DISC WALL STRUCTURAL ABNORMALITIES MAY ACT AS INITIATION SITES FOR HERNIATION
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Introduction
Clinically, disc herniation results from annular failure or endplate junction failure. These cases have been reproduced in vitro, and it is known that both posture and loading rate influence the nature of herniation. However, it has not been possible to accurately assess disc structure prior to testing and the effects of components of complex loading have also not been studied in detail. Therefore, the goal of this study was to investigate the role of different loading combinations and disc structure itself in the process of disc failure.

Methods
Thirty lumbar spinal segments from mature ewes (3-5 years old) were subjected to a combination of four loading conditions (0-12° flexion, 0-9° lateral bending, 0-4° axial rotation, 0-800 N axial compression) for 1000 loading cycles at 2 Hz in a recently developed dynamic 6-DOF disc loading simulator. One group was subjected to all loading conditions and the other four groups had one condition omitted to allow identification of potential effects of the loading conditions. Macroscopic changes of the posterior part of the disc were recorded by video during testing. Prior to and after testing the discs were scanned with ultra-high field MRI (11.7 T) and µCT. They were then fixed and decalcified to enable cryosectioning, then analyzed microstructurally with light microscopy.

Results
Ten discs suffered annular failure, with four of these involving subligamentous herniation of inner disc material and the remaining protrusion of inner disc material into the outer annulus as judged by examination of the high resolution MRI images. All discs that herniated contained distinctive irregularities in the posterior mid-inner annulus that were visible in the pretest MRI images as can be seen in Figure 1. Microstructural investigation revealed that the mid-outter annular-endplate junction had failed in all herniated discs.

Discussion
These results indicate that the distinctive irregularities in the lamellar structure are responsible for annular failure and herniation under these loading conditions. They appear to act as initiation sites for herniation since inner disc material migrates through them when the disc is overloaded regardless of the posture applied. The failure of the posterior mid-outter annulus at the endplate junction is likely a consequence of the relatively rapid loading applied to the disc, in this case arising from the compromised annulus being unable to contain the pressure generated within the nucleus. This study indicates that experimental MRI imaging may be able to detect discs that are at risk of herniation, at least in the ovine samples used in the present study. It may thus be possible in the
future to develop clinical imaging techniques capable of identifying patients at risk of suffering disc herniation.

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INTRODUCTION

Metastatic spine disease is a common complication to malignancies. Several scoring systems are available to predict survival and helping the clinician to select surgical or non-surgical treatment. The aim of this study was to evaluate the precision of the scores.

METHODS

315 adult patients (213 men, 102 women, mean age 67.2 years) undergoing spinal surgery at a regional center due to metastatic spine disease 2006-2012 were included. Data was collected prospectively for the Swedish Spine Register and retrospectively from the medical records. Tomita, Modified Bauer, Tokuhashi scores and Revised Tokuhashi scores were calculated and compared with actual survival data from the Swedish Population Register. If a patient was scored in the group with the shortest expected survival but lived >6 months after surgery, we defined that scoring to underestimate survival. If a patient was scored in the group with the longest expected survival but died <3 months after surgery, we defined that scoring to overestimate survival.

RESULTS

The mean estimated survival time after surgery for all patients included was 12.4 months (CI 10.6-14.2) and median 5.9 months (CI 4.5-7.3). All four scores had significant correlation to survival (p<0.0001).

Modified Bauer score was the best of the scores to predict short survival, both regarding median and mean survival. Patients who had long expected survival according to the Revised Tokuhashi score had the longest median survival. However, the Revised Tokuhashi score had the highest proportion of underestimated survival among the scores and could be regarded as the most defensive score in this material.

CONCLUSION

Tomita, Modified Bauer, Tokuhashi and Revised Tokuhashi scores might give misleading predictions regarding patient survival. These scoring systems are valuable for communication but should be used with caution for treatment decisions. All scoring systems used clinically should undergo regular revisions to reflect oncological advancements.

DISCLOSURES

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NATURAL HISTORY OF LUMBAR DEGENERATIVE KYPHOSIS WITH CONSERVATIVE TREATMENT - DO CLINICAL SYMPTOMS AND RADIOLOGICAL PARAMETERS PROGRESS?

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Introduction:
The correlation between the clinical symptoms and the radiologic findings of general adult spinal deformity (ASD) is widely known. However, in lumbar degenerative kyphosis (LDK), which mainly occur in Asian population, dynamic sagittal imbalance occurs during ambulation so its pathogenesis and natural history is different and not widely recognized compared to other ASD resulting many controversial for treatment. To make clear the natural history of LDK, we analyzed the clinical and radiologic factors of the first visit and the final follow-up and their correlations.

Material and Methods:
From June 2006 to January 2016, 31 patients, who were diagnosed with a LDK and underwent conservative treatment, were studied. Mean age of the patients was 72.5 years old and the mean follow-up period was 58 months. In every case, clinical and radiologic evaluation was conducted on the first visit and the last follow-up. Clinical evaluations were done using the visual analogue scale (VAS) and the Oswestry disability index (ODI). Radiographic evaluation were performed including SRS-Schwab sagittal modifiers (pelvic tilt (PT); sagittal vertical axis (SVA); pelvic incidence-lumbar lordosis (PI-LL)), thoracic kyphosis (TK), thoracolumbar kyphosis (TLK), lumbar lordosis (LL), pelvic incidence (PI) and sacral slope (SS) on whole spine lateral radiograph.

Results:
Patients who were diagnosed with LDK and underwent conservative treatment showed no significant differences in the clinical outcomes between the first visit and the final follow-up. The mean VAS was 3.2 (range, 2-6) at initial visit and 3.4 (range, 2-5) at final follow-up. The mean ODI score was 31.9 (range, 18-58) at initial visit and 34.7 (range, 20-52) at final follow-up. Of the radiologic evaluation, radiological parameters except TK, PI, PT, SS significantly increased. The mean SVA, TLK, LL, and PI-LL changed from 8.5cm, 15.9°, 6.2°, and 51.1° at initial visit and to 17cm, 19.5°, -5.4°, and 67.4° at final follow-up after conservative treatment. Moreover, there were no significant correlation between the clinical symptoms and the radiologic parameters including SRS-Schwab sagittal modifiers of the first visit and the final follow-up.

Conclusion:
Conservative treatment in LDK patients, radiologic parameters have progressed but there were no correlation between radiologic parameters and clinical symptoms. Furthermore, SRS Schwab sagittal modifiers showed weak clinical relevance. Decisions for surgical treatment of LDK should not be determined only by the radiologic parameters showing the deformation degree, but by carefully determining the patients’ demand and disability level.

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IS PREOPERATIVE DURATION OF SYMPTOMS A SIGNIFICANT PREDICTOR OF FUNCTIONAL OUTCOMES IN PATIENTS UNDERGOING SURGERY FOR THE TREATMENT OF DEGENERATIVE CERVICAL MYELOPATHY?

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Introduction: Longstanding compression of the spinal cord in patients with degenerative cervical myelopathy (DCM) may result in irreversible neural tissue damage. This study aims to analyze whether a longer duration of symptoms is associated with poor surgical outcomes and to determine the optimal timing for decompressive surgery in patients with mild, moderate and severe DCM.

Methods: Three hundred and fifty patients with symptomatic DCM were prospectively enrolled in either the CSM-North America or International study at 12 sites in North America. For each patient, extensive demographic information was collected, including age, co-morbidities, and a self-reported estimate of preoperative duration of symptoms. Postoperative functional status and quality of life were evaluated at 6-months, 1- and 2-years using the modified Japanese Orthopaedic Association (mJOA). Change scores between baseline and 1-year follow-up were computed for each outcome measure. Duration of symptoms was dichotomized into a “short” and “long” group at several cut-offs. An iterative mixed model analytic approach procedure was used to evaluate differences in change scores on the mJOA between duration groups in 1-month increments. Two models were constructed: 1) an unadjusted model between duration of symptoms and surgical outcome and 2) a model adjusting for significant independent covariates identified through stepwise regression analysis. This analysis was repeated for subgroups of patients with mild (mJOA≥15), moderate (mJOA=12-14) and severe (mJOA<12) myelopathy.

Results: Our cohort consisted of 201 (57.43%) men and 149 (42.57%) women, with a mean age of 57.49±11.77 years (range: 29-87 years). The mean duration of symptoms was 25.71±36.68 months (range: 1-240 months). In unadjusted analysis, patients with a duration of symptoms shorter than 4 months had significantly better functional outcomes based on the mJOA (p=0.04) than patients with a longer duration of symptoms (>4 months). On average, patients with a shorter duration of symptom improved by 3.76 on the mJOA, whereas those with a duration 4 months or longer only exhibited a 2.87 mean gain (p=0.0276). Twenty-nine months was identified as the next important cut-off beyond which patients had a significantly worse outcome on the mJOA. When stratifying by myelopathy severity, we were unable to identify an appropriate cut-off for patients with mild myelopathy. In patients with moderate disease, however, each 1-month delay in surgery had a significant impact on clinical outcomes.

Conclusions: Patients who are operated on within 4 months of symptom presentation have better mJOA outcomes than those treated after this 4-month cut-off. This is especially true in patients with moderate disease. It is recommended that patients with DCM are diagnosed in a timely fashion and referred early for surgical consultation.

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NO LONG TIME BENEFIT FROM FUSION IN DECOMPRESSIVE SURGERY FOR LUMBAR SPINAL STENOSIS.
5 YEAR-RESULTS FROM THE SWEDISH SPINAL STENOSIS STUDY, A MULTICENTER RCT OF 233 PATIENTS
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Introduction
The role of fusion in surgery for lumbar spinal stenosis (LSS) is a controversy in spine surgery. The aim of this study was to examine if additional fusion improves the outcome after decompression for LSS with or without preoperative degenerative spondylolisthesis (DS). The results after 2 years from this study showed no benefit from fusion.

Methods
From 2006 to 2012, 233 patients aged 50-80 years with spinal stenosis on 1 or 2 adjacent lumbar levels on MRI were included and operated in the study. Randomization was made between decompression with concomitant fusion and decompression only. The material was stratified for the existence of preop DS ≥3 mm on plain X-ray. 135 (58%) of the patients had preop DS (mean 7.4 mm). Outcome measures were collected from the Swedish register for spine surgery (Swespine) with the primary outcome measure ODI. 9 patients had died during the 5 years study period. Of the eligible patients, the follow up rate after 5 years was 89%.

Results
At the 5-year follow-up, there were significant improvements in all outcome measures compared to preoperative regardless of treatment group. For all patients, regardless of DS, ODI was 26 in the decompression group and 29 in the decompression + fusion group (p=0.35), back pain (VAS) 35 vs. 38 (p=0.48), and leg pain 34 vs. 33 (p=0.88). In the group with preop DS ODI was 24 in the decompression group and 29 in the decompression + fusion group (p=0.19), back pain 33 vs. 36 (p=0.60) and leg pain 34 vs. 32 (p=0.71). No differences were found in EQ-5D regardless of the presence of DS. 58% in the decompression group and 53% in the decompression + fusion group reported better walking ability compared to preoperatively, OR 1.2 (95%CI 0.6-2.6). Satisfaction with surgery was reported by 63% in the decompression group and 58% after fusion, OR 1.1 (95%CI 0.7-1.8). The frequency of severe adverse events did not differ between the treatment groups. The proportion of patients who had subsequent lumbar surgery within 5 years was 23% in the decompression group and 25% in the decompression + fusion group regardless of the presence of DS. Reasons for a second operation was predominantly restenosis after decompression alone and spinal stenosis in the upper adjacent segment after decompression + fusion.

Conclusions
In this multicenter RCT we found no long time benefit from fusion in decompressive surgery for LSS, regardless of if DS was present preop or not. These results confirm the 2-year results published 2016. In this elderly population with one- or two-level LSS, surgery should be limited to the less invasive procedure of decompression in order to decrease the number of complications and costs for the society. Due to the progressive degenerative nature of LSS, as many as up to 25% of operated patients had repeated lumbar surgery within five years. This predominantly due to
either restenosis in a decompressed segment or development of stenosis in a new lumbar segment.

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