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Title: Alveolar mechanics studied by closed-chest in-vivo microscopy

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Body: In vivo microscopy is a useful tool to study lung alveolar mechanics (Schiller et al. Crit Care Med 2001; 29: 1049–1055). A new surgical approach is here proposed to image changes in alveolar morphology through the intact pleura in order to partition between elastic and surface tension (γ) forces involved in lung volume change. In 6 male anesthetized, tracheotomized and mechanically ventilated rabbits, a “pleural window” was opened by stripping the endothoracic fascia (Fig. 1a). Subpleural alveoli were observed under microscopic view (60x) during stepwise inflation/deflation maneuvers, starting from FRC. Alveolar areas were measured through a custom software and median values from all rabbits were used to produce an overall local distending pressure P_{ld}-alveolar radius curve (Fig. 1b). A mathematical model, based on an asymptotic increase of γ with increasing radius from a minimal value γ_0 to a maximum γ_{max}, allowed to derive surfactant (P_γ) and elastic (P_{el}) contributions to P_{ld}. Alveolar radius increased up to a maximum at a local distending pressure of 10 cmH_2O with negligible hysteresis. Experimental data are well fitted by computed curves for P_γ, with (γ_0; γ_{max}) values ranging from (3; 15) up to (3; 21) dynes/cm. Our results suggest that P_γ is only responsible for alveolar distension within a lung volume change from FRC up to ~80% of inspiratory capacity. An increase in P_{el} only allows a further minor increase in alveolar volume.