Cervical facet joint degeneration

- In-vitro study of the third occipital nerve near the C2-3 facet joint and the association between its morphology and the presence of a third occipital nerve notch
- Effects of new assembled titanium mesh cage on the improvement in biomechanical performance of single-level anterior cervical corpectomy and fusion: a finite element analysis
- Factors associated with cervical instability in cervical myelopathy patients
- Mechanisms and multimodal treatment of neuropathic pain associated with degenerative cervical spondylosis: Current status and progress
- Preoperative three-dimensional simulation and clinical evaluation of in-situ bone harvesting in anterior cervical discectomy and fusion surgery
- Are Postoperative Neck Pain and Kyphotic Change After Laminoplasty Affected by Degree of Facet Joint Degeneration?
- Reoperation Strategy for Failure of Cervical Disc Arthroplasty at Index and Adjacent Levels
- Facet joint loading after 1-, 2- and 3-level cervical disc arthroplasty: a comparison of spiked versus keeled baseplates

It has been demonstrated that articular facet degeneration can cause local strain alterations and induce neck pain.

A study aimed to quantify the biomechanical effects of normal and degenerated C5-C6 articular facets, and evaluate the correlation of mechanical strain between healthy and degenerated spine. A 3-dimensional finite element (FE) model of the C5-C6 cervical spine was developed [Model 0 (M0)]. The asymmetric models of C5-C6 bilateral articular facet joint were established separately to mimic articular facet joint degeneration. The capsule ligament stiffness of C5-C6 unilateral facet joint was altered with minimum and maximum threshold to simulate capsule ligaments' lesion and calcification [Model 1 (M1) and Model 2 (M2), respectively]. Besides, the cervical C5-C6 unilateral articular facet joint direction was changed by 5° and 10° forward to imitate the moderate joint hyperplasia and severe osteophyte (Model 3 and Model 4 respectively). M1 increased the rotation range of ipsilateral side (left), while M2 reduced, and both had limited effect on the contralateral side (right). The angle increased in Model 3 (M3) (61°) and Model 4 (M4) (55°) comparing to M0 during the axial rotation, and the angle of M4 was larger. M3 and M4 increased the nucleus pulposus pressure with and without controlled angular displacement during axial rotation. The pressure of nucleus pulpous increased during M1 rotating to the abnormal side but decreased when rotating to the other side, but the results of M2 were opposite. The capsule ligament stiffness made an impact on segmental mobility and vertebral spatial position, and the sagittal angle of articular facet joint exerted an influence on disc pressure distribution ¹⁾.

The discrepancies in the interpretation of CT and MRI data in the evaluation of facet tropism and arthrosis have given rise to questions regarding the reliability of comparisons of the two techniques. Using a 4-point scale, 3 blinded readers independently graded the severity of facet tropism and facet arthrosis of 79 cervical facet joints on axial T2-weighted and sagittal T1 and T2-weighted turbo spin echo images as well as the corresponding axial CT scans. All results were subjected to the kappa coefficient statistic for strength of agreement. In the assessment of the severity of facet arthrosis, intermethod agreement (weighted κ) between CT scanning with a moderate inter-rater reliability (range $\kappa = 0.43-0.57$) and MRI with fair inter-rater reliability (range $\kappa = 0.23-0.38$) was 0.76 and 0.43 for the severity of facet tropism and facet arthrosis, respectively. Intra-rater reliability for the severity of facet arthrosis was moderate to substantial for CT and was moderate for MRI scans. Intra-rater

reliability for the severity of facet tropism was substantial to very good for CT and substantial for MRI scans. MRI can reliably determine the presence or degree of facet tropism but not facet arthrosis. Therefore, for a comprehensive assessment of cervical facet joint degeneration, both a CT and an MRI scan should be performed ²⁾.

Case series

The clinical case series of patients treated by the senior author at a single tertiary care institution between September 2014 and April 2018 were reviewed. Patients were selected for inclusion if their primary symptom at presentation was axial neck pain without neurological deficits and if CT imaging revealed facet arthropathy of the cervical spine. These patients underwent radionucleotide imaging in the form of a planar 99mTc methylene diphosphonate (99mTc MDP) bone scintigraphy study. Those with a finding of radionucleotide tracer uptake at a location concordant with the facet arthropathy were selected to undergo posterior cervical instrumented arthrodesis of the affected levels. PROs were recorded at the time of surgical consultation (i.e., after nonoperative treatment) and at 6 weeks, 3 months, 6 months, and 1 year following surgery. These include neck and arm pain, the Neck Disability Index (NDI) and the 12-Item Short Form Health Survey responses.

A total of 11 patients were included in this retrospective case series. The average reported neck pain and NDI scores were high at baseline; 7.6 ± 2.3 and 37.1 ± 13.9 respectively. Twelve months after surgical intervention, a significant decrease in reported neck pain of -4.5 (95% CI -6.9, -2.1; p = 0.015) and a significant decrease in NDI of -20.0 (95% CI -29.4, -10.6; p = 0.014) was observed.

This case series represents the largest to date of patients undergoing surgical arthrodesis following a finding of facet arthropathy with a concordant positive radioisotope image study. These observations add support to a growing body of evidence that suggests the utility of radioisotope imaging for identification of a facetogenic pain generator in patients with primary axial neck pain and a finding of cervical facet arthropathy. These preliminary data should serve to promote future prospective, controlled studies on the incorporation of radionucleotide imaging into the workup of patients with suspected facetogenic pain of the cervical spine ³.

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