Purpose

Explored the scan protocol parameters that impact radiation dose in temporal bone MDCT and determined the optimal scan parameters that balance radiation dose with diagnostic image quality.

Methods and Materials

Using exsomatized cadaveric heads, traditional axial scanning and helical scanning were performed with different detector collimations. Helical scans of the same scan region were then acquired using the determined optimal detector collimation and various tube voltages while other scan parameters remained fixed. Next, the scans were repeated using various tube current-time products using the determined optimal tube voltage. Last, with fixed tube current-time product, the scans were repeated with various pitches. All thin-slice, helically acquired scans were reformatted to axial and coronal images with respect to the relevant baseline. In each of the image volumes, the mean and standard deviation Hounsfield Unit values in regions of interest were measured and contrast-to-noise ratio (CNR) values were calculated.

Results

In helical scanning, the detector collimation of 16x0.625 mm had higher image quality and the minimum dose-length product. Axial and coronal images acquired using a 140 kVp tube voltage had significantly lower noise than scans acquired at other kVps with equivalent CTDI\textsubscript{vol}. Diagnostic image quality was achieved when using a minimum tube current-time product of 120 mAs. Noise, CNR, and dose were jointly optimized with a pitch of 0.685.

Conclusion

Temporal bone CT scanning parameters may be optimized by following a systematic procedure that allows for the optimization of diagnostic image quality and the minimization of radiation dose.
References


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