Adjacent segment disease

Adjacent segment degeneration and adjacent segment disease are terms referring to degenerative disease known to occur after reconstructive spine surgery, most commonly at an immediately adjacent functional spinal unit. These can include disc degeneration, instability, spinal stenosis, facet degeneration, and deformity….

Previously reported biomechanical studies on the effects of various types of spinal fusion procedures upon the adjacent segment indicate a significant degree of increased stress at that segment.

ASD has been considered a potential long-term complication of spinal arthrodesis. However, the exact mechanisms and risk factors related to ASD are not completely understood.

The true incidence and clinical impact of degenerative changes at the adjacent segment is unclear because there is lack of a universally accepted classification system that rigorously addresses clinical and radiological issues [1)].

Classification

Seven classification systems of spinal degeneration, including degeneration at the adjacent segment, were identified. None have been evaluated for reliability or validity specific to patients with degeneration at the adjacent segment. The ways in which terms related to adjacent segment “degeneration” or “disease” are defined in the peer-reviewed literature are highly variable.

No formal classification system for either cervical or thoracolumbar adjacent segment disorders currently exists [2)].

Etiology

Degenerative adjacent segment stenosis after lumbar fusion

Findings

Include:

Disc degeneration

Stenosis

Facet joint hypertrophy

Scoliosis

Listhesis

Instability

see Cervical adjacent segment disease

see Lumbar adjacent segment disease

Treatment

Adjacent-segment stenosis and spondylosis can be treated with a number of different operative techniques. Lateral interbody fusion provides an attractive alternative with reduced blood loss and complications, as there is no need to re-explore a previous laminectomy site. A minimally invasive lateral approach provided high fusion rates when performed with osteobiological adjuvants [3].

Case series

A retrospective study was conducted on 46 patients (26 men and 20 women; average age 60.8 ± 6.78 years) with symptomatic ASD. The patients were treated with three approaches. The operation time, incision length, time to return to work, complications, and the like were compared among the three groups. Intervertebral disc space height, angular motion, and vertebral slippage were obtained to assess spine biomechanical stability following surgery. The visual analog scale (VAS) score and Oswestry disability index were evaluated at preoperation and 1-week, 3 months, and the latest follow-ups. Clinical global outcomes were also estimated using modified MacNab criteria.

Results: The operation time, incision length, intraoperative blood loss, and time to return to work for the percutaneous transforaminal endoscopic discectomy (PTED) group were significantly decreased compared with those for the other two groups ($P < 0.05$). The radiological indicators in the CBT-PLIF group and TT-PLIF group had better biomechanical stability compared with those in the PTED groups at the latest follow-up ($P < 0.05$). The back pain VAS score in the CBT-PLIF group was significantly decreased compared with those in the other two groups at the latest follow-up ($P < 0.05$). The good-to-excellent rate was 82.35% in the PTED group, 88.89% in the CBT-PLIF group, and 85.00% in the TT-PLIF group. No serious complications were encountered. Two patients experienced dysesthesia in the PTED group; screw malposition was found in one patient in the CBT-PLIF group. One case with a dural matter tear was observed in the TT-PLIF group.

All three approaches can treat patients with symptomatic ASD efficiently and safely. Functional recovery was more accelerated in the PTED group compared with the other approaches in the short term; CBT-PLIF and TT-PLIF can provide superior biomechanical stability to the lumbosacral spine following decompression compared with PTED; however, compared with TT-PLIF, CBT-PLIF can significantly reduce back pain caused by iatrogenic muscle injury and improve functional recovery. Therefore, superior clinical outcomes were achieved in the cortical bone trajectory screw fixation (CBT-PLIF) group compared with the PTED and TT-PLIF groups in the long term [4].

Zhong et al. from the Department of Spinal Surgery, Nanfang Hospital, Southern Medical University, Guangzhou, China. and Department of Orthopaedic Surgery, University of California, San Francisco, CA, USA, retrospectively assessed adult patients who had undergone decompression and instrumented fusion for lumbar spondylolisthesis between January 2006 and December 2012. The incidence of ASD was analyzed. Potential risk factors included the patient-related factors, surgery-related factors, and radiographic variables such as sagittal alignment, preexisting disc degeneration

and spinal stenosis at the adjacent segment.

A total of 154 patients (mean age, 58.4 years) were included. Mean duration of follow-up was 28.6 months. Eighteen patients (11.7%) underwent a reoperation for ASD; 15 patients had reoperation at cranial ASD and 3 at caudal ASD. The simultaneous decompression at adjacent segment (p=0.002) and preexisting spinal stenosis at cranial adjacent segment (p=0.01) were identified as risk factors for ASD. The occurrence of ASD was not affected by patient-related factors, the types, grades and levels of spondylolisthesis, surgical approach, fusion procedures, levels of fusion, number of levels fused, types of bone graft, use of bone morphogenetic proteins, sagittal alignment, preexisting adjacent disc degeneration and preexisting spinal stenosis at caudal adjacent segments.

The findings suggest the overall incidence of ASD is 11.7% in adult patients with lumbar spondylolisthesis after decompression and instrumented fusion at a mean follow-up of 28.6 months, the simultaneous decompression at the adjacent segment and preexisting spinal stenosis at cranial adjacent segment are risk factors for ASD [5].

A study presents 18 patients in whom new symptoms developed from the segment adjacent to a fusion after an average symptom-free interval of 8.5 years (1-38 years). The most common pathologic condition at the adjacent segment was hypertrophic degenerative arthritis of the facet joints. Spinal stenosis was found there in eight cases; severe disc degeneration in five; degenerative spondylolisthesis in two; and spondylolysis acquisita in one [6].

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