First Computer-Aided Diagnosis of Neural Foramina Stenosis

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PURPOSE

Neural Foramina Stenosis (NFS) is a leading cause of lower back pain and has the risk of disability. However, clinical diagnosis of NFS is a highly laborious and time-consuming task for physicians. In this study, a fully automated CAD of NFS was firstly developed and validated in clinic against manual diagnosis.

METHOD AND MATERIALS

A new label-supervised feature learning algorithm was used to transfer the experts’ knowledge to computer, and then neural foramina diagnosis is automatically reported. Following IRB approval, spine magnetic resonance images from 110 subjects (58 women, 52 men, 56±12 yrs) were collected to validate the proposed CAD against manual diagnosis by two expert physicians. The performance was evaluated via the diagnostic accuracy, specificity, and sensitivity, using a leave-one-subject-out strategy.

RESULTS

High diagnostic accuracy of the proposed CAD has demonstrated by 98.52% accuracy with specificity as 100.00% and sensitivity as 97.96%.

CONCLUSION

This study demonstrated that the developed CAD has a comparable accuracy and sensitivity with the expert physicians. These findings provide an effective way to relieve the heavy burden of physicians, pay more attention to high-level clinical tasks, and offer an efficient clinical tool for neural foramina stenosis.

CLINICAL RELEVANCE/APPLICATION