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BIPORTAL ENDOSCOPIC VERSUS MICROSCOPIC LUMBAR DECOMPRESSIVE LAMINECTOMY IN PATIENTS WITH SPINAL STENOSIS: A RANDOMIZED CONTROLLED TRIAL

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Background(s): Biportal endoscopic decompressive laminectomy is a widely performed procedure and shows acceptable clinical outcomes. However, the evidence regarding the advantages of biportal endoscopic surgery is weak; a randomized controlled trial is therefore warranted. The purpose of this study is to compare the clinical efficacies of biportal endoscopic and microscopic decompressive laminectomy in patients with lumbar spinal stenosis.

Method(s): All participants were randomly assigned in a 1:1 ratio to undergo biportal endoscopic or microscopic decompressive laminectomy. The primary outcome was the ODI score at 12 months after surgery based on a modified intention-to-treat strategy. The secondary outcomes included VAS score for low back and lower extremity radiating pain, ODI scores, EQ-5D score, and painDETECT score. There were no sources of funding and no conflicts of interest associated with this study.

Result(s): There was no significant difference between groups in the mean ODI score at 12 months after surgery (30 in the microscopy vs. 29 in the biportal endoscopy group, p = .635). There were also no significant differences in low back and lower extremity pain VAS scores, ODI, EQ-5D scores, and painDETECT scores at the 3-, 6-, or 12-month follow-up (Fig 1). Operation time, length of hospital stay, serum creatine phosphokinase and perioperative complications, such as durotomies and symptomatic hematoma, showed no significant differences between the groups; however, one participant underwent additional revision surgery 9 months after the index surgery in the microscopy group.

Conclusion(s): Despite the study design limitation of relatively short duration of follow-up, this
trial suggests that biportal endoscopic decompressive laminectomy is an alternative to and offers similar clinical outcomes as microscopic open surgery in patients with symptomatic lumbar spinal stenosis.

Disclosures:
author 1: none; author 2: none; author 3: none; author 4: none

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COMPARISON OF PATIENT-REPORTED OUTCOMES BETWEEN TRANSFORAMINAL AND INTERLAMINAR ENDOSCOPIC DISCECTOMY IN TREATING PATIENTS WITH PARACENTRAL DISC HERNIATION: A RANDOMIZED CONTROLLED TRIAL STUDY AND PRELIMINARY REPORT

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Objective: To compare the patient-reported outcomes (PROs) between TELD and IELD in treating patients with paracentral-typed HNP patients.
Methods: Fifty-six patients with paracentral-typed disc herniation were randomized into two groups: the transforaminal and interlaminar group. The patients have then received treatment according to their groups and they all completed at least 3-month of follow-up. The patient-
reported outcomes were assessed according to the Oswestry Disability Index (ODI), Visual Analog Scale (VAS) score for back leg and wound, and modified MacNab criteria. The operation time, intraoperative radiation time, hospitalization period, returned-to-work time, and complications were obtained. All parameters were compared between the two groups. Student t-test, a Mann-Whitney U test, and a χ 2 were used in statistical analysis.

Results: All the patients completed follow up with a mean of 6.8 months (range, 3.1-9.8 months). In the TELD group, the mean operation time was 51.0 ± 7.3 minutes, and the intraoperative radiation time was 4.60 ± 1.32 seconds. While in the IELD group, the mean operation time was 42.2 ± 23.4 minutes, and the intraoperative radiation time was 0.57 ± 2.21 seconds. There were significant differences in operation time and radiation time between the two groups (p<0.01) but not in the hospitalization period, return-to-work time, or complication rate (P > 0.05). There were 2 incidental dural tears, and 1 recurrent herniation in the IELD group and 1 recurrent herniation in the IELD group. Concerning the PROs, patients' satisfactory rates were 82.6% (19/23) and 87.0% (20/23) owing to the good-to-excellent modified Macnab criteria without a significant difference (p>0.05). The postoperative ODI and VAS were significantly improved in the two groups when compared with preoperative status (p<0.01) which achieved a minimal clinically important difference (MCID). Early postoperative wound pain was more in the IELD group (VAS = 3.4 ± 1.2 VS 0.8 ± 0.3, p = 0.047) but not different after 2-week follow-up periods.

Conclusion: Both IELD and TELD yielded good PROs without statistical difference. The patients in the IELD group experienced a slightly earlier postoperative pain than in the TELD group. However, without any anatomy restriction, IELD provides a more familiar operative orientation associated with shorter operative time and less radiation exposure when compared to the TELD. Skillful needle placement could reduce the operative time and radiation exposure in TELD surgery.

Disclosures:
OVER TEN-YEAR FOLLOW-UP RESULTS OF MIS-TLIF FOR PATIENTS WITH DEGENERATIVE SPONDYLOLISTHESIS OF THE LUMBAR SPINE - PRESERVATION OF POSTERIOR STRUCTURES MIGHT REDUCE ADJACENT SEGMENT DEGENERATION

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Background Context: Minimally invasive transforaminal lumbar interbody fusion (MIS-TLIF) has become widely performed for the last decade, but long-term advantages in patients undergoing MIS-TLIF compared to TLIF (C-TLIF) have not been well documented.

Purpose: To elucidate the long-term outcomes of MIS-TLIF, especially focused on adjacent segment degeneration (ASD).

Study design: A retrospective analysis of prospectively collected clinical and radiographic data of patients who underwent MIS-TLIF for single-level symptomatic degenerative spondylolisthesis (DS) of the lumbar spine, and compared with C-TLIF.

Patients sample: A total of 106 patients from 2004 to 2009, 73 (30 males, 43 females) aged 48-81 years that underwent single-level MIS-TLIF (35 cases) and C-TLIF (38 cases) were included with minimum follow-up of 10 years. Mean follow-up duration was 13.5 years for MIS-TLIF cases and 13.1 years for C-TLIF cases, with overall follow up rate is 70.2%.

Outcome measures: Clinical outcomes were evaluated according to the Japanese Orthopedic Association score (JOA score). Clinical ASD was defined as patients who required additional surgery due to ASD. Radiographic ASD, multifidus muscle atrophy, and fat degeneration were assessed using flexion-extension radiographs, CT scan, and MRI T2 axial images.

Methods: MIS-TLIF was performed via a unilateral dorsal approach using tubular retractor. MIS-TLIF was achieved using titanium cage with autologous bone. Percutaneous pedicle screw fixation was added bilaterally. C-TLIF was performed via a mid-sagittal dorsal approach, followed by stripping the paravertebral muscle. After removal of the spinous process, standard laminomomy, unilateral facetectomy and discectomy followed by interbody fusion and pedicle screw placement was.

Results: Cohorts were well matched based on patient age (MIS: 64.3 yrs. C: 62.6 yrs.), duration of symptoms (MIS: 15.2 mo. C: 17.3 mo.), and JOA score (MIS: 15.7 points. C: 14.6 points.) before surgery. The mean JOA scores in MIS group and C group were both significantly improved to 25.2 and 24.4 respectively at the latest follow-up with no significant difference. Postoperative lumbar stiffness complains were significantly less in the MIS than C. Clinical ASD was observed in 2 case with MIS and in 8 cases with C (P=0.05). Also radiographic ASD was observed in 6 cases with MIS group and in 18 cases with C group (P=0.03). Postoperative multifidus muscle atrophy ratio in MIS group was significantly less than C group.

Conclusions: This this study demonstrates that MIS-TLIF obtained the same clinical improvements as C-TLIF over ten years period. Preservation of posterior elements using MIS technique including minimizing approach related soft tissue trauma, posterior bony structures as much as possible might reduce adjacent segment degeneration.

Disclosures:
author 1: none; author 2: none; author 3: none; author 4: none; author 5: no indication; author 6: no indication
DOES THE APPROACH MATTER? SHORT-TERM RESULTS AFTER MINIMALLY INVASIVE POSTERIOR OR ANTEROLATERAL LUMBAR FUSION SURGERY FOR DEGENERATIVE SPONDYLOLISTHESIS

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Background
Favourable outcomes have been reported after lumbar interbody fusion (LIF) surgery for patients with degenerative spondylolisthesis (DS) regardless of the surgical approach. Minimally invasive (MI) surgery compares favourably to traditional techniques regarding postoperative recovery, blood loss and costs. However, uncertainty remains about the most appropriate MI technique to treat patients with DS.

Purpose of the study
This study reports on outcomes of patients with DS (grade I and II) operated with either anterolateral or posterior MI-LIF and hypothesized that these patients have equivalence in mean improvement of ODI at 3-months regardless of the MI-LIF approach used.

Materials and methods
A prospective clinical study (NCT02617563) with experienced surgeons from 26 sites across Europe, Latin America, and Asia, consecutively enrolled 231 DS patients indicated for a MI-LIF procedure via posterior or anterolateral approach based on surgeon’s decision. Primary Patient Reported Outcome Measures (PROMs) were Oswestry Disability Index (ODI), VAS pain scale (back and leg) and EQ5D index assessed at baseline and 3-months post-surgery. Mean improvement in ODI at 3-months was specified as the primary endpoint. For the hypothesis the two-sided 95% Confidence Interval (CI) was applied. Further, paired t-test and ANCOVA were used to test for improvements and group differences.

Results
At 3-months post-surgery, all patients, regardless whether anterolateral or posterior surgical MI-LIF procedure was performed, demonstrated statistically and minimally clinically important significant improvements compared to baseline for all PROMs. Both groups improved equally well on ODI with 95% CI of (-5.6, 3.0) for mean difference, which was within the equivalent range of (-10, 10). Six MI-LIF procedure-related (3 in the anterolateral group; 3 in the posterior group) and 6 device-related serious adverse events (4 in the anterolateral group; 2 in the posterior group) were reported up to 3-months after the surgery.

Conclusion
Patients with DS demonstrated equivalent short-term improvement in disability (ODI) regardless whether an anterolateral or posterior MI-LIF approach was used. If short-term PROMs for pain and general health are also similar irrespective of approach used, then other factors such as risk of surgery-related adverse events, necessary decompression, long-term outcomes, costs, or patient characteristics could influence surgeons’ decisions about what the most suitable MI approach is for each patient. This ongoing study will further report on 1-year post-operation clinical outcomes, fusion rates and annual follow-up data.
Table 1. Mean (SD) baseline characteristics and patient reported outcomes in patients with degenerative spondylolisthesis at 3-months post-operation.

<table>
<thead>
<tr>
<th></th>
<th>Anterolateral n=114</th>
<th>Posterior n=117</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>56.9 (10.3)</td>
<td>62.1 (10.3)</td>
</tr>
<tr>
<td>Females, %</td>
<td>60.5</td>
<td>66.7</td>
</tr>
<tr>
<td>BMI</td>
<td>27.4 (4.2)</td>
<td>26.7 (4.5)</td>
</tr>
<tr>
<td>Conservative care, months</td>
<td>25.9 (29.4) n=112</td>
<td>20.0 (23.7) n=106</td>
</tr>
<tr>
<td>Back pain, %</td>
<td>96.5</td>
<td>89.7</td>
</tr>
<tr>
<td>Leg pain, %</td>
<td>93.9</td>
<td>92.3</td>
</tr>
<tr>
<td>Tobacco use, %</td>
<td>22.8</td>
<td>12.8</td>
</tr>
<tr>
<td>ODI</td>
<td>Baseline</td>
<td>45.4 (18.3)</td>
</tr>
<tr>
<td>Mean improvement</td>
<td>23.2 (21.3)**</td>
<td>25.8 (19.2)**</td>
</tr>
<tr>
<td>VAS back pain</td>
<td>Baseline</td>
<td>6.4 (2.4)</td>
</tr>
<tr>
<td>Mean improvement</td>
<td>2.5 (2.4) n=106</td>
<td>2.3 (2.2) n=102</td>
</tr>
<tr>
<td>VAS leg pain</td>
<td>Baseline</td>
<td>6.3 (2.8)</td>
</tr>
<tr>
<td>Mean improvement</td>
<td>1.6 (2.3) n=106</td>
<td>1.2 (1.9) n=102</td>
</tr>
<tr>
<td>EQ-5D Index</td>
<td>Baseline</td>
<td>0.489 (0.236)</td>
</tr>
<tr>
<td>Mean improvement</td>
<td>0.782 (0.179) n=104</td>
<td>0.838 (0.149) n=102</td>
</tr>
<tr>
<td>Mean improvement</td>
<td>0.308 (0.272)** n=102</td>
<td>0.294 (0.250)**</td>
</tr>
</tbody>
</table>

***3-month compared to pre-op: p<.001

Disclosures:
author 1: consultant=Medtronic; author 2: grants/research support=Medtronic; author 3: consultant=; author 4: grants/research support=Medtronic, Stryker, Clariance, Philips, consultant=Stryker, Clariance , royalties=Stryker, Clariance; author 5: grants/research support=Medtronic; author 6: none; author 7: grants/research support=Medtronic; author 8: grants/research support=Medtronic; Zimmer, Geistlich, consultant=medtronic, Zimmer, Paradigm spine, Eos Imaging, Medacta, OHST, royalties=Medacta, OHST, author 9: none; author 10: none; author 11: grants/research support=Medtronic company; author 12: none

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COMPARISON OF UNREMOVED INTERVERTEBRAL DISC LOCATION AND AREA BETWEEN TWO ANTERIOR LATERAL LUMBAR INTERBODY FUSIONS (LLIF)
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Background/ introduction: Vertebral endplate preparation plays an important role to promote bony fusion in spine procedure. With a LLIF approach, more amounts of disc removal can be performed and larger cage can be inserted. However, up to 19% of pseudarthrosis and 29.7% of cage subsidence has been reported. Inadequate disc removal was shown to inhibit spinal fusion which may also cause a cage malposition and postoperative neurological deficit. Although extreme lateral interbody fusion (XLIF) and oblique lumbar interbody fusion (OLIF) shared the same principle of anterior lumbar fusion and indirect decompression, due to different entry point to disc space, location and area of unremoved intervertebral disc may be different.

Purpose of the study: Our study compared location and area of unremoved intervertebral disc between both procedures in order to increase awareness of surgeon during operation which may reduce such complications.
Materials and Methods: Postoperative MRIs at 3 to 6 months of patients who underwent XLIF and OLIF for degenerative spine disease were reviewed. A T2-weight image of an axial cut with largest unremoved disc visualized was selected. We divided the intervertebral disc into 5 zones, central, left anterior, left posterior, right anterior and right posterior. (Figure 1) Area was measured using Picture Archiving and Communication System (PACS) program. Angle of intervertebral cage was measured.

Results: A total of 61 levels of XLIF from 51 patients and 62 levels of OLIF from 34 patients were included in the study. The areas of unremoved intervertebral disc at left anterior, right anterior and left posterior zones of OLIF were significantly more than XLIF (55.7±41.5 vs 29.8±33.3 mm², 57.9±43.6 vs 34.1±33.1 mm² and 50.5±41.8 vs 31.5±35.9 mm² retrospectively, p<0.01). (Figure 1) No significant differences were found at right posterior and central zones. A 9.2° ± 6.1° and 0.7° ± 4.9° cage angulation from left anterior to right posterior was found in OLIF and XLIF retrospectively with statistical different.

Conclusion: Our study found greater area of unremoved disc in OLIF compare to XLF. The common locations were in contralateral side of surgical approach, right anterior in OLIF and right posterior in XLIF. Greater area of unremoved disc in anterior zone after OLIF due to oblique corridor to disc space may cause malposition of cage. Meticulously disc removal should be done especially in OLIF procedure to prevent complications.

Disclosures:
FACET JOINT OPENING ON CT IS RISK FACTOR FOR REOPERATION AFTER LESS-INVASIVE DECOMPRESSION SURGERY FOR LUMBAR DEGENERATIVE DISORDERS

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[Introduction] We have performed less-invasive surgery using microscopy or microendscopy for lumbar degenerative disorder without severe segmental spinal instability by dynamic X-ray. Although spinal fusion surgery is gold standard for surgical treatment with segmental spinal instability, It has not been clarified about threshold which can be treated by less-invasive decompression alone surgery. Facet joint opening on CT was reported as an indicator for segmental spinal instability by an experimental study (Hasegawa K, J Neurosurg Spine 2010). However, there is no study which investigated the impact of facet joint opening on clinical outcomes or revision surgery after decompression alone surgery.

[Aim] The purpose of this study was to investigate risk factors for reoperation after less-invasive surgery including facet joint opening in a long-term cohort study.

[Materials and Methods] This study included a total of 244 patients (male 130/ female 114, mean age at surgery 68.5 years, mean follow-up 6.3 years) who underwent less-invasive surgery for lumbar degenerative disorder and have followed up ≥ 5 years in one institution. Patients who had prior lumbar surgery or undergone emergent surgery were excluded. Reoperation was defined as surgeries due to progression of degeneration either at index lumbar level or not; excluded surgeries because of postoperative infection or hematoma. Facet joint opening was defined as ≥ 2mm facet interval on axial images of CT in each lumbar level. Facet joint opening was evaluated at index decompression level and total number of facet joint opening within lumbar segment from L1-2 to L5-S. Risk factors for reoperation were analysed by Cox proportional hazards regression analysis adjusted with patients’ demographic, preoperative symptom severity, and radiological findings (≥ 6mm spondylolisthesis, ≥ 20°scoliosis, and sagittal spinal parameters by standing radiographs), other than facet joint opening on CT.

[Results] Reoperations were performed in 26 cases (10.7%) at average 3.9 years after initial surgery. Facet joint openings at index decompression level were significantly more observed in patient with reoperation than those without (69 and 39%, respectively, p = 0.003). Total number of facet joint opening within lumbar segment were also significantly more observed in patients with reoperation than those without (2.0 and 1.2 levels, respectively, p = 0.001). Total number of facet joint opening within lumbar segment was independent risk factor for reoperation by multivariate analysis (Hazard ratio 1.47, p= 0.003) other than severe preoperative symptom or lumbar foraminal stenosis.

[Conclusion] This study indicated that facet joint openings, not only at index level but also total number within lumbar segment, were predictor for reoperation. Facet joint opening on CT is useful not only to evaluate present instability but also to predict future progression of degeneration for lumbar segment.

Disclosures: author 1: none; author 2: none; author 3: none
COMPARISON OF THE EFFECTS OF PEDICLE SCREWS BY WILTSE APPROACH AND PERCUTANEOUS FOR TREATMENT OF THORACOLUMBAR FRACTURES ON FACET JOINTS: A PROSPECTIVE, DOUBLE-BLIND, RANDOMIZED CONTROLLED STUDY

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Objective: A prospective comparative study was performed to analyze the effects of the pedicle screws via Wiltse approach and percutaneous for treatment of thoracolumbar fractures which focus on the facet joint invasion rate and the clinical efficacy.

Methods: A total of 138 patients who underwent internal fixation by minimally invasive surgery for thoracolumbar fractures in our department from January 2018 to January 2019 were randomly divided into two groups. One group underwent reduction and internal fixation with pedicle screws by Wiltse approach (MWPS group, n=69), the other group underwent percutaneous reduction and internal fixation (PPS group, n=69); A total of 372 pedicle screws were planted in MWPS group and 352 screws were planted in the PPS group. All the patients were followed up at least one year and underwent X-ray, CT, or MRI examinations postoperative. At the last follow-up, vertebral collapse correction rate and Cobb's angle were assessed and analyzed. The rate of facet joint invasion (FJV) was evaluated by CT scan. The pain visual analogue score (VAS) and the Oswestry disability index (ODI) score were also recorded and the patients satisfaction and quality of life were investegated at the final follow-up.

Results: All patients were followed up at least 12 months. The FJV was observed in 7 cases (7/69, 10.1%) among the MWPS group and 22 cases (22/69, 31.8%) among the PPS group, the difference was statistically significant (p <0.05). In correspondence, there were 10 screws (10/372, 2.6%) present FJV in the MWPS group and 68 screws (68/352, 19.3%) present FJV in the PPS group, the difference was significant in statistical (p <0.05). The recovery of anterior height of injured vertebrae and Cobb angles of local segment in MWPS group were better than those in PPS group at final follow-up (p <0.05); In terms of clinical function, there was no significant difference in VAS scores between the two groups of patients at the last follow-up (P > 0.05), while the ODI score and the patient satisfaction in PPS group were lower than those in the MWPS group, and there were statistical differences between the two groups (p <0.05).

Conclusion: The rate of FJV caused by pedicle screw implantation in percutaneous minimally invasive internal fixation is higher than that via the Wiltse approach for treatment of thoracolumbar fractures. The direct injury of the facet joint or acceleration of the degeneration may affect function of the thoracolumbar spine and life quality of the patients.

Disclosures:
author 1: none; author 2: none; author 3: none

POSITIVE ASSOCIATION BETWEEN INTRASPINAL MENINGIOMA AND BREAST CANCER: CASE SERIES AND SYSTEMATIC REVIEW OF LITERATURE

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Background: Intraspinal meningiomas are rare intradural extramedullary spinal tumours. Surgical resection is the treatment of choice for symptomatic lesions. Here we present our experience with surgically managed intraspinal menigioma in a single UK unit and report an
association between these tumours and breast cancer.

Methods: We performed a retrospective review of all intraspinal meningiomas presenting to our unit over the last 5 years, evaluating the presentation, demographics, pathology and outcomes. A systematic review was also performed according to PRISMA guideline, identifying all English language literature mentioning breast cancer, meningioma and the possible association.

Results:
A total of 69 patients presented with intraspinal meningioma. Of these 56 [81%] were female. Vast majority of the spinal meningiomas were managed surgically (n = 62). The most common presenting symptoms were weakness and balance problems and surgery significantly improved both motor outcome (p=0.002) and health related qualities of life (SF36, p<0.01).
Seventeen percent of spinal meningioma cases (n=12) had a preceding presumed unrelated cancer diagnosis. Of these three quarters (n=9/12) were attributable to breast cancer. 16% [n=9] of female patients had a preceding history of breast cancer. The mean age of presentation was 60.7 years (sd 9.03) at the time of breast cancer diagnosis and on average 8.14 (sd 5.04 years) years elapsed prior to the diagnosis of an intraspinal meningioma. All apart from one of the patients had oestrogen receptor positive breast cancer and underwent hormonal therapy and adjunct radiotherapy following resection of their breast cancer. In order to compare our data with those published in literature, we performed a systematic review of literature looking for association between breast cancer and meningioma. We did not identify any published English-language literature reporting a link between breast cancer and intraspinal meningioma. There were 18 cohort studies looking into the risk of developing breast cancer and intracranial meningioma. Of which, four explicitly compared these against background population, with three showing an increased relative risk of around 1.5 to 1.7. The prevalence of breast cancer in cohorts of intracranial meningioma patients varied between 1.63% to 8.33%, significantly lower than the reported prevalence of 16% in our data series.

Conclusions: Intraspinal meningioma is disproportionately represented in female. Patients typically presented with neurological deficit and surgery improved both neurological outcome and quality of life. We have observed a previously undemonstrated association between a preceding diagnosis of breast cancer and intraspinal meningioma. The association is potentially stronger than those suggested by published literature for breast cancer and intracranial meningioma.

Disclosures:
author 1: not indicated; author 2: none; author 3: not indicated; author 4: none; author 5: none