

# 3D Computed Tomography of the Nasal Airway: Protocol Development, Analysis and Applications

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## ABSTRACT

At the outset of this project imaging of the nasal airways using conventional Computed Tomography (CT) was problematic. The aim of this project was therefore to develop a scanning protocol using helical CT that could improve on data acquisition, patient compliance and 3d imaging of the nasal airway whilst maintaining image quality for routine diagnosis.

An initial protocol was proposed and trial scanning was carried out on a phantom. This provided a dose estimation which was included in the ethical application as directed by the Ionising Radiation (Medical Exposure) Regulations (IR(ME)R) 2000. Once ethical approval was received the new scanning protocol was investigated in 50 patients. Image quality assessment was carried out in a double blind study by two independent assessors to identify anatomical and pathological changes. This new protocol showed an improved ability to identify pathological changes and included the entire nasal cavity rather than selected segments. In addition the images were also used to generate 3d models for computational airflow analysis.

A Multi Detector CT (MDCT) scanner became available in 2003 and thus a further improvement in scanning technique was developed. Using the same experimental approach imaging parameters were developed on a new group of 50 patients. Image acquisition can be carried out on supine patients and over a much shorter time (4.6 seconds as compared to 36 seconds using helical CT). This reduces the likelihood of artefact created by patient movement. In addition there was an increase in the number of anatomical changes/pathologies identified from 16/50 using helical CT to 38/50 using MDCT.

In conclusion the new protocol for MDCT imaging of the nasal airway gives more data and better diagnostic information. The MDCT protocol has been adopted by Toshiba as a baseline protocol for their MDCT scanners.