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Title: Changes in respiratory system reactance (Xrs) during the first lung volume recruitment in preterm lambs on high frequency oscillatory ventilation (HFOV)

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Body: The aim of this study was to assess the dynamic changes in respiratory mechanics during the first stepwise increase of mean airway pressure (MAP) in preterm lambs receiving HFOV. Six 132d preterm lambs were commenced on HFOV at MAP of 14 cmH₂O and frequency (fosc) of 10Hz. Five min after birth MAP was increased up to 30 cmH₂O in 2-min steps of 4 cmH₂O. At the beginning (t₀) and at the end (t₁) of each step fosc was reduced to measure Xrs at 5Hz. Lung volume (VL) changes were simultaneously measured by electrical impedance tomography. VL monotonically increased during the recruitment manoeuvre (RM). In average only the 22±2% (mean±SD) of the total change occurring at each step immediately followed the change in MAP, while the remaining 78±2% occurred over the next 2 min. Xrs at first decreased, then it increased over time stabilizing to a higher value compared with the lower MAP step.

During the first RM of an immature lung, VL recruitment is a very-time dependent phenomenon and when MAP is increased, stabilization to a higher lung volume requires few minutes and is preceded by tissue distension. These data suggest that monitoring lung mechanics during the first RM could maximise the efficacy of the procedure minimising mechanical stress to lung tissues.