

Lung Microstructure in Adolescent Idiopathic Scoliosis Before and After Posterior Spinal Fusion Compared to Control Subjects

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Abstract

Background: Although adolescent idiopathic scoliosis (AIS) is associated with decreased respiratory quality of life, it is unknown how AIS impacts distal lung microstructure. Recent reports indicate that alveolarization continues throughout adolescence, and human and animal studies have demonstrated the importance of mechanical forces on normal lung development. We therefore performed this pilot study hypothesizing that patients with AIS would have alterations in alveolar-airspace size, number, or structure compared to adolescents without AIS. **Objective and Study Design:** We conducted a prospective observational trial using hyperpolarized helium (HHe) MRI in control and adolescent idiopathic scoliosis (AIS) subjects to determine if AIS is associated with lung microstructural changes and whether posterior spinal fusion (PSF) impacts these changes. **Methods** We used hyperpolarized helium (HHe) and proton MRI to assess lung microstructure in 13 AIS and 16 control subjects aged 8-21 years. Clinical trial registration number NCT03539770. **Results:** At baseline, there were no significant differences in alveolar size, number, or alveolar duct morphometry between AIS and control subjects or between the concave and convex lungs of AIS subjects. At one year after PSF AIS subjects had an increase in alveolar density in the formerly convex lung ($p=0.05$), likely reflecting a change in thoracic anatomy, but there were no other significant changes in lung microstructure. Modeling of alveolar size over time demonstrated similar rates of alveolar growth in control and AIS subjects in both right and left lungs pre- and post-PSF. **Conclusions:** In this study, we found no evidence that AIS or PSF impacts lung microstructure.

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