QUANTITATIVE UPPER AIRWAY IMAGING USING ANATOMICAL OPTICAL COHERENCE TOMOGRAPHY

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Endoscopic visualization of the internal surface of hollow organ systems is widely used in medical practice. However a limitation of video endoscopy in airway research is the inability to easily quantify internal dimensions. Such objective measurements would be valuable in investigating the behaviour of the human upper airway during sleep - an important area for the study of obstructive sleep apnoea and other sleep-related conditions. Although imaging modalities such as X-ray CT and MRI can give quantitative information on the airway, they are not suitable for continuous monitoring applications.

We have developed a quantitative hollow organ profiling system[1][2] which can be used for long periods of time, including during sleep. The system is built around a long-range optical coherence tomography system, modified to use an endoscopic sample arm. It is capable of continuously measuring the size and shape of a subject's airway over a period of several hours. We present results showing the accuracy of our system, measured against standard targets and other imaging modalities, and show in vivo measurements of the human airway during wakefulness and sleep. We also demonstrate the capability of the system to monitor the changes in airway structure over an extended time period, measurements which could lead to a deeper understanding of the causes of obstructive sleep apnoea.

Figure 1: A section of airway recorded in vivo with anatomical OCT.