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SUMMARY OF PAPER

Spinal Cord Injury: Optimization of Computerized Tomography Image Factors for Accuracy*

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Computerised tomography (CT) scanning has become an accepted diagnostic method in evaluation of patients with spinal cord injury and has become increasingly important in the assessment of the vertebral column, spinal cord, and brain. Since CT images are graphic representations of generated computer mathematical data viewed with variable window and level selections (display factors), various image representatations are possible and potentially erroneous objective and subjective conclusions from viewing and measuring anatomical findings can result if an appreciation of this potential variability is not understood. Additionally, the CT image can be reconstructed from a variety of mathematical algorithm selections, which can enhance or diminish aspects of tissue contrast (smoothing or edge enhancement). Optimization of these factors, (window and level selection for viewing, and image generation algorithm), is especially important if detection and measurement of objective structures are to be reliable.

The authors studied otpimization of algorithm selection and display factors (window and level selection), with a phantom designed to mimic spinal column, spinal cord and subarachnoid space. Varying concentrations of metrizamide in the phantom were scanned.

With the G.E. 8800 Scanner, the bone algorithm was found to be the optimum algorithm for optimum spinal cord images if the measured metrizamide CT attenuation number was greater than 150–200. With a metrizamide CT attentuation number less than 150 the soft tissue algorithm was optimum. Window centre (level) selection greatly influenced the measurement of cord size, whereas window width did not. The appropriate window centre (level) selection is the mean between the metrizamide CT attenuation number and the cord CT attenuation number.

The clinical application of these findings is summarized, and includes: Patients with metrizamide CT studies that require accurate measurement of spinal cord size or measurement of spinal cord cyst size (post-traumatic cystic myelopathy). Significant errors are possible if the formula for appropriate window centre selection is not followed. Additionally, the use of the bone algorithm requires higher contrast for accuracy, thus if metrizamide concentrations are weak, erroneous interpretations are possible. The authors also found that in the presence of metal (rods, screws or plates) the bone algorithm increased artifacts in CT, thus should not be used in this situation but rather the soft tissue algorithm must be used when metal is present to minimize artifacts.

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