

patient was subsequently referred to our hospital 2 months after onset. She exhibited a typical cock-robin position. Her neck remained in a fixed rotated position to the left, and her neck movement to the right side was severely restricted. She denied any history of trauma, infectious diseases, psychiatric diseases, or surgeries related to her cervical spine. The cervical radiographs and computed tomography (CT) scans revealed torticollis to the right and C1 rotation with normal atlantodental interval. There were no obvious fractures, ligament injury, or any other inflammatory findings in CT scans and magnetic resonance imaging. There was no C2 facet deformity or C1–C2 bony union on three-dimensional CT images in the plane position. According to her radiographs and CT scans, a diagnosis of Fielding classification type I, Pang's classification type 2, and Ishii's grade I AARF was confirmed.

Results: She eventually underwent closed reduction under general anesthesia. The operator held her mandible with his thumbs and her neck with his other fingers, provided careful traction in the cephalic direction, and rotated her neck gradually to the right while palpating for crepitus. Her neck was fully rotated to the right after 10 minutes of manipulation, and the reduction was confirmed by fluoroscopy. Immediately after waking up from general anesthesia, her neck pain and irreducible cervical rotation dramatically improved without any complications such as neurological deficit or fractures. Two years after closed reduction, she had no neck pain or recurrence of limited cervical rotation.

Conclusions: A closed reduction under general anesthesia for non-traumatic AARF in adult patients might be an effective treatment option, even for chronic cases or intractable cases by traction treatment.

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The Ipsilateral Epiphyseal and Central Endplate Hounsfield Units Accurately Predicts Intraoperative Endplate Violation and Delayed Cage Subsidence with Oblique Lateral Interbody Fusion

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Purpose: There are favorable results with oblique lateral interbody fusion (OLIF) to achieve indirect decompression. Some of the most dreaded complications include intraoperative endplate violations and delayed cage subsidence. The endplate plays an important role in distributing compressive load across a functional spinal unit. The Hounsfield units (HUs) can provide detailed information regarding bone quality across endplates at surgical levels. We aimed to investigate the risk factors for intraoperative endplate violations and delayed cage subsidence after OLIF surgery.

Methods: A total of 61 consecutive patients (mean age, 65.1±9.5 years; 107 segments) who underwent OLIF with or without posterior instrumentation from May 2015 to April 2019 were studied. Intraoperative endplate violation was defined as more than 2 mm collapse of the cage into the endplate of the adjacent vertebral body on sagittal reconstructed computed tomography images immediate postoperatively. Delayed cage subsidence was evaluated using lateral radiographs and defined as more than 2 mm migration of the cage into the adjacent vertebral endplate at 1-month follow-up or later. As potential contributors, bone mineral density, number of surgical levels, preoperative and postoperative disc height and Hounsfield units (HUs) at different regions of the endplate were obtained along with other demographic factors.

Results: Total postoperative cage subsidence was identified in 45 surgical levels (42.0%) in 26 patients (42.6%) up till postoperative 1-year follow-up. These consisted of 25 intraoperative endplate violation segments (23.4%) and 20 levels (18.7%) with delayed cage subsidence. Low HU value at the ipsilateral epiphyseal ring was an independent

risk factor for intraoperative endplate violation ($p=0.01$) with a cut-off value of 326.21 HUs (sensitivity 79.0%, specificity 77.3%). Low HU values at the central endplate had a significant correlation with delayed cage subsidence in stand-alone cases ($p=0.01$) with a cut-off value of 296.42 HUs (sensitivity 76.9%, specificity 76.6%).

Conclusions: HUs of the endplate are good predictors for intraoperative endplate violation and cage subsidence since they can represent the regional bone quality of the endplate in contact with the implant. These are important parameters for consideration preoperatively to plan for cage sizes and posterior instrumentation.

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A New Full Endoscopy System and Intradiscal Irrigator Combined with a Novel Annular Repair Device for the Treatment of Lumbar Disc Herniation

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Purpose: The aim of this study was to determine the technical feasibility, clinical safety, and efficacies of a new transforaminal approach endoscopic system for the treatment of lumbar disc herniation. The new serial therapeutic system includes a novel endoscopy system, an intradiscal irrigator, and a full endoscopic annular repairment device.

Methods: From October 2017 to June 2019, we enrolled 16 patients 21 to 46 years of age, with imaging confirmation of single-level disk herniation between L3 and L5 (L3/L4 level, three cases; L4/L5 level, eight cases; L5/S1 level, five cases) with disk height ≥ 5 mm, and who failed ≥ 6

weeks of nonsurgical treatment. Magnetic resonance imaging with T1- and T2-weighted axial and sagittal images, multiplanar computed tomography, and flexion/extension X-rays were performed. All patients had lumbar radiculopathy with positive straight leg raise or femoral stretch test. All patients underwent transforaminal approach endoscopic discectomy use the novel endoscopic system, after discectomy we used the novel irrigator inserted into the tears of annulus fibrosus for intradiscal irrigation, then we used a novel full endoscopic annular repairment device close the annular defects which was an automatic stitching and tying device. The Visual Analog Scale (VAS) and Oswestry Disability Index (ODI) were observed before operation and at 1 day, 1 month, 6 months, and last follow-up after the operation.

Results: The procedure was successfully performed in all cases. Average operation time was 95 minutes. Average blood loss was 15.3 ± 3.8 mL. At last follow-up (9.6 ± 1.7 months), all patients experienced a minimally clinically important improvement of their VAS for ipsilateral leg pain, which improved from 7.3 ± 0.2 preoperatively to 1.8 ± 0.3 postoperatively ($p=0.001$). The ODI improved from 52 ± 3.8 preoperatively to 20.1 ± 4.4 at last follow-up ($p=0.001$). There was no postoperative complication and recurrence of disc herniation.

Conclusions: Early results showed the use of the new transforaminal approach endoscopic irrigation and annular repairment system for the treatment of lumbar disc herniation are beneficial for short term outcomes demonstrating reduction in symptomatic disc reherniation with low postoperative complication rates. Long-term studies are required to further investigate the efficacy of such devices.