Development of MRI image generation model for spinal cord injury patients using artificial intelligence

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Purpose of the Study

The purpose of this study is to generate pseudo-MRI images from CT images of patients with cervical spinal cord injuries using artificial intelligence (AI) and to evaluate their clinical utility.

Research Methods

Stable Diffusion, a generative AI model released in 2022, creates realistic images from text and image prompts. This model was trained on T2-weighted MRI images of 22 actual patients with spinal injuries to construct a pseudo-MRI generation model. Pseudo-MRI images were generated from CT images of 7 additional cervical spinal cord injury patients not used in the training, and radiological reading tests were conducted by two orthopedic specialists. The tests compared readings using pseudo-MRI and actual CT images, and another test a month later using actual MRI and CT images.

Results

Pseudo-MRI images could relatively accurately reproduce the spinal cord course and the presence or absence of spinal canal stenosis but had limitations in depicting soft tissues such as intervertebral discs and ligaments. The reading test results showed that orthopedic surgeon A had high accuracy in diagnosing retropharyngeal hematoma and spinal cord edema but low accuracy in identifying the level of spinal cord injury. The results for orthopedic surgeon B were similar, with particular difficulty in evaluating soft tissue injuries.

Conclusion

Pseudo-MRI images generated from CT can accurately reproduce some findings of spinal cord injuries but are not a complete substitute and are more suitable as an auxiliary diagnostic tool. Future tasks include additional training on fat suppression images and improving the model.