Minimal Handling during Extubation of Preterm Infants in Prone Position: A Prospective Observational Study

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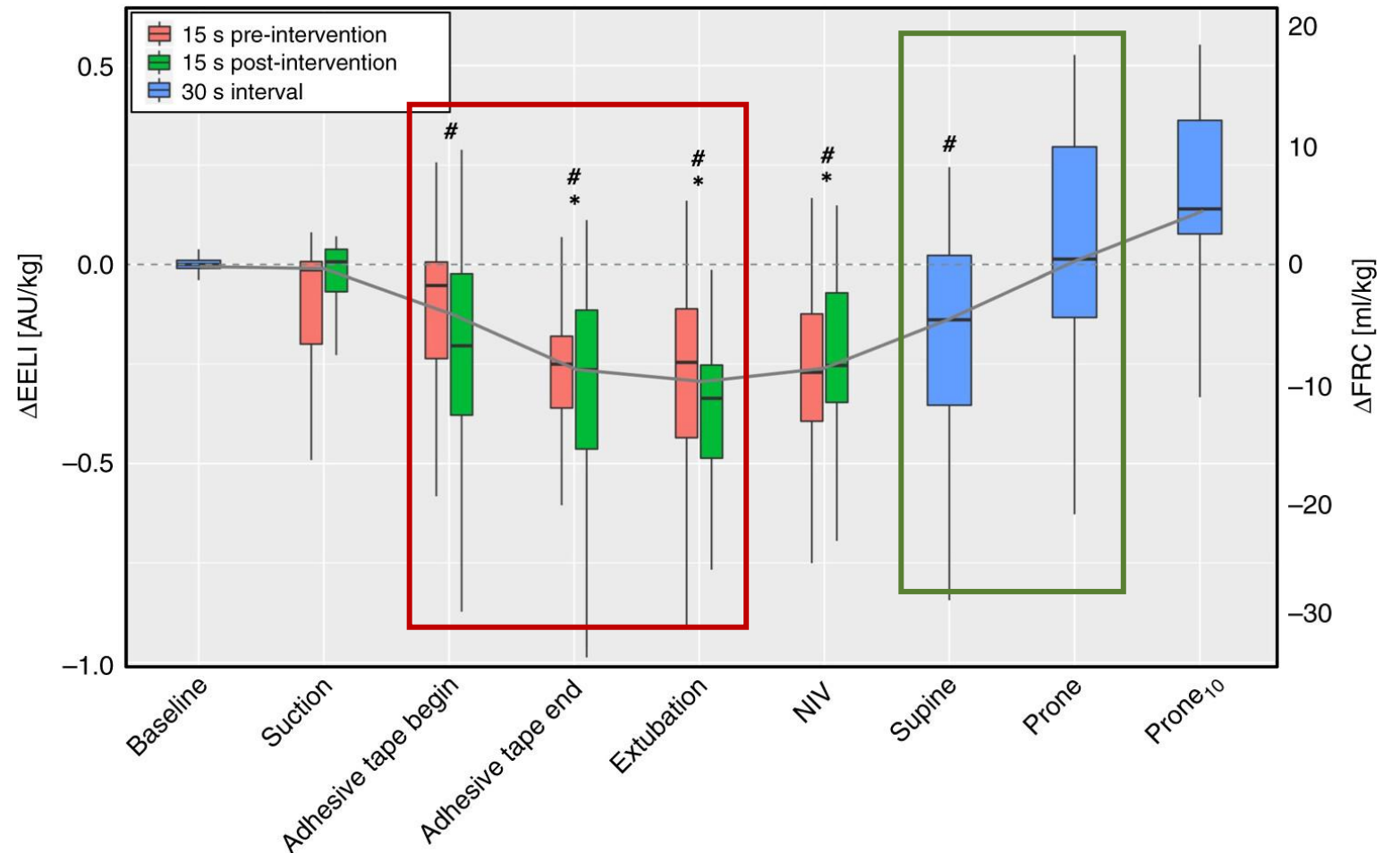[3] German Center for Lung Research (DZL), Munich, Germany

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Introduction

20-40%
reintubation rate

Dargaville, P. et al., 2016; Plastina L. et al. 2022; Photo source: swiss society of neonatology, 2010

Objectives

Measure changes in EELI (≙ EELV) during the adapted extubation protocol using EIT

- Specific events and their influence

- Association with cardiorespiratory parameters

- Evaluate procedural efficiency

EIT   electrical impedance tomography

EELI   end-expiratory lung impedance

EELV   end-expiratory lung volume

Methods

Population   planned elective extubation at PMA $< 32^{0/7}$ weeks

Intervention   continuous monitoring of lung volumes using EIT

- **prone positioning** throughout
- Non invasive ventilation (NIV) interface **partially secured**
- **recruitment period** after adhesive tape removal

Analysis   predefined events: 30 seconds of artefact free tidal ventilation

- normalized for body weight
- changes compared to baseline ($= \Delta$EELI)
- calculation of tidal volume ($=$ ml/kg)

Methods

recruitment period

- tube held in place (min. 60 sec)

- no infant handling

- invasive ventilation unchanged

Results: Patient characteristics (n = 15)

Perinatal	Median (IQR)
Complete course of antenatal steroids, n (%)	11 (73%)
Gestational age at birth (completed weeks)	26.9 (25.1 – 27.9)
Birth weight (g)	820 (650 – 1005)
Male, n (%)	12 (80 %)
Apgar score at 5 minutes	5 (5 – 8)

Postnatal at study	
Duration of endotracheal ventilation (d)	1 (1 – 3)
Day of life at extubation (d)	2 (2 – 4)
Postmenstrual age at extubation (weeks)	27.3 (26.1 – 28.5)
Ventilation mode after extubation, n (%)	NIPPV: 13 (87%)
	nCPAP: 2 (13%)

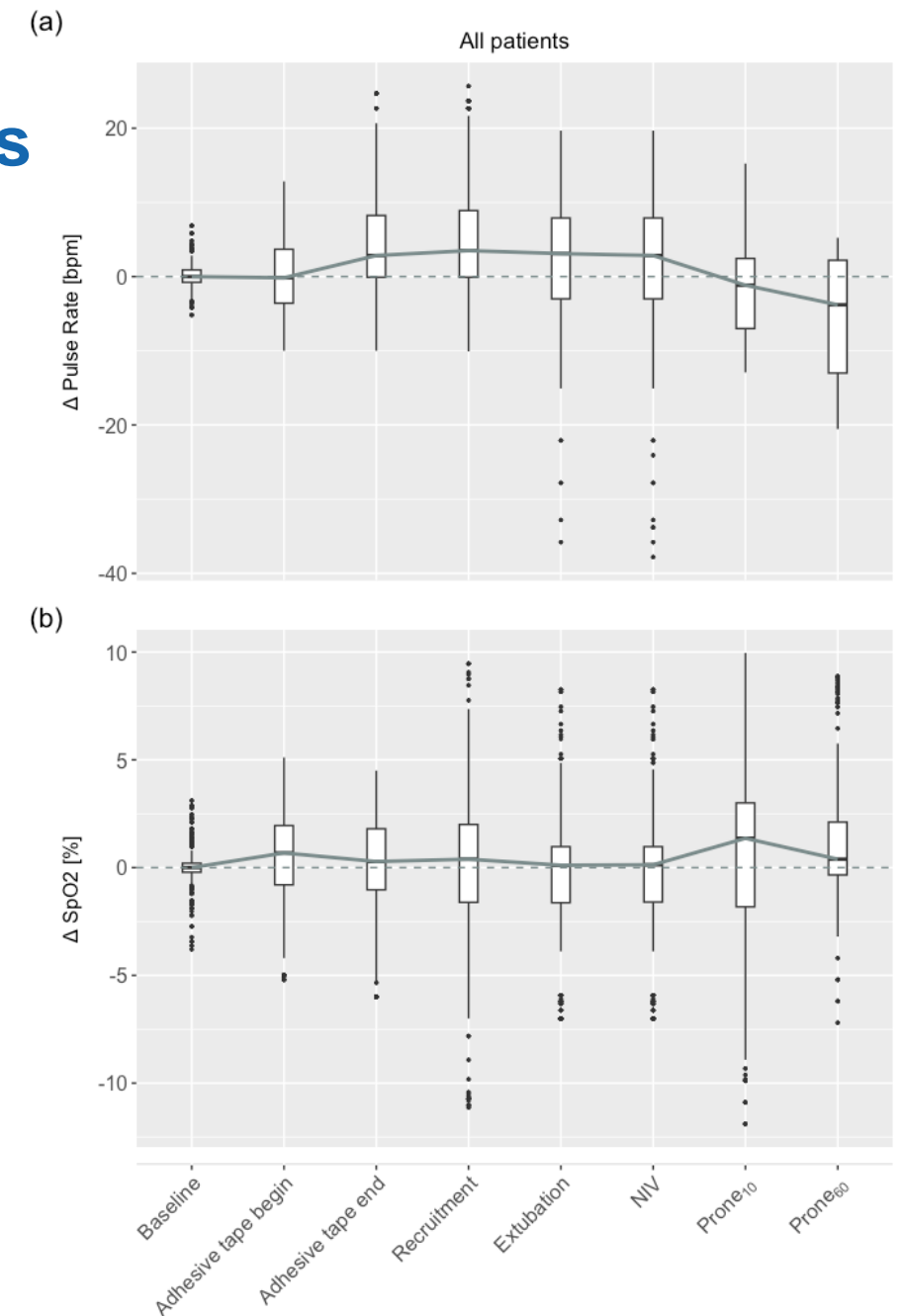| Ventilator settings before extubation	
PIP	14 (11 – 18)
PEEP	6 (5 – 6)
MAP	8 (7 – 9)
VT_e (ml/kg)	4.9 (4.3 – 5.0)
FiO_2	0.24 (0.22 – 0.25)

≈ 4'150 breaths analysed

Results: Development of ΔEELI
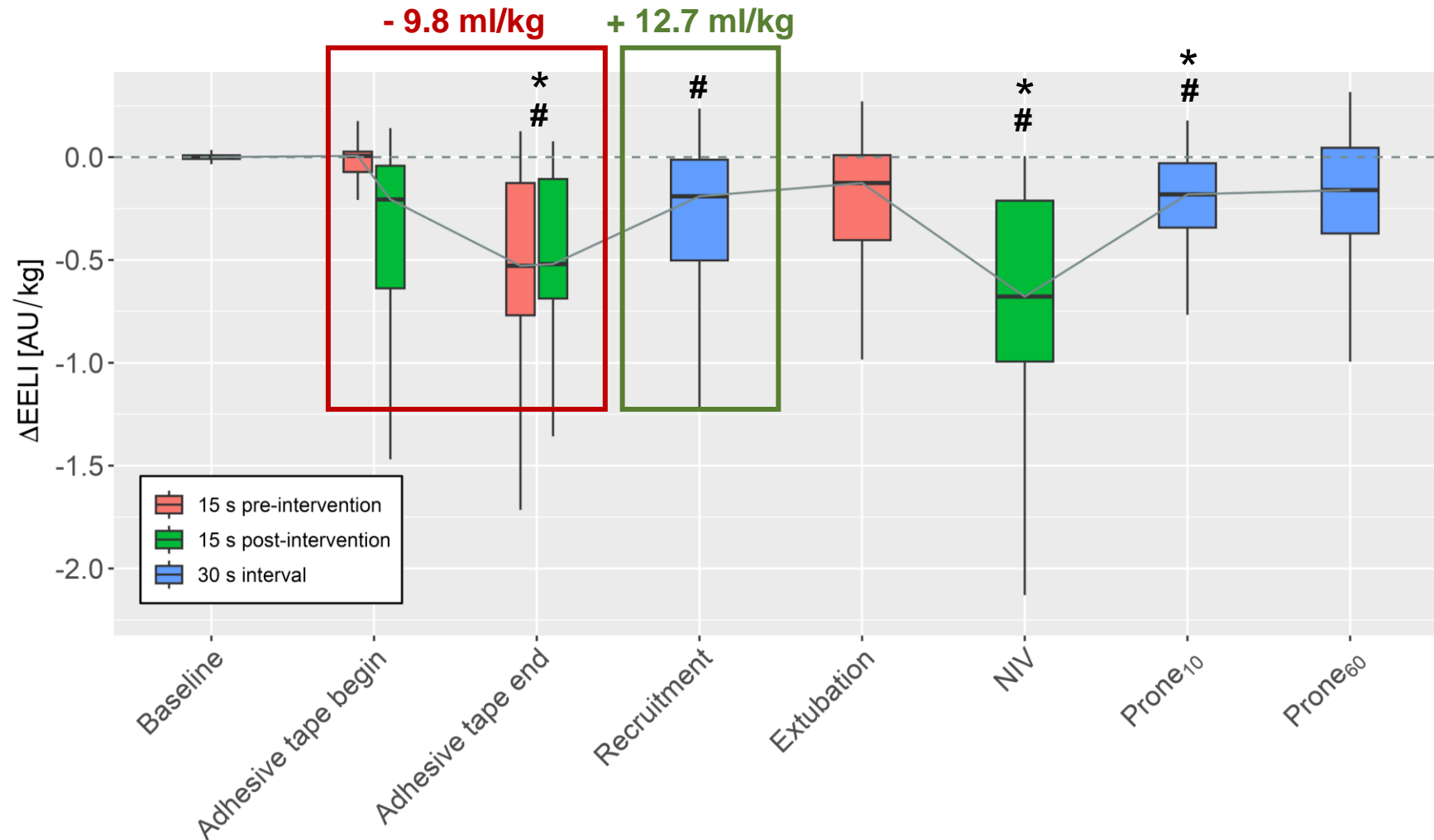
Results: Development of clinical parameters and procedural efficacy

- No significant changes in SpO_2 and PR

- Weak positive correlations between

  - $\Delta EELI$ and ΔSpO_2

  - $\Delta EELI$ and the $\Delta SpO_2/FiO_2$ ratio

- Extubation time: 1.7 min (vs. 2.3 min)

- Adhesive tape removal: 29 sec (vs. 75 sec)

- Tube-to-NIV: 2 sec (vs. 19 sec)

(a) All patients — Δ Pulse Rate [bpm]

(b) $\Delta SpO2$ [%]

Baseline, Adhesive tape begin, Adhesive tape end, Recruitment, Extubation, NIV, Prone$_{10}$, Prone$_{60}$

Conclusion

- Minimal handling, prone position extubation is feasible, safe and efficient

- **Recruitment period** allows partial restoration of lung volume

- Team training and practice may reduce manipulation time further and possibly EELV loss

- Further studies are warranted (*short-term benefits → long-term improvement?*)

Thank you very much!

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