METHODS: All patients with standing whole spine radiographs were included. Any patients with thoracic spine operation were excluded. Thirty-seven patients (56% of total patients) had preoperative global sagittal imbalance >5cm. Twenty-four patients (36% of total patients) had preoperative lumbar scoliosis. Five patients (8% of total patients) had segmental kyphosis preoperatively. The optimal sagittal balance was defined as the distance from C7 plumb to superior posterior end plate of S1 2.0 cm or less.
RESULTS: The preoperative lumbar lordosis angle of 32°+19.5° between T12 and S1 increased to 50°+15.5° at postoperative 6 weeks, and then to 48°+16.0° at final follow-up. The preoperative thoracic sagittal Cobb angle of 27°+17.7° between T5 and T12 increased to 37°+16.7° at final follow-up (Average; 10°+10.8° increase). Factors such as preoperative sagittal imbalance ($p=.34$), fusion to L5 or S1 ($p=.98$), and uppermost instrumented vertebrae (T9/10 vs. T11/12 vs. L1/2, $p=.29$) did not demonstrate any significant differences to regional sagittal alignment. The optimal sagittal balance group demonstrated the larger average angle differences between lumbar lordosis and thoracic kyphosis (Lumbar lordosis minus thoracic kyphosis) as of 20°+13.5° (sagittal imbalance group; −3°+18.0°, $p<.0001$), larger average lumbar lordosis angle of −51°+14.8° (sagittal imbalance group; −38°+19.8°, $p<.0001$), and smaller average thoracic kyphosis angle of 30°+14.5° (sagittal imbalance group; 36°+18.3°, $p=.023$). The more positive sagittal global balance, the smaller differences between lumbar lordosis and thoracic kyphosis (Lumbar lordosis minus thoracic kyphosis, $r=0.557$ and $p<.0001$).
CONCLUSIONS: The average increase of thoracic kyphosis following adult long lumbar/lumbosacral instrumentation and fusions to S1 until final follow-up was 10°. The ideal average angle differences between lumbar lordosis (T12-S1) and thoracic kyphosis (T5-T12) for optimal sagittal balance was 20°. Thus, the angle of lumbar lordosis during operation should be at least 30° larger than that of thoracic kyphosis for optimal sagittal balance at final follow-up.
DISCLOSURES: No disclosures.
CONFLICT OF INTEREST: No conflicts.

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P103. Cervical disc replacement–intermediate-term follow-up (1 to 2 years) of range of motion and clinical outcomes with the ProDisc-C prosthesis

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BACKGROUND CONTEXT: On the heels of encouraging results with lumbar total disc arthroplasty, clinical trials for cervical spine total disc arthroplasty have begun in the US. This paper represents one of the longest follow-ups of outcomes analysis with cervical disc replacements in the U.S. using the ProDisc-C prosthesis, from a site where it was first implanted.
PURPOSE: To examine the viability of cervical spine arthroplasty, as compared with anterior cervical discectomy and fusion for cervical disc degeneration and / or herniation.
STUDY DESIGN/SETTING: A prospective, randomized, and controlled study comparing cervical disc replacement with the ProDisc-C prosthesis versus anterior cervical discectomy and fusion with allograft and anterior cervical plate.
PATIENT SAMPLE: Patients with degenerative spondylosis or disc herniations at a single level causing neck and arm pain were randomized to spinal arthroplasty or fusion at a 1:1 ratio.
OUTCOME MEASURES: Visual Analog Scale (VAS), Oswestry Disability Index (ODI), patient satisfaction scores, and sequential radiographs (including bending films).
METHODS: This is a prospective randomized FDA clinical trial of ProDisc-C intervertebral arthroplasty versus anterior cervical discectomy and fusion. Thirty patients were enrolled in the study. Preoperative and follow-up flexion-extension and side bending radiographs were studied and measured. Clinical outcomes were recorded with the Visual Analog Scale (VAS) for both neck and arm pain, and Oswestry disability questionnaires. The follow-up was up to 24 months postoperatively.
RESULTS: Average flexion-extension motion went from 9 degrees preoperatively to less than 1 degree (essentially no motion) at over 12 months postoperatively in the fusion group, but was well-preserved from 11 to 12.5 degrees in the disc replacement group. Side bending went from 6 degrees to <2 degrees (essentially no motion) in the fusion group, versus 5.9 to 5 degrees in disc replacement patients. Clinical outcome scores revealed significant improvements in VAS and Oswestry scores for both groups. By six months, VAS (neck) was down from 6.6 to 2.4 in disc replacement patients, and 6.2 to 2.6 in fusion patients. VAS (arm) was down from 4.7 to 2.4 and 6.5 to 2.9 in disc replacement and fusion patients respectively. Oswestry scores similarly decreased from 25 to 9 and 24 to 13 at over 12 months in disc replacement and fusion patients respectively.
CONCLUSIONS: Our longest-term results suggest that cervical disc replacement is a viable alternative for preservation of motion at affected vertebral levels without compromising clinical outcomes, and with the additional upside of possible prevention of adjacent segment degeneration. This is one of the first clinical trials in the US for this prosthetic cervical disc. Longer term safety and efficacy studies are in progress.
DISCLOSURES: FDA device/drug: ProDisc-C prosthesis. Status: Investigational/not approved.
CONFLICT OF INTEREST: Author (RBD) Grant Research Support: Synthes.

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P104. A long-term clinical outcome analysis of minimally invasive cervical foraminotomy for the treatment of cervical radiculopathy

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BACKGROUND CONTEXT: Published series of inimally invasive cervical foraminotomy (MICF) have shown excellent short-term relief of cervical radiculopathy (85–98%) with minimal surgical morbidity and blood loss. As reports of this technique have been relatively recent, long-term clinical series documenting the stability of these early results over time. This is the first reported long-term follow-up of MICF patients.
PURPOSE: This study examines the long-term clinical outcomes of MICF over time to determine the incidence of recurrent symptoms and the percentage of patients requiring additional cervical spinal surgery.
STUDY DESIGN/SETTING: Postoperative retrospective analysis of cervical radiculopathy patients over a 4-year period.
PATIENT SAMPLE: N=73.
OUTCOME MEASURES: clinical records, phone call surveys, repeat operative records.
METHODS: We conducted a multi-center retrospective chart review of 73 patients who had a MICF. Clinical outcome measures were assessed from clinic records, new operative records, and phone surveys were done to assess results.
RESULTS: Initially at 3 months, 96% reported relief of radicular pain compared with preop. With regards to cervical radiculopathy, 15 had recurrent symptoms with onset in 3% at 1 year, 10% at 2 years, 13% at 3 years, and 17% at 40 months. Of these, 8 had symptoms attributable to the same radicular pattern as preop. Recurrent disc herniations were noted in only 2 of the 15 cases with progressive osteophytes or foraminal narrowing being the most common MRI finding. Of the remaining 7 with symptoms at other levels, 6 had evidence of radiographic abnormality preoperatively at that level. Whereas patients selected for MICF had minimal preoperative neck pain, signficant neck pain was subsequently seen in 8 patients with symptoms in 2% at 1 year, 5% at 2 years, 9% at 3 years, and 11% at 40 months. Overall, 15 patients (20%) of these 23 symptomatic patients underwent an additional cervical surgery after MICF. 4% of patients underwent a repeat MICF at the same level as before at an average of 12 mos postoperatively with a positive response in all 3 cases. An additional 2 patients had