immunostained using anti-NGFβ antibody. In vitro study: Human nucleus pulposus (NP) and annulus fibrosus (AF) cells obtained from cadaveric human spines (three donors, mean age 55.7, MRI Thompson grade 2–3) were cultured on monolayer or on 1.2% alginate beads for 10 days, and further cultured in the presence or absence of recombinant human interleukin-1β (rhIL-1β: 0.1–10 ng/ml) or tumor necrosis factor-α (rhTNF-α: 0.1–100 ng/ml) for 3 days. NGF expression was analyzed through ELISA and RT-PCR.

RESULTS: In the whole disc sample from the reconstructive surgery, NGF was strongly stained in the anterior longitudinal ligament and the outer AF and less in the inner AF and the NP. In herniated IVD tissues, NGF immunoreactivity was found in microvessels and disc cells associated with inflammatory cells. The cell culture experiment using cadaveric cells confirmed these results; both AF and NP cells cultured on monolayer and alginate beads were stained positively with anti-NGF antibody and expressed the NGF mRNA. A detectable amount of NGF was found in cell lysates, but no significant differences were observed among treatment groups. Although the constitutive secretion of NGF into the media was not detectable by the ELISA, rhIL-1β (10 ng/ml) and rhTNF-α (100 ng/ml) significantly upregulated the secretion of NGF (rhIL-1β: AF; 167.3±2.9, NP; 239.4±25.9 pg/ml, rhTNF-α: AF; 20.8±4.5, NP; 86.5±3.5 pg/ml, $p<.01$ vs. control) by ELISA.

CONCLUSIONS: The presence of NGF in human IVD was confirmed immunohistochemically in human IVD tissues. There was a strong presence in the outer AF and in the herniated mass. The stimulative effects of rhIL-1β and rhTNF-α suggests the involvement of proinflammatory cytokines in the regulatory pathway of NGF in the IVD disc. The results of this experiment suggest the possibility that NGF secreted in the IVD may be involved in nerve ingrowth into the inflamed/degenerated discs that expresses proinflammatory cytokines. Further research in NGF expression in the human IVD or in an animal model of disc degeneration may shed light on the mechanism of low back pain associated with degenerated disc disease.

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CONFLICT OF INTEREST: Author (KM) Grant/Research Support: NIH grants (P01-AR48152 and P50-AR39329).

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P28. Incidence of Dysphagia Comparing Cervical Arthroplasty and ACDF With Internal Fixation

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BACKGROUND CONTEXT: Dysphagia after anterior cervical discectomy and fusion with plating is a well known complication. Its incidence has been reported between 5–12.5% of cases. It appears that approximately 80% of these patients have resolution of their symptoms at 12 months, leaving 20% with persistent dysphagic symptoms. These symptoms include difficulty swallowing and dysphonia. The etiology of this complication is unknown in a majority of patients. Vocal fold paresis is only identified in 1.3% of patients, and adhesions to the plate or just irritation of the soft tissues of the anterior neck are felt to contribute to dysphagia. When dysphagia is severe enough, plate removal and adhesion lysis can be attempted if the vocal folds appear to be functioning appropriately. Reports show improvement of symptoms to little or none in 87% of patients treated in this manner. There has been concern that the rates of dysphagia may be higher with arthroplasty procedures because of the amount of soft-tissue mobilization to place the prosthesis in the proper position and the additional instrumentation required.

PURPOSE: To evaluate whether cervical disc arthroplasty results in a higher rate of dysphagia compared with ACDF.

STUDY DESIGN/SETTING: 45 patients were randomized to receive a Prodisc-C arthroplasty, and 44 patients were randomized to the ACDF and plate group. All surgical interventions were between C3-7. The average follow-up averaged 18.2 months. Complaints of dysphagia and dystonia were recorded in a prospective manner.

PATIENT SAMPLE: 87 of 92 patients with cervical spondylosis with radiculopathy and/or myelopathy who fit the inclusion criteria.

OUTCOME MEASURES: Complaints of dysphagia and dystonia were recorded in a prospective randomized manner.

METHODS: Direct comparison of dysphagia complaints.

RESULTS: An average of 18.2 months of follow-up were completed. One of 45 patients reported ongoing dysphagic complaints (2.2%) in the Prodisc-C group. Two of 44 patients in the ACDF and plate group (4.5%) had continued complaints of dysphagia. One patient required removal of the plate with improvement in symptoms.

CONCLUSIONS: This study demonstrates that the added soft-tissue mobilization and additional instrument does not cause an increase in the amount of dysphagia compared with a similar group undergoing ACDF. There were actually fewer complaints of dysphagia compared with the ACDF and plate group. This may be related to the absence of an anterior plate that potentially leads to higher rates of soft-tissue adhesions after anterior cervical surgery.

FDA DEVICE/DRUG STATUS: Prodisc-C Cervical Arthroplasty: Investigational/not approved.

CONFLICT OF INTEREST: Author (MJ) Consultant: Synthes; Author (MJ, DM) Grant/Research Support: Synthes.

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P29. Charité-III versus ProDisc-L Early Head-to-Head Results at a Single Institute

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BACKGROUND CONTEXT: Currently two anterior disc replacement devices (Link-Charité and Prodisc-II) have been approved by the FDA for use in the lumbar spine. The mechanical design and properties of each device are dissimilar, the Charité being a nonconstrained device with an unfixed polyethylene insert, smooth end plate surfaces and without keels, whereas the ProDisc-L is a semi-constrained device with a fixed polyethylene insert, porous coated end plate surfaces, and with keels. There are as of yet no studies directly comparing patient outcomes with these prostheses.

PURPOSE: To compare early functional outcome scores and device-related complications between patients treated by two surgeons at a single institution with anterior lumbar disc arthroplasty using either the Link-Charité or ProDisc-L prosthesis.

STUDY DESIGN/SETTING: Patients meeting inclusion criteria were consented for the study. This is a comparison of prospective cohorts consisting of consecutive anterior disc replacement (ADR) surgeries performed at a single institution.

PATIENT SAMPLE: This ongoing investigation includes patient data collected over a 12-month follow-up period. The Charité-III and ProDisc-L cohorts consist of 45 and 68 patients respectively. Of the Charité-III patients, 44% were treated with single-level ADR, 54% were two-level ADR, and 2% were three-level ADR. Of the ProDisc-L patients, 47% were single-level replacement, 47% were treated with two-level replacement, and 6% were treated with three-level replacement. Charité-III and ProDisc-L cohorts were equivalent with respect to gender, average BMI, age at surgery, as well as preoperative historical and physical examination findings.

OUTCOME MEASURES: Patients rated their pain on the Visual Analogue Scale (VAS) and completed the Oswestry Disability Index (ODI) questionnaire. Assessments were made preoperatively, at 6 weeks, 3 months, 6 months, and 1 year (ongoing).

METHODS: VAS scores and ODI scores were obtained on written surveys administered to patients at each visit. Clinical and radiographic follow-up was obtained at each return visit to monitor for device-related complications. Student *t* test was used to assess stastical significance of mean VAS and ODI scores.
RESULTS: Preoperative mean VAS scores of the Charité-III versus ProDisc-L cohorts were 7.2 and 7.1 respectively, and preoperative mean ODI scores were 27.0 and 31.2 respectively (no statistical difference, $p>.05$). Both cohorts experienced a stepwise decrease in mean VAS and ODI scores during the follow-up period. At the 6-month visit, mean VAS scores of the Charité-III versus ProDisc-L patients were 3.7 and 3.1 respectively, and mean Oswestry scores were 16.0 and 15.1. With respect to device-related complications, there were four late failures (after 2 months postoperatively) in the Charité-III cohort and no failures in the ProDisc-L cohort. Failures included subsidence and dislocation.
CONCLUSIONS: Follow-up results of Charité-III and ProDisc-L anterior disc replacement cohorts indicate statistically significant improvement in VAS and Oswestry functional outcomes. There was a 9% device-related late complication rate in the Charité-III cohort, underscoring the importance of frequent radiographic follow-up after ADR surgery.
FDA DEVICE/DRUG STATUS: Charité: Approved for this indication; ProDisc: Approved for this indication.
CONFLICT OF INTEREST: No conflicts.

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P30. Surgical Outcomes of Syringomyelia Associated With Chiari I Malformation in Adults: Relationship Between Scoliosis and Neurologic Symptoms

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BACKGROUND CONTEXT: In previous studies, the clinical characteristics of pediatric scoliosis associated with syringomyelia have been reported. However, scoliosis associated with syringomyelia in adults is rarely treated and there is a paucity of detailed studies.
PURPOSE: In adult syringomyelia associated with Chiari I malformation, the relationship between syrinx, scoliosis, and neurologic symptoms before and after surgery was investigated.
STUDY DESIGN/SETTING: Retrospective study.
PATIENT SAMPLE: The subjects were 27 patients (20 years of age or older) who underwent foramen magnum decompression for the surgical treatment of syringomyelia.
OUTCOME MEASURES: The length of the syrinx, the morbidity period, the muscular atrophy of the upper extremity, increased deep tendon reflex of the lower extremity, lower cranial nerve symptoms, and clinical evaluation before and after surgery based on the Japanese Orthopaedic Association (JOA) score and the recovery rate were investigated.
METHODS: The mean age at surgery was 54.7 years. The mean follow-up period was 5.7 years. The patients were divided into two groups; group A with scoliosis of 10 degrees or more and group B without scoliosis. A comparison was made between these two groups concerning the length of syrinx, morbidity period, and clinical evaluation before and after surgery. In addition, the configuration of the syrinx was classified into one of the four types: distended, moniliform, slender, and circumscribed. The first two were called the wide type and the latter two, the narrow type; the frequency of scoliosis and surgical outcomes were compared between these two types. For the statistical test, Mann-Whitney *U* test was conducted. The significance level was set at $<5\%$.
RESULTS: There were 15 cases in group A and 12 in group B. The mean Cobb angle was 23.4 degrees (range, 15 to 42 degrees) for group A. The mean length of syrinx was 12.8 vertebral bodies in group A and 7.2 in group B. The mean morbidity period was 14.2 years in group A and 6.8 in group B. Muscular atrophy of the upper extremity was seen in 73.3% of those in group A and 8.3% of group B. Increased deep tendon reflex of the lower extremity was found in 93.3% of those in group A and 41.7% for group B. Lower cranial nerve symptoms were found in 40.0% and 25.0% in groups A and B, respectively. The mean preoperative JOA score was 10.1 points in group A and 14.4 in group B. The mean postoperative JOA score was 11.9 points in group A and 15.8 in group B. The mean postoperative recovery rate was 26.0% in group A and 58.3% in group B. There were significant differences between group A and group B in length of syrinx, morbidity periods, muscular atrophy of the upper extremity, increased deep tendon reflex of the lower extremity, pre- and postoperative JOA scores, and postoperative recovery rates. For the configuration of the syrinx, 12 belonged to the wide type and 15 belonged to the narrow type, with no statistically significant difference associated with the scoliosis. Neither were there statistically significant intergroup differences related to pre- and postoperative JOA scores or recovery rate. The postoperative reduction of the syrinx amounted to 60.0% for group A and 83.3% for group B. There was no significant difference between group A and group B.
CONCLUSIONS: The patients with syringomyelia and scoliosis had longer syrinx, longer morbidity periods, severer neurologic symptoms, and poorer surgical results. The findings suggested that in treatment of adult syringomyelia with Chiari I malformation, scoliosis could be a predicting factor of prognosis.
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
CONFLICT OF INTEREST: No conflicts.

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P31. Functional Diagnosis Using Multimodal Spinal Cord Evoked Potentials in Cervical Myelopathy

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BACKGROUND CONTEXT: The electrophysiological measurement of spinal cord evoked potentials (SCEPs) has been established as spinal cord monitoring or localization of cord involvement for spinal lesion. The SCEP studies contribute to performing a safe operation as well as localizing the spinal level responsible for myelopathy. Only a few reports, however, employed multimodal SCEPs for localization of cord involvement for cervical myelopathy.
PURPOSE: The objective of this study was to examine the correlation between intraoperative multimodal SCEPs recorded during cervical laminoplasty and MRI abnormalities, comparing older patients aged 70 years and older with non-older patients less than 69 years of age.
STUDY DESIGN/SETTING: Intraoperative multimodal SCEP studies were conducted to detect the exact level responsible for the main functional change in cervical myelopathy.
PATIENT SAMPLE: Sixty consecutive patients who had undergone cervical laminoplasty for myelopathy were included in this study. Patients were classified into two groups: 21 patients aged 70 years and older (older group), and 39 patients less than 69 years (non-older group). The mean ages of the older group and the non-older group were 77 and 51 years, respectively. The older group consisted of 19 patients with cervical spondylotic myelopathy and 2 with intervertebral disc herniation. The non-older group consisted of 31 patients with cervical spondylotic