

Abstract

Obstructive Sleep Apnea (OSA) is the most common type of sleep apnea and is caused by complete or partial obstructions of the upper airway. In addition to disrupting normal sleep, OSA causes a variety of medical problems including hypoxia, which is a deficiency in the amount of oxygen reaching the tissues. To support research efforts to gain a better understanding for the mechanics that cause airway collapse, the goal of this study is to construct a MRI-compatible, dynamic airway phantom using materials that mimic features of the upper airway such as motion and air-tissue interfaces. The phantom serves as a test object to characterize the accuracy of different MR imaging methods. The upper airway structure was simplified to consist of a tongue and sidewalls. Different materials were researched and tested to assess their applicability in the model. Samples for each material were tested in an MRI machine to determine imaging qualities.

The phantom consists of two motors, a tongue, and sidewalls and framework to house these parts. The tongue and sidewalls were fabricated from polyvinyl alcohol (PVA). Once constructed, the phantom was run in an MRI machine. The resulting MR-image sequences were analyzed to characterize and assess the consistency of the motion of the phantom parts.