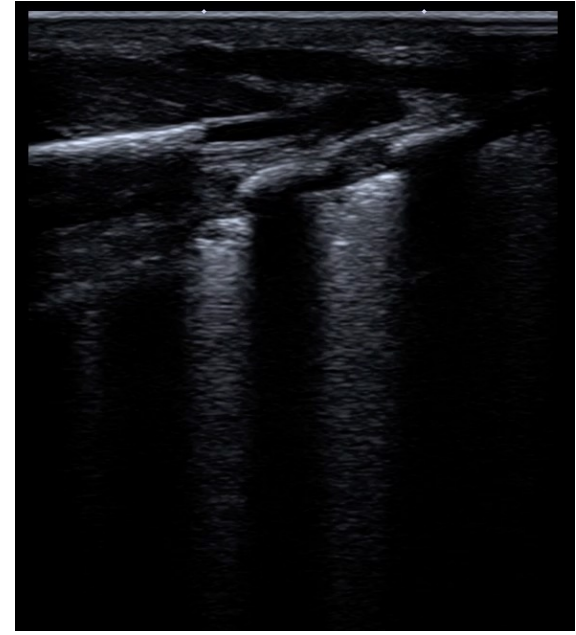
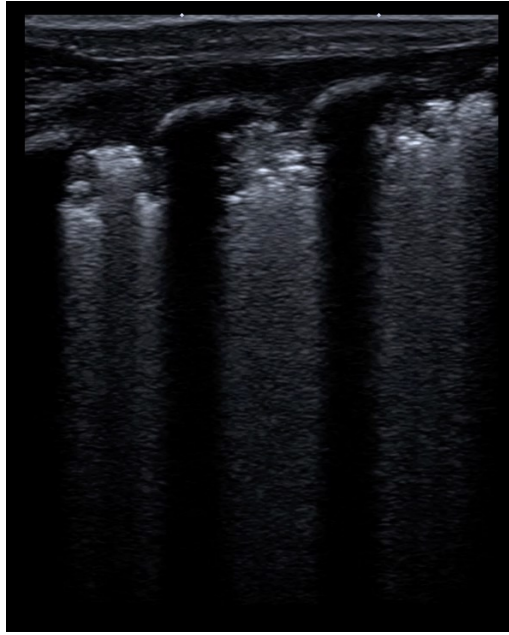
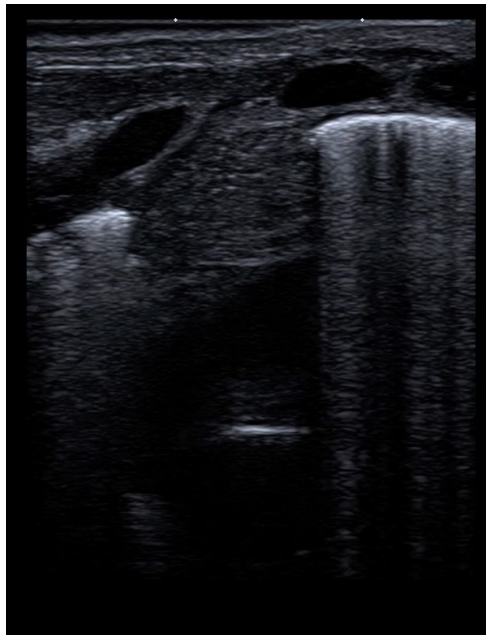
Intubado al nacimiento en centro periférico

Administración selectiva surfactante en bronquio derecho

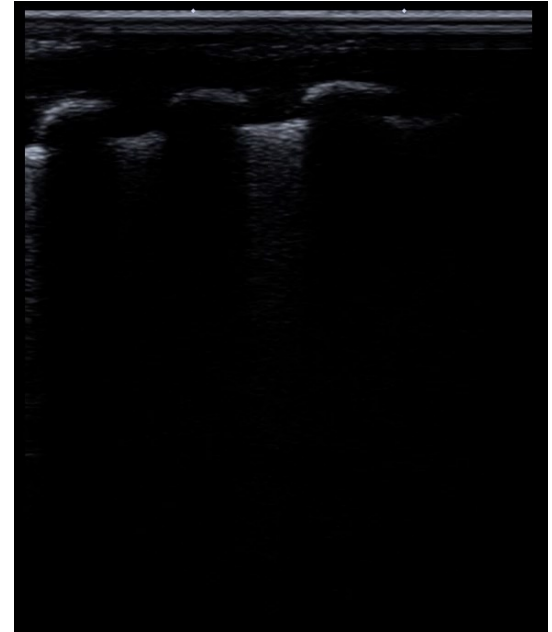
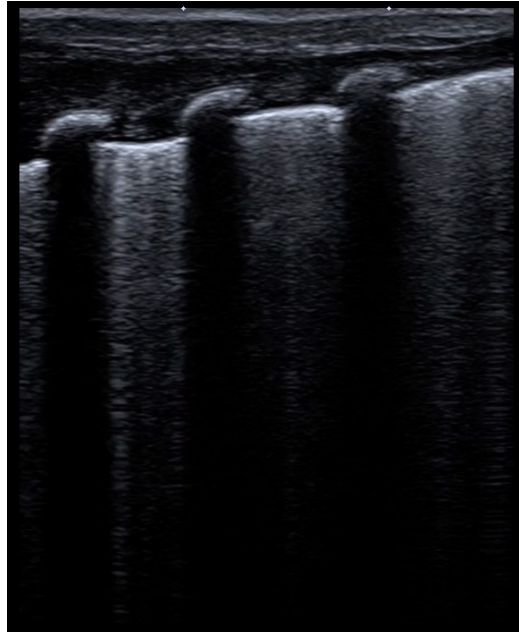
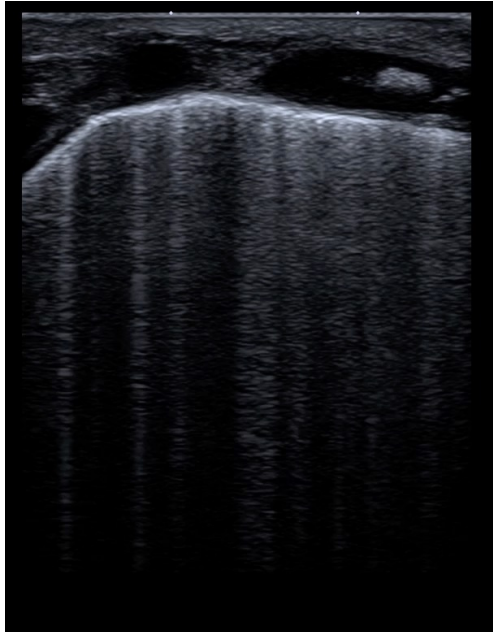
Trasladado a nuestro centro

Al tercer día de vida: VMI en PC, con PIP 15, PEEP 6, FR 50 y FiO₂ 25%

PULMON IZQUIERDO

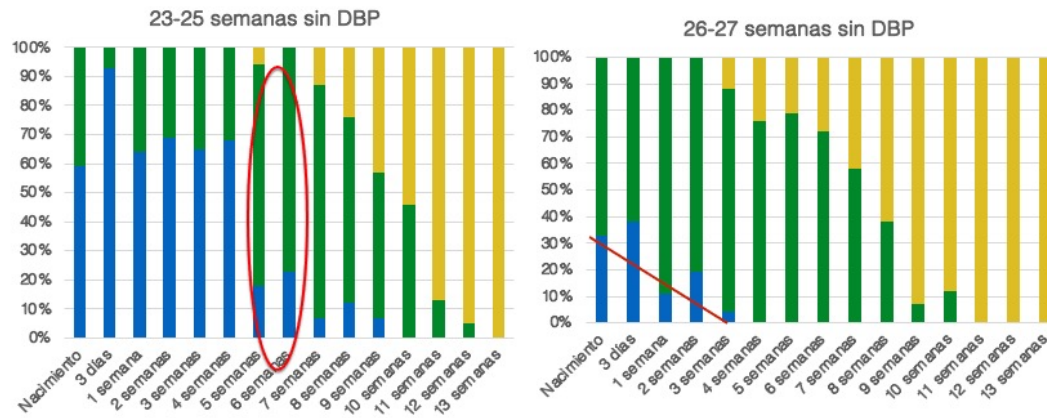
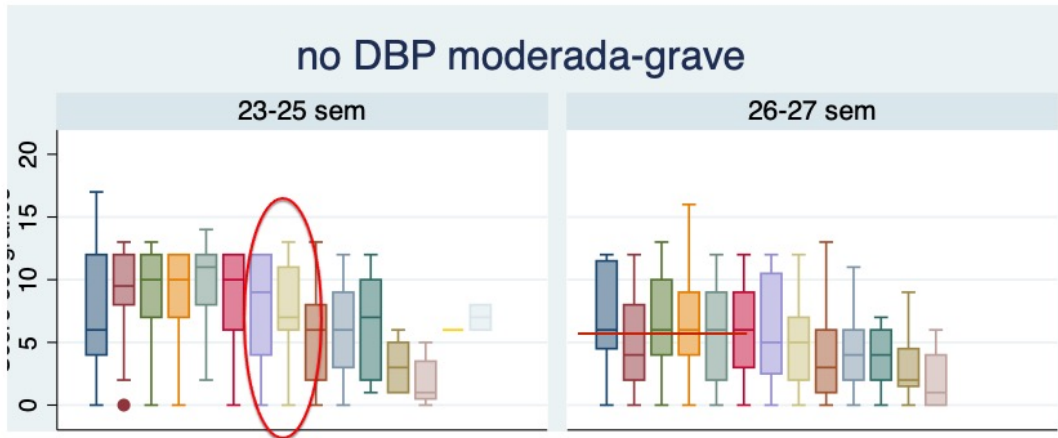


PULMON DERECHO



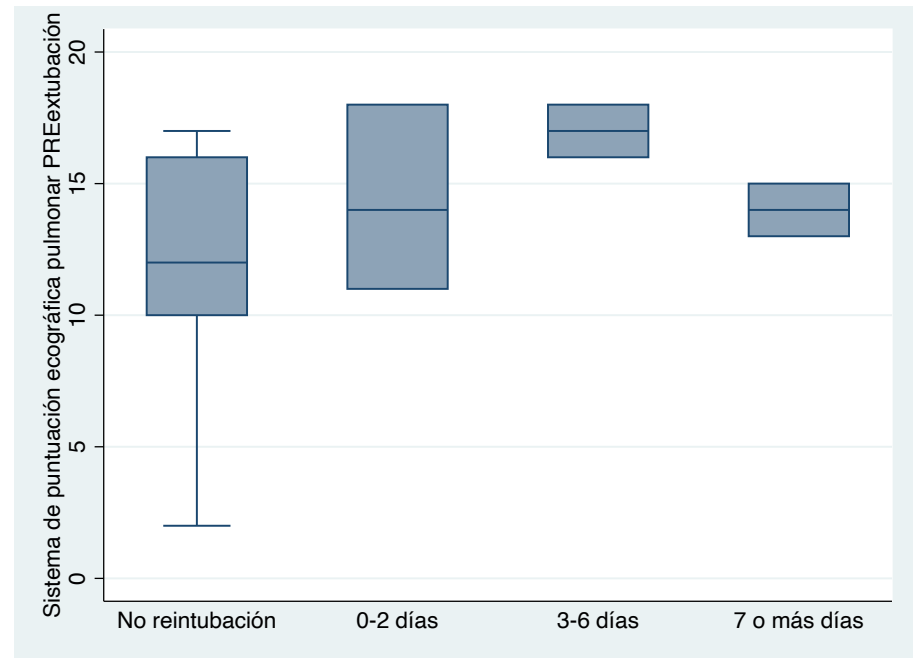
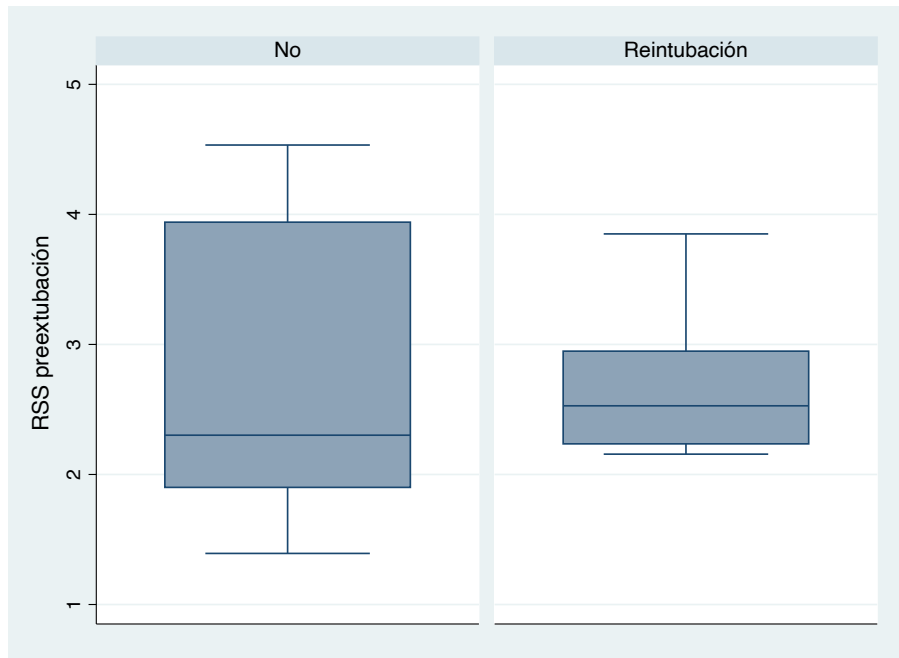
DISPLASIA BRONCOPULMONAR

- Ninguna evidencia publicada
- Menor influencia la puntuación ecográfica pulmonar
- Consolidaciones previas a la extubación
- Respuesta a tratamientos: corticoides, diuréticos



LUS-EXT

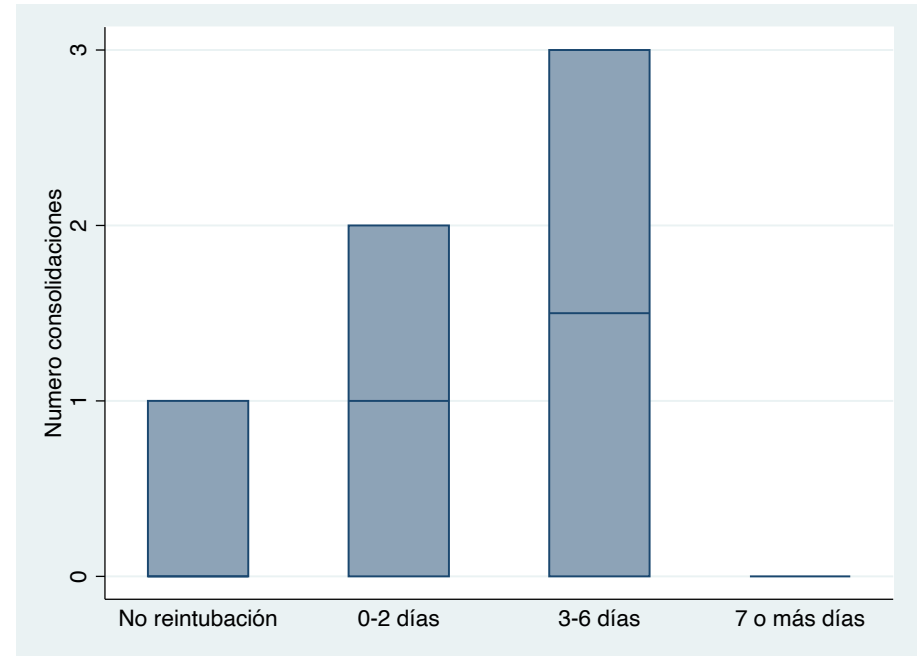
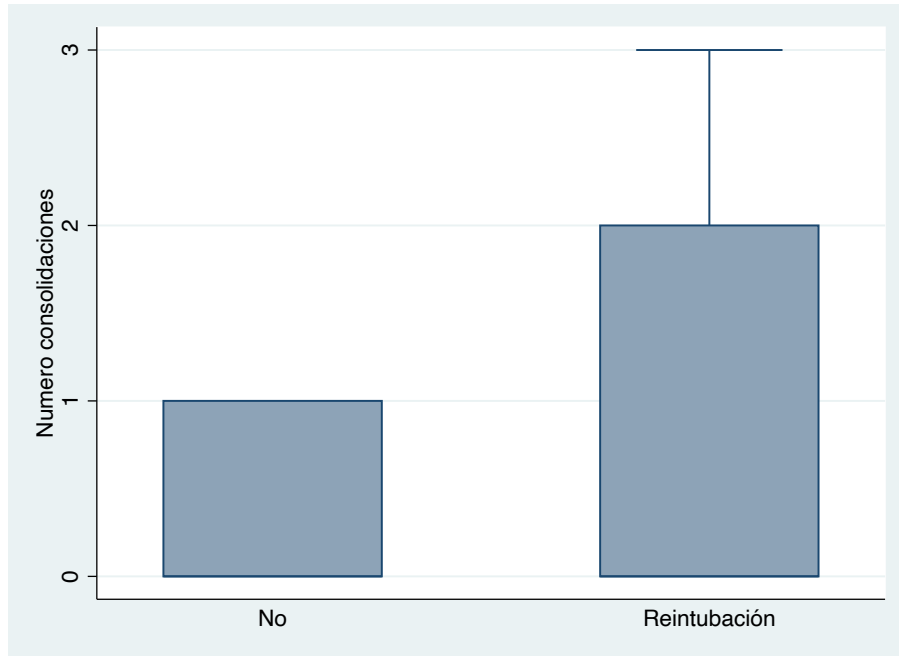
PREEXTUBACIÓN



p=0.984

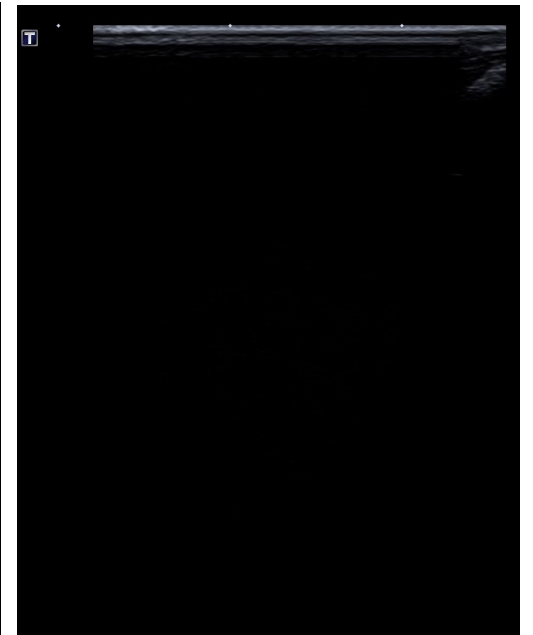
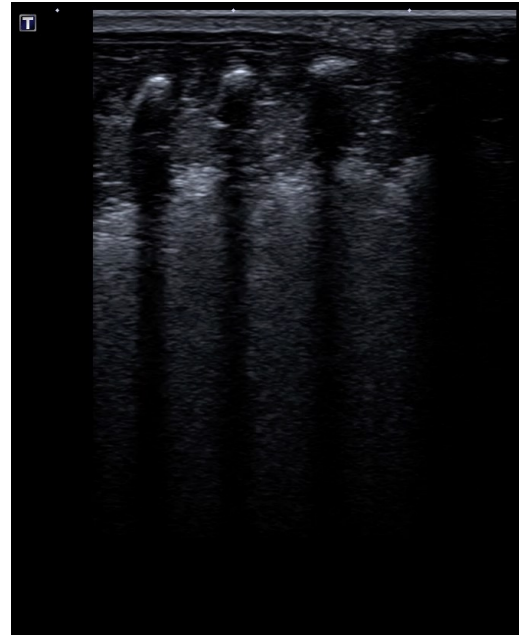
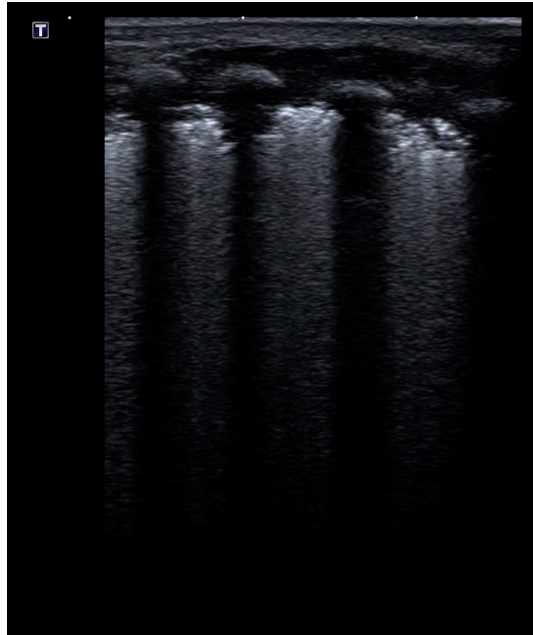
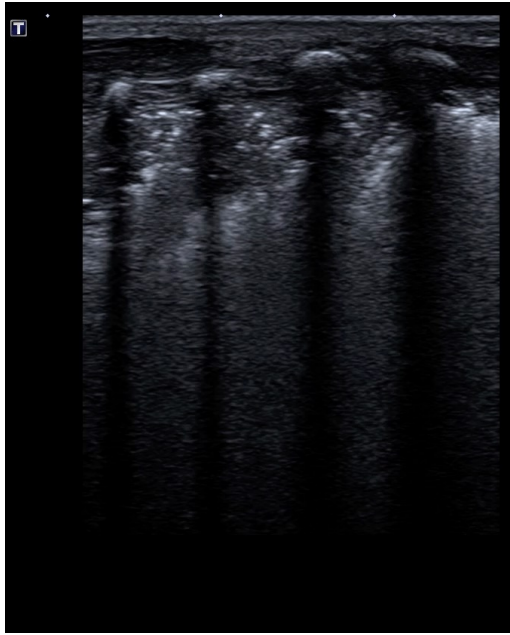
LUS-EXT

PREEXTUBACIÓN

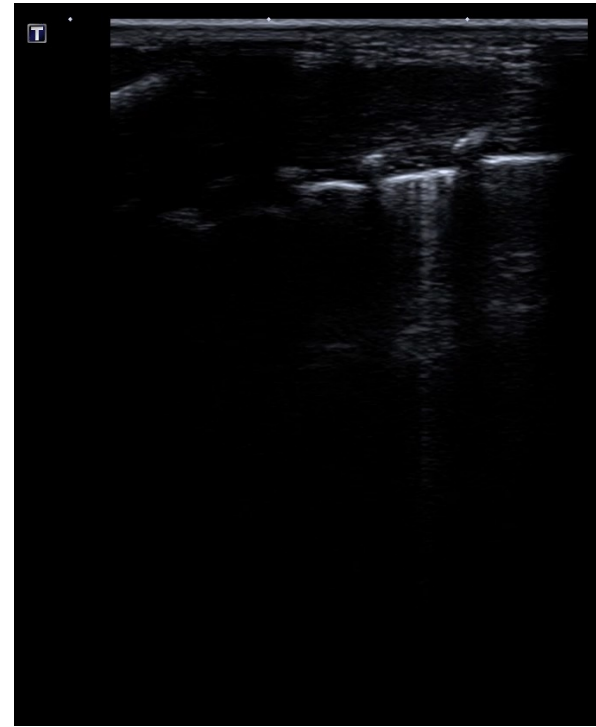
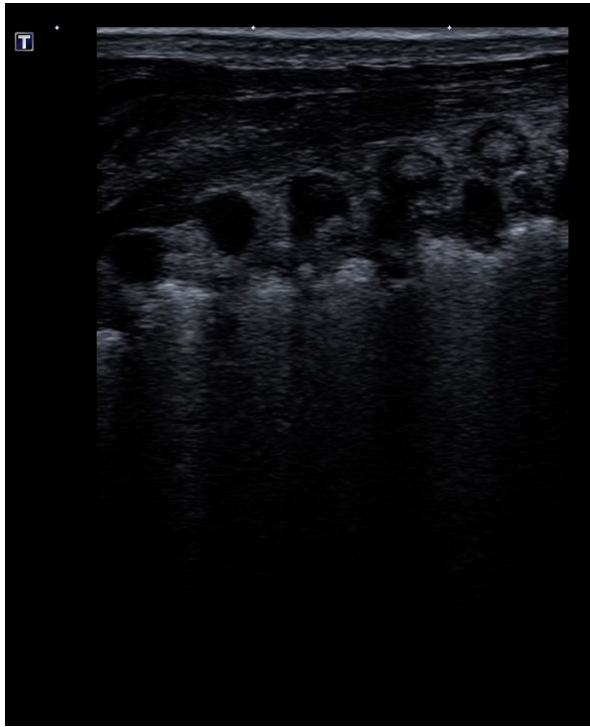


p=0.242

PREEXTUBACIÓN

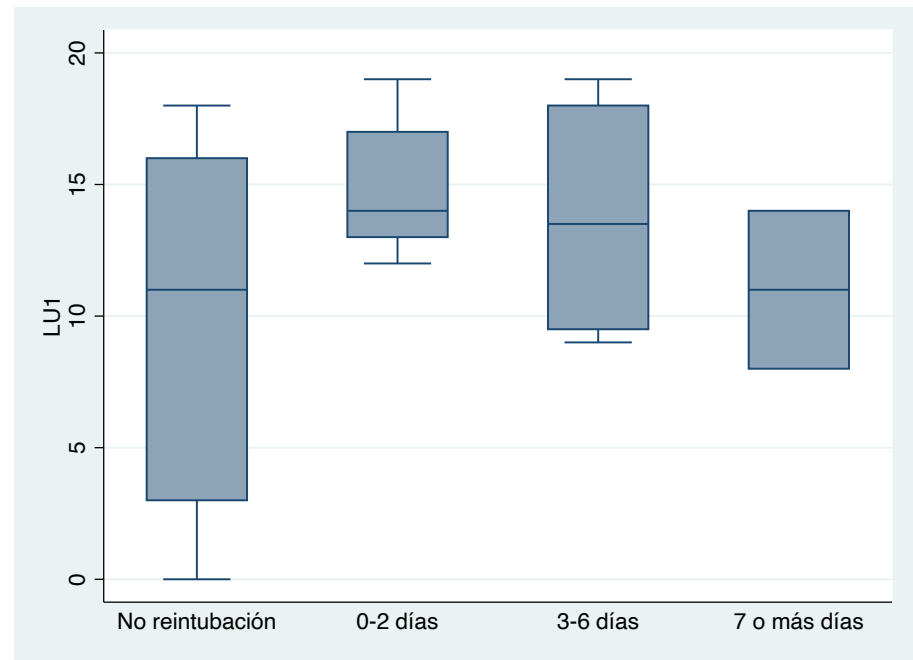
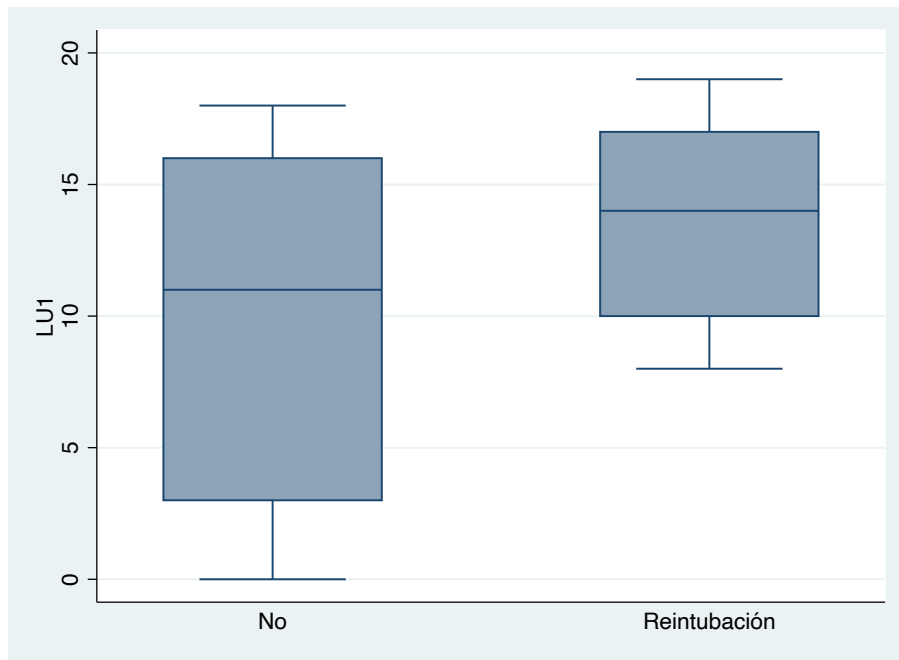


DESPUÉS DE UNA HORA EN DECÚBITO PRONO



LUS-EXT

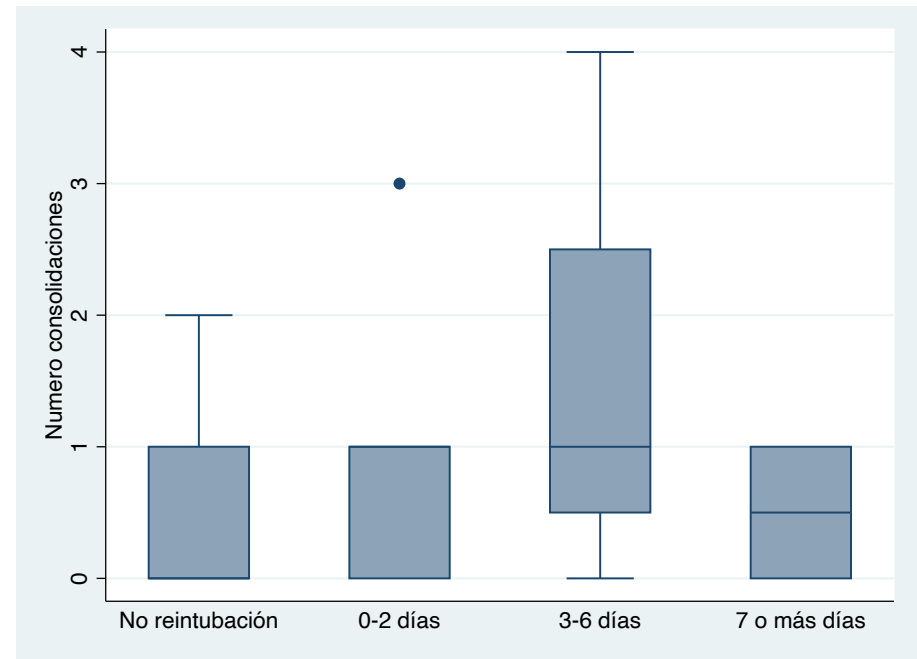
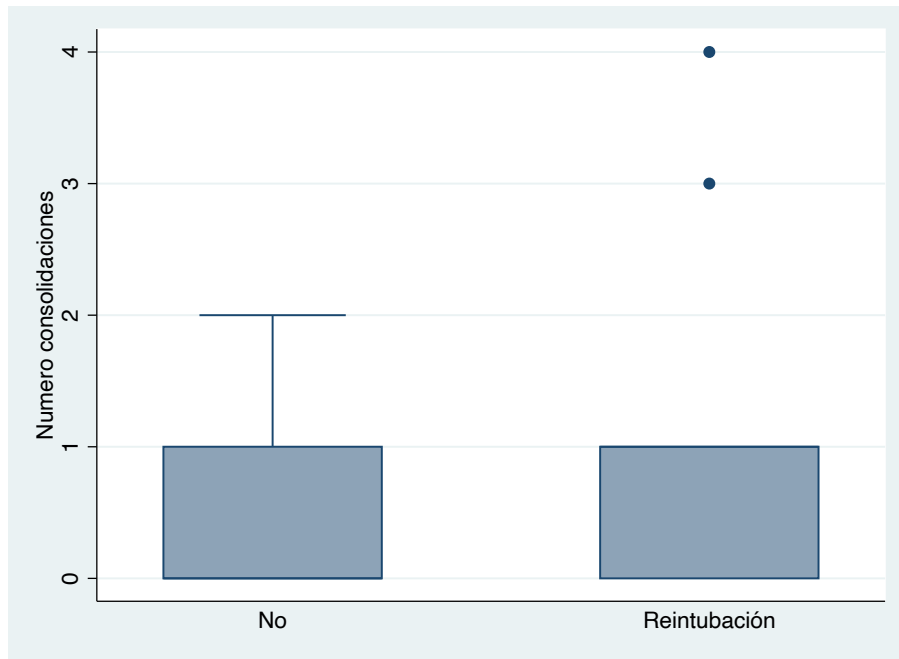
POSTEXTUBACIÓN



p=0.10

LUS-EXT

POSTEXTUBACIÓN



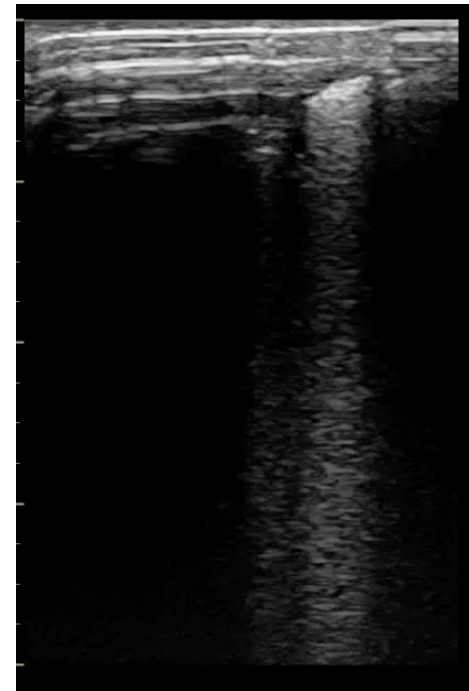
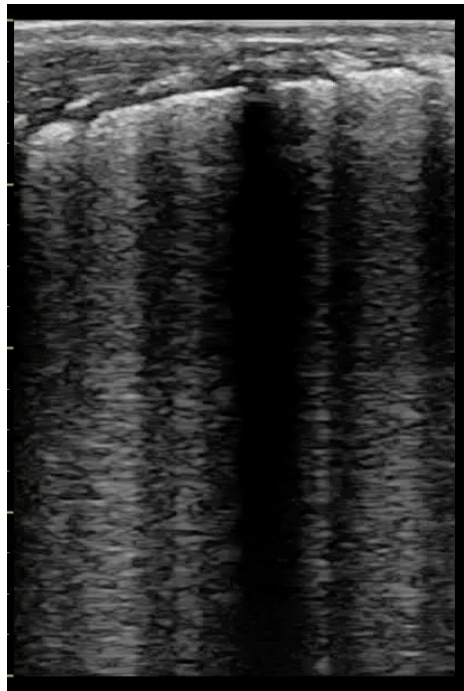
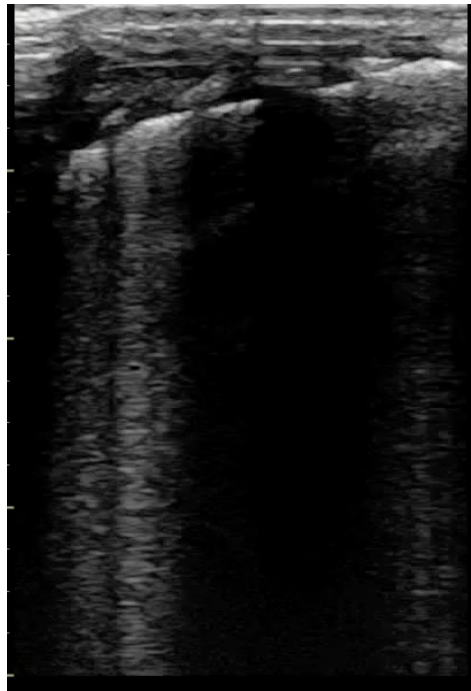
p=0.19

POST-EXTUBACIÓN

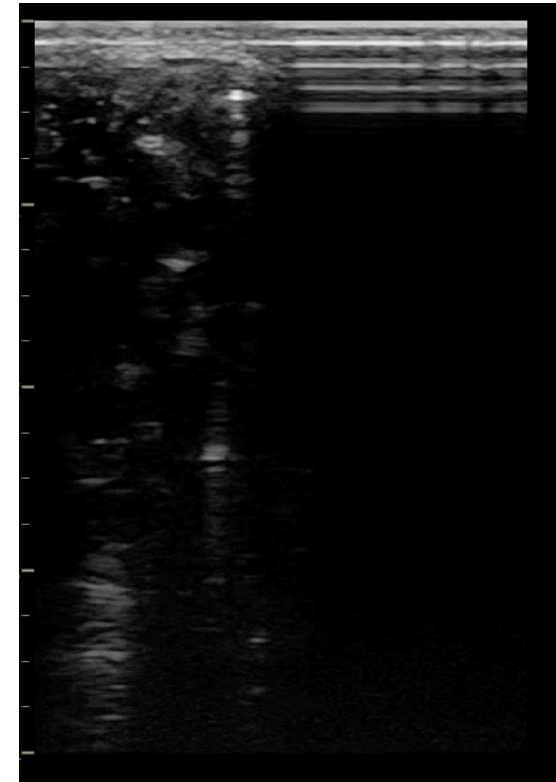
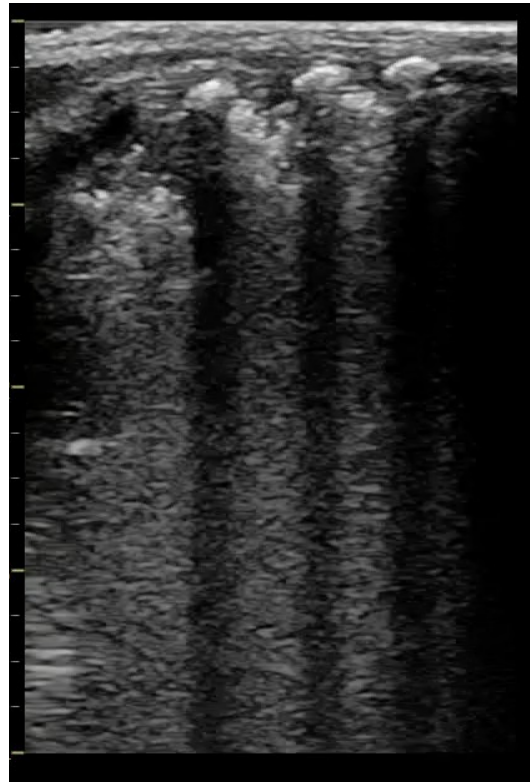
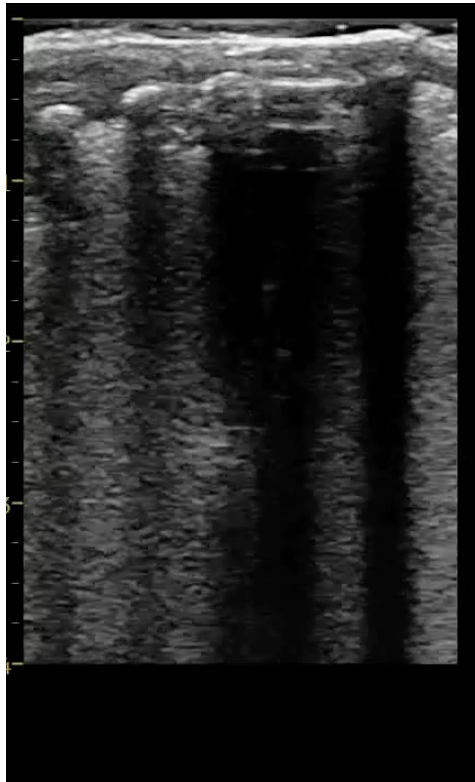
- RNPT (24+4) CON PRN: 490g
- Sin complicaciones en periodo perinatal inmediato

- Primer intento de extubación
- A los 14 días de vida: modalidad PC, PIP 14, PEEP 6, FR 50, FiO2 21%

PRE-EXTUBACIÓN EN VMI

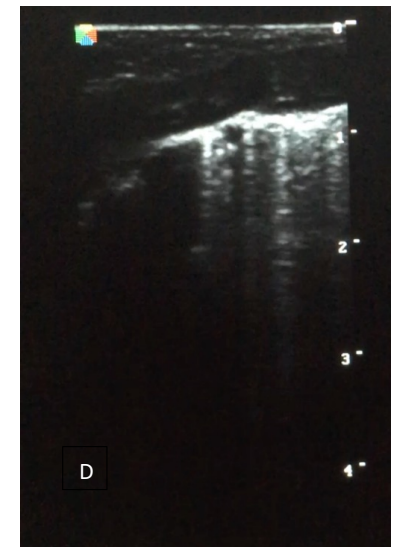
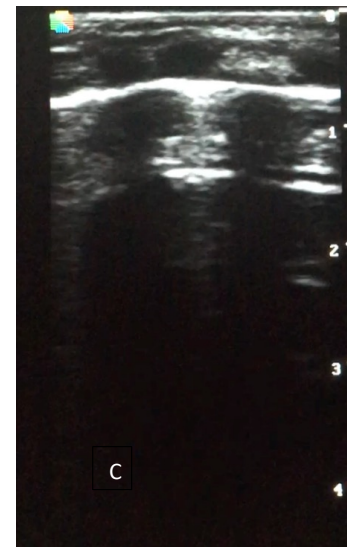
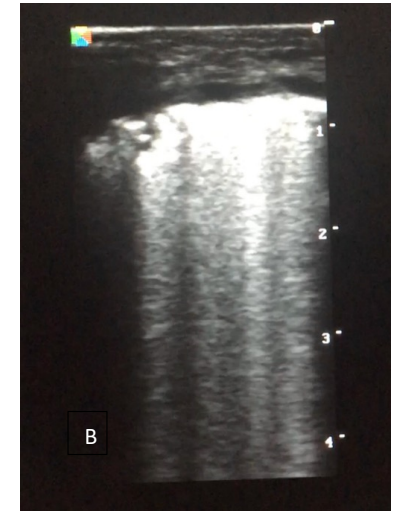


DURANTE EXTUBACIÓN EN NAVA-NI

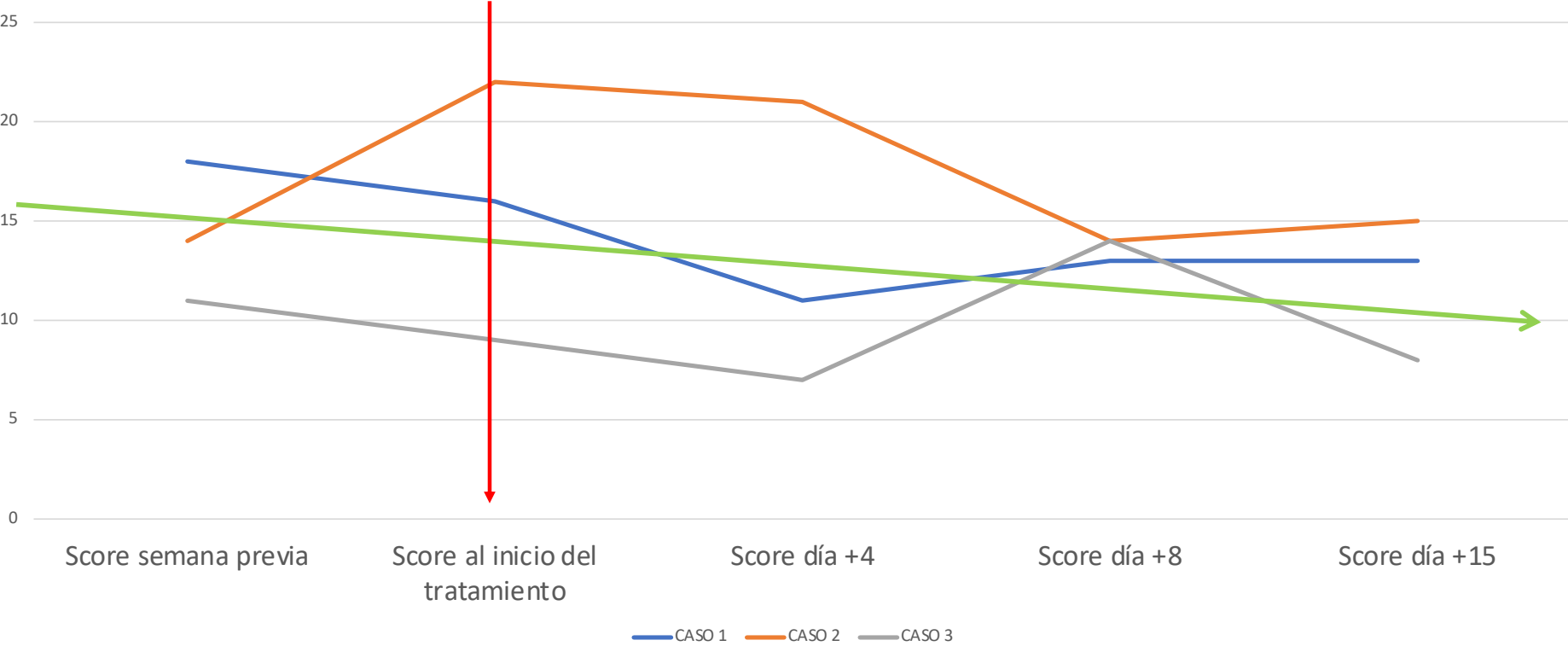


CORTICOIDES POSNATALES

Morales-Arandojo et al (en prensa)

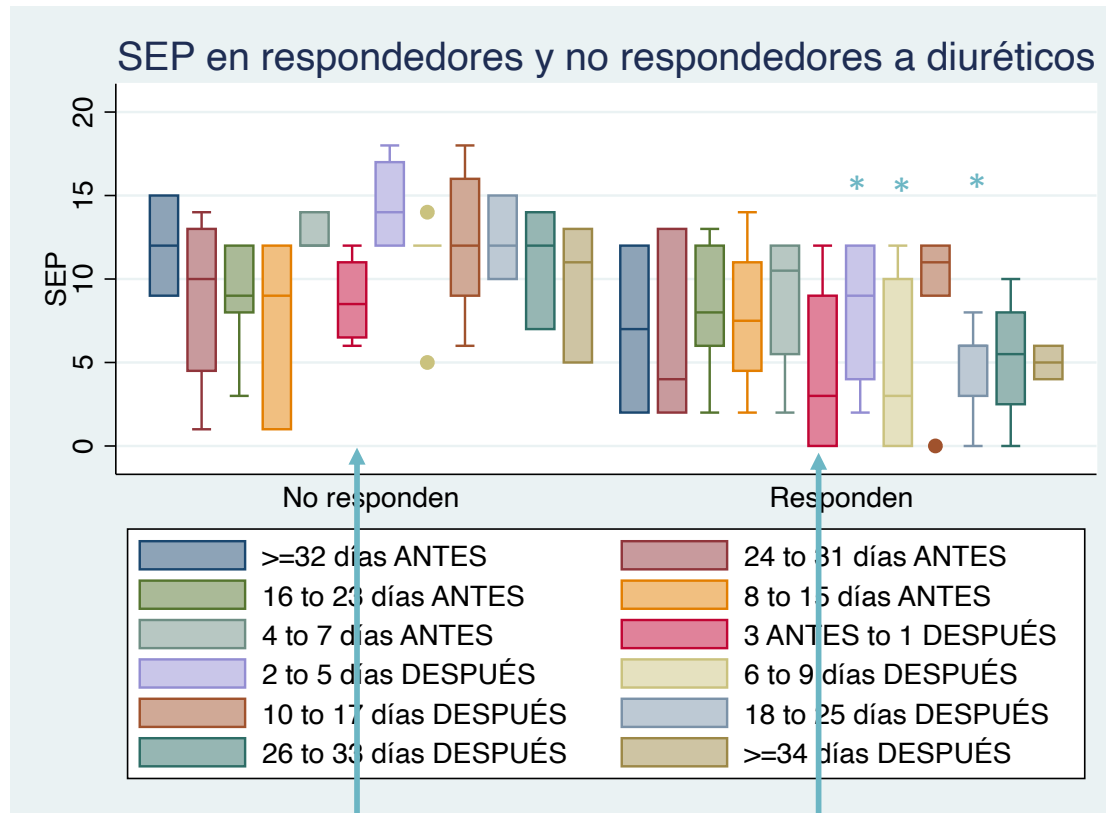


CORTICOIDES POSNATALES



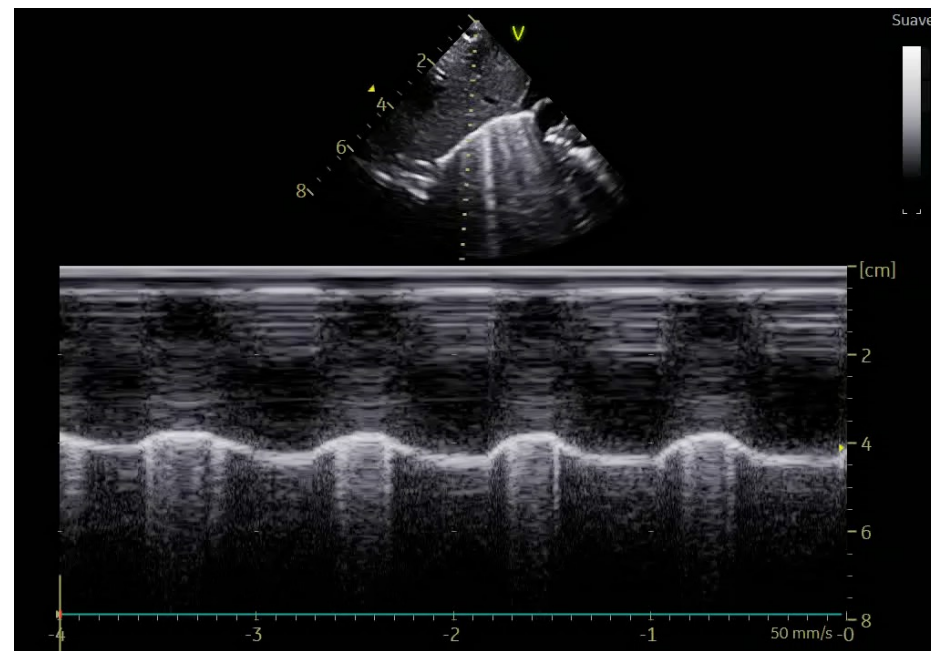
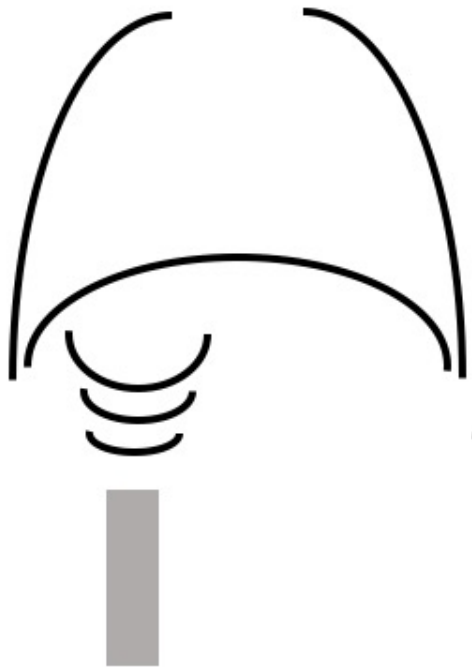
Morales-Arandojo et al. J Ped 2022 (en prensa)

DIURÉTICOS

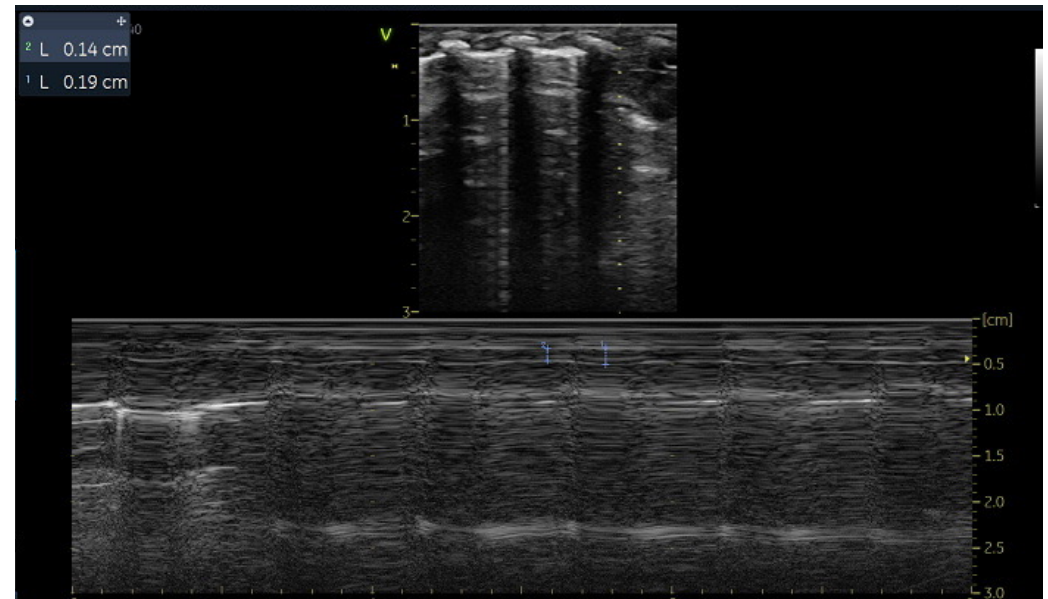
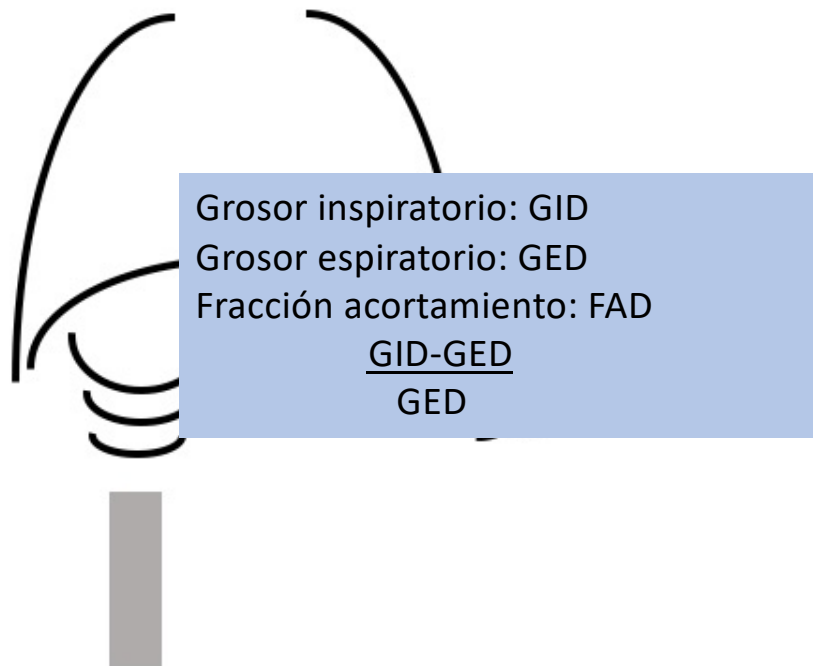


* p<0.05

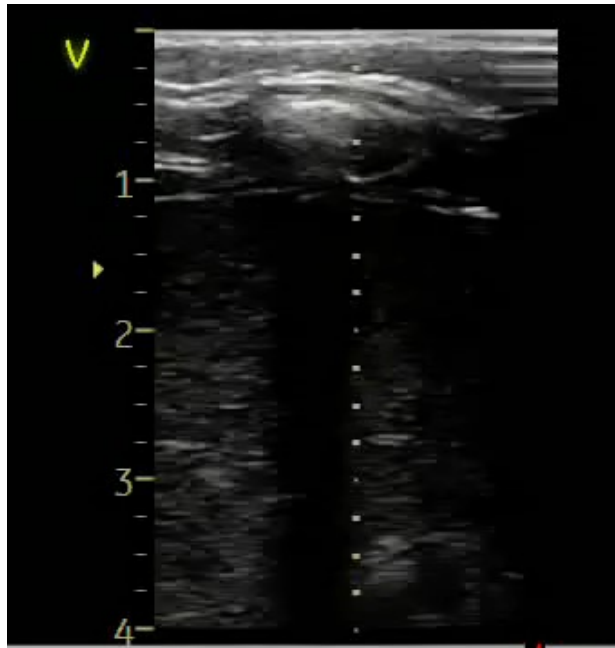
ECOGRAFÍA DIAFRAGMÁTICA



ECOGRAFÍA DIAFRAGMÁTICA



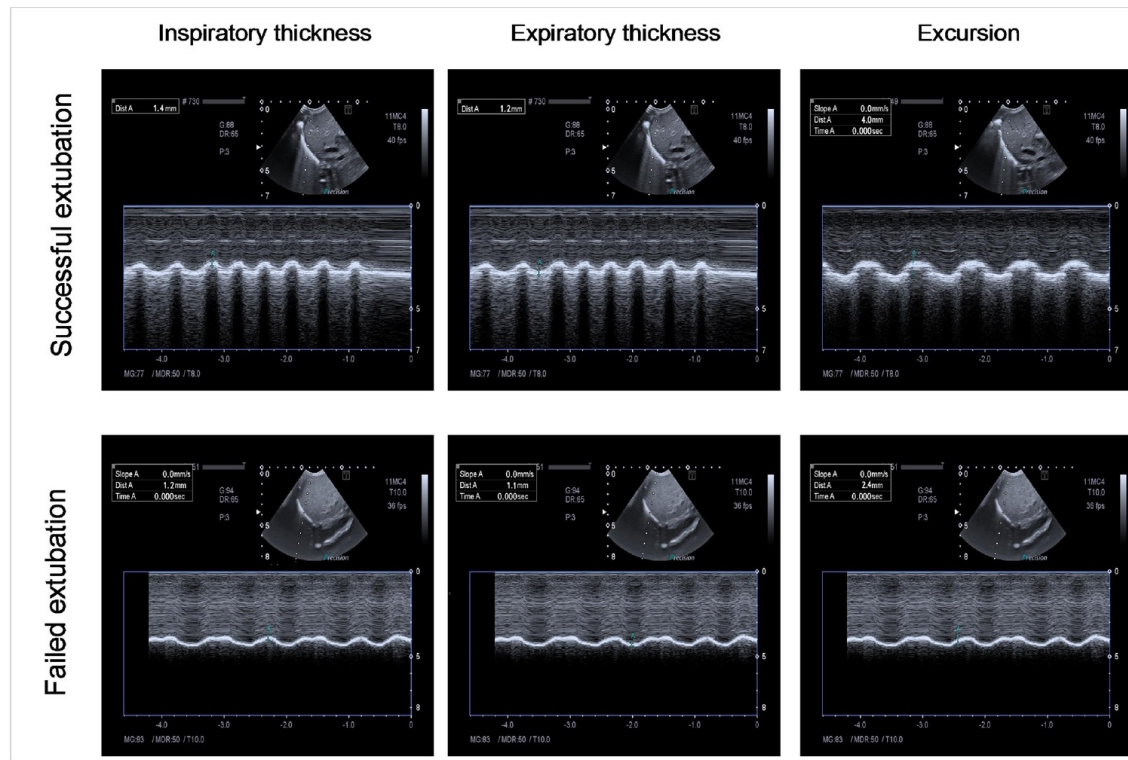
SANO



PARÉTICO

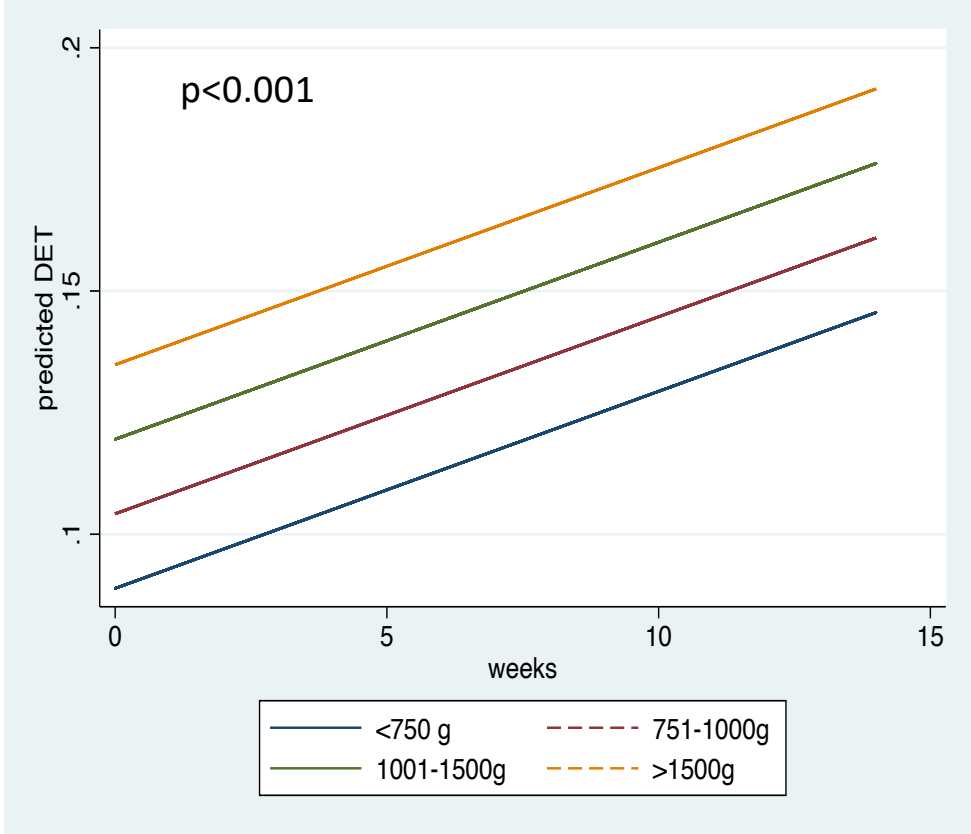
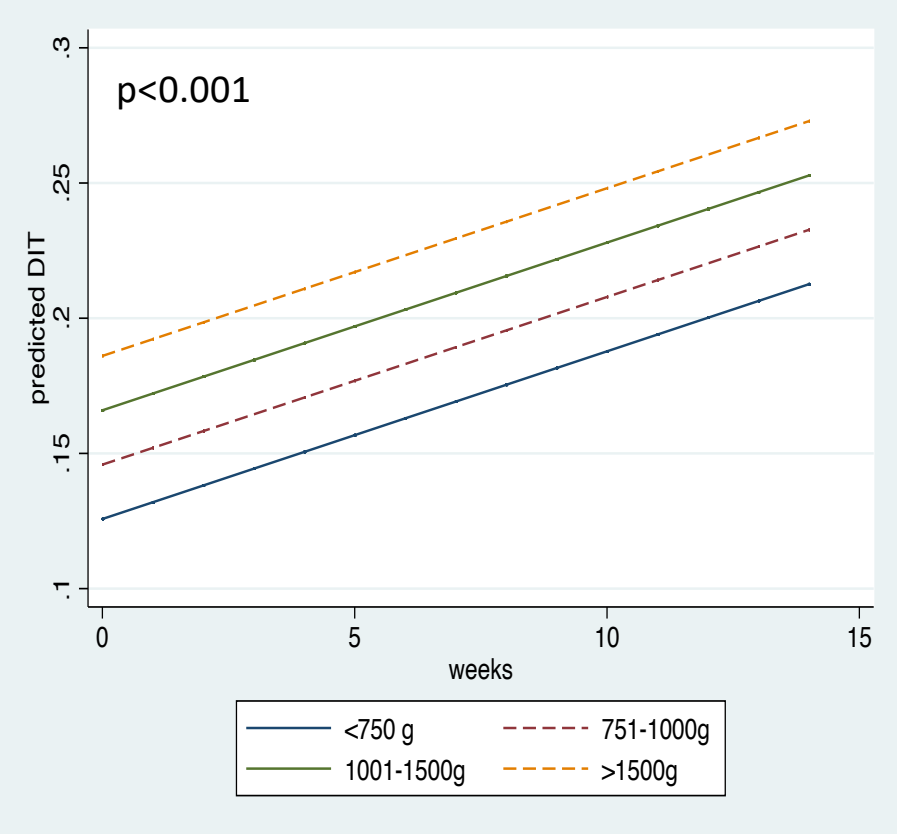


ECOGRAFÍA DIAFRAGMÁTICA EN SDR

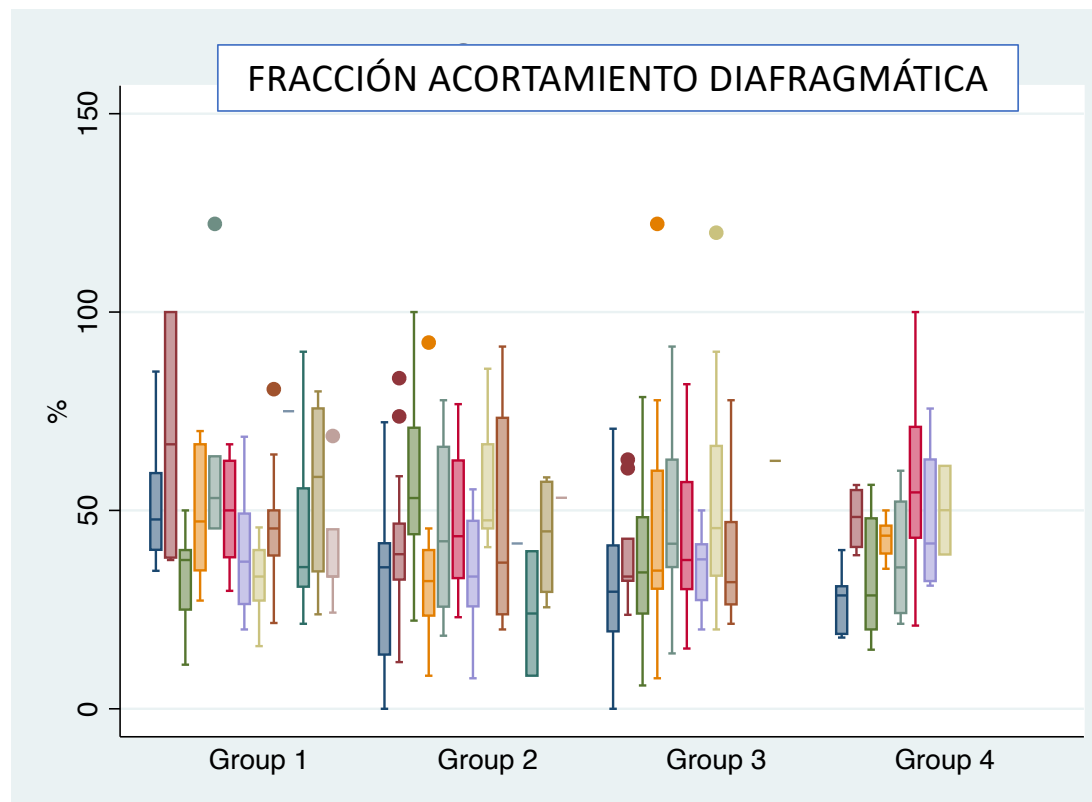


BAHGAT et al. Eur J Ped 2020.

CRECIMIENTO GROSORES (N=118)

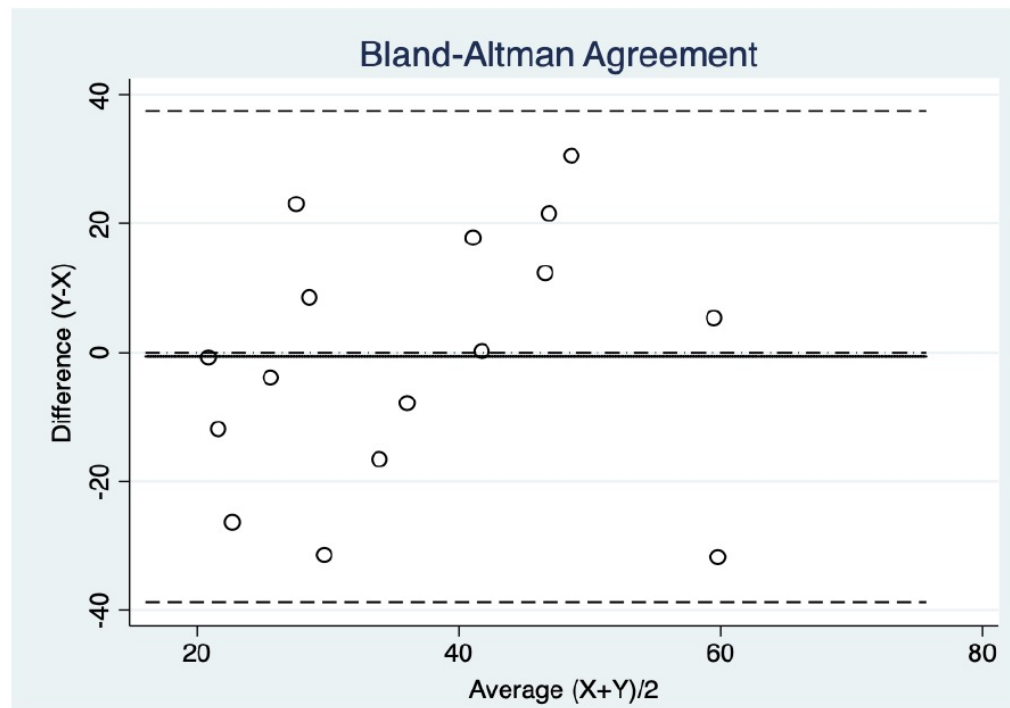


EVOLUCIÓN FRACCIÓN ACORTAMIENTO



- 1: <750g
- 2: 750-1000g
- 3: 1001-1500g
- 4: >1500g

BAJA REPRODUCIBILIDAD EN RNPT



Alonso-Ojembarrena et al. Ped Pulmonol 2020

DTI-DIAFRAGMÁTICO

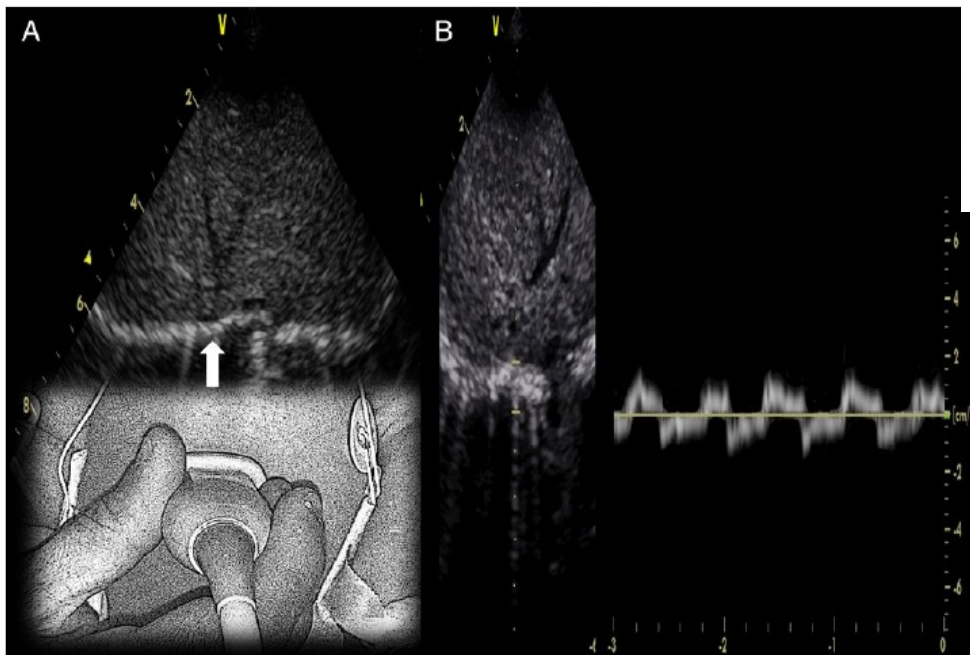


Table 1. Interobserver Reproducibility Parameters for PW-TDI Measurements

Variable	Observer 1	Observer 2	Difference	Limits of Agreement	ICC	CV, %
I-Peak	1.34 ± 0.51	1.34 ± 0.44	0 ± 0.16	-0.31 to 0.27	0.942	8.9
E-Peak	1.23 ± 0.37	1.29 ± 0.5	0.06 ± 0.16	-0.41 to 0.29	0.931	7.1

Table 2. Intraobserver Reproducibility Parameters for PW-TDI Measurements

Variable	1st Measurement	2nd Measurement	Difference	Limits of Agreement	ICC	CV, %
I-Peak	1.28 ± 0.44	1.32 ± 0.46	0.04 ± 0.16	-0.35 to 0.27	0.935	7.9
E-Peak	1.27 ± 0.41	1.30 ± 0.46	0.03 ± 0.10	-0.23 to 0.15	0.973	6.1

Maurizio et al. J Ultras Med 2019.

UCI-ADULTOS

Dres et al. *Ann. Intensive Care* (2021) 11:99
<https://doi.org/10.1186/s13613-021-00886-6>

 Annals of Intensive Care

Intensive Care Med
<https://doi.org/10.1007/s00134-019-05902-9>

RESEARCH

Open Access

Diaphragm dysfunction, lung aeration loss and weaning-induced pulmonary oedema in difficult-to-wean patients

Martin Dres^{1,2*} , Emmanuel Rozenberg¹, Elise Morawiec¹, Julien Mayaux¹, Julie Delemazure¹, Thomas Similowski^{1,2} and Alexandre Demoule^{1,2}



ORIGINAL

Use of combined cardiac and lung ultrasound to predict weaning failure in elderly, high-risk cardiac patients: a pilot study

Belaid Bouhemad^{1,2*} , Francesco Mojoli³, Nicolas Nowobilski¹, Arif Hussain⁴, Isabelle Rouquette⁵, Pierre- Grégoire Guinot¹ and Silvia Mongodi³



Tenza-Lozano et al. *Crit Ultrasound J* (2018) 10:12
<https://doi.org/10.1186/s13089-018-0094-3>

 Critical Ultrasound Journal

ORIGINAL ARTICLE

Open Access

Lung and diaphragm ultrasound as predictors of success in weaning from mechanical ventilation

Eva Tenza-Lozano^{1*} , Ana Llamas-Alvarez¹, Enrique Jaimez-Navarro¹ and Javier Fernández-Sánchez²



UCI-ADULTOS

Combined Thoracic Ultrasound Assessment during a Successful Weaning Trial Predicts Postextubation Distress

Stein Silva, M.D., Ph.D., Dalinda Ait Aissa, M.D., Pierre Cocquet, M.D., Lucille Hoarau, M.D., Jean Ruiz, M.D., Fabrice Ferre, M.D., David Rousset, M.D., Michel Mora, M.D., Arnaud Mari, M.D., Olivier Fourcade, M.D., Ph.D., Béatrice Riu, M.D., Samir Jaber, M.D., Ph.D., Benoît Bataille, M.D.

ANESTHESIOLOGY 2017



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CONCLUSIONES

- Ayuda a predecir éxito en extubación tras SDR
- En estudio la utilidad para predecir éxito en extubación en DBP
- Detección de complicaciones de la VM
- Respuesta a tratamientos específicos
- Diafragma: investigación por baja reproducibilidad en RNPT