Conservative treatment for common spinal diseases
View from a high-income country

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The Big 5 African Game
The Big 5 of Spinal Disorders
Diagnoses and Treatments for Common Musculoskeletal Conditions
Figure 3. Computed tomography discogram of the L4–L5 disc, demonstrating a grade 4 anular tear on the right side.
Facet joints are implicated as a major source of neck and low-back pain. Both cervical and lumbar facet syndromes have been described in the medical literature. Biomechanical studies have shown that lumbar and cervical facet-joint capsules can undergo high strains during spine-loading. Neuroanatomic studies have demonstrated free and encapsulated nerve endings in facet joints as well as nerves containing substance P and calcitonin gene-related peptide. Neurophysiologic studies have shown that facet-joint capsules contain low-threshold mechanoreceptors, mechanically sensitive nociceptors, and silent nociceptors. Inflammation leads to decreased thresholds of nerve endings in facet capsules as well as elevated baseline discharge rates. Recent biomechanical studies suggest that rear-end motor-vehicle impacts give rise to excessive deformation of the capsules of lower cervical facet joints. Still unresolved is whether this stretch is sufficient to activate nociceptors in the joint capsule.

To answer this question, recent studies indicate that low stretch levels activate proprioceptors in the facet-joint capsule. Excessive capsule stretch activates nociceptors, leads to prolonged neural afterdischarges, and can cause damage to the capsule and to axons in the capsule. In instances in which a whiplash event is severe enough to injure the joint capsule, facet capsule overstretch is a possible cause of persistent neck pain.
MAGNETIC RESONANCE IMAGING OF THE LUMBAR SPINE IN PEOPLE WITHOUT BACK PAIN

Maureen C. Jensen, M.D., Michael N. Brant-Zawadzki, M.D., Nancy Obuchowski, Ph.D., Michael T. Modic, M.D., Dennis Malkasian, M.D., Ph.D., and Jeffrey S. Ross, M.D.
Table 3. Number of Subjects with Protrusions, According to the Age of the Subject and the Location of the Protrusion.*

<table>
<thead>
<tr>
<th>AGE (YR)</th>
<th>LOCATION OF PROTRUSION</th>
<th>PROTRUSION AT LEAST AT ONE LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L1–2</td>
<td>L2–3</td>
</tr>
<tr>
<td>20–29 (n = 20)</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>30–39 (n = 28)</td>
<td>1/1</td>
<td>1/1</td>
</tr>
<tr>
<td>40–49 (n = 23)</td>
<td>0/1</td>
<td>0/0</td>
</tr>
<tr>
<td>50–59 (n = 17)</td>
<td>0/0</td>
<td>1/1</td>
</tr>
<tr>
<td>≥60 (n = 10)</td>
<td>0/0</td>
<td>2/1</td>
</tr>
<tr>
<td>Total (n = 98)</td>
<td>1/2</td>
<td>4/3</td>
</tr>
</tbody>
</table>

*For each pair of data, the first number refers to the first evaluator’s result, and the second number to the second evaluator’s result.
Conclusions. On MRI examination of the lumbar spine, many people without back pain have disk bulges or protrusions but not extrusions. Given the high prevalence of these findings and of back pain, the discovery by MRI of bulges or protrusions in people with low back pain may frequently be coincidental. (N Engl J Med 1994;331:69-73.)
Patient Encounter

• History
• Physical Examination
• Diagnostic Imaging
• Differential Diagnosis
• Outcome Assessments
• Clinical Decision Making
Referred vs. Radicular Symptoms
Centralization vs. Peripherization
Etiology of Disc Degeneration

“Lumbar intervertebral discs are particularly vulnerable to fatigue failure because they are the largest avascular structures in the body.”
The mechanical behavior of individual disc tissue is dependent not only on their location, but also on the loading and loading history of the disc.

DISC FUNCTION DEPENDENT UPON LOAD

• Discal hydration varied with load

• Hydration decreased as load increased

Figure 1. The three models (A, B, and C) that were simulated in the finite element analysis.
• Under load, water and metabolic waste products are pressed out whereas the IVD absorbs water & metabolic substrates when the load is reduced.

• “This pumping mechanism maintains the nutrition and biomechanical function of the intervertebral disc.”

• Under asymmetrical loading, such as a maintained lateral flexion or flexion angle of adjacent vertebrae, the disc no longer transmits loads uniformly and stress concentrations develop in the outer anulus and ground substance.
Dysfunction of C5-C6
Such changes, and spinal joint soft tissue fibrosis, alters the normal instantaneous axis of rotation of these joints.
Abnormal instantaneous axes of rotation (IARs) have been shown to correlate with spinal pain.
The use of disharmonic motion curves in problems of the cervical spine

Fig. 2. a Flexion extension curves of asymptomatic volunteers. b Flexion extension curves of patients. Note the presence of various types of alteration – (1) plateau-like shape, (2) exponential shape
Normal

Dysfunctional
Do Fire Trucks Cause Fires?
Systematic Literature Review of Imaging Features of Spinal Degeneration in Asymptomatic Populations


Age-specific prevalence estimates of degenerative spine imaging findings in asymptomatic patients

<table>
<thead>
<tr>
<th>Imaging Finding</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disk degeneration</td>
<td>37%</td>
<td>52%</td>
<td>68%</td>
<td>80%</td>
<td>88%</td>
<td>93%</td>
<td>96%</td>
</tr>
<tr>
<td>Disk signal loss</td>
<td>17%</td>
<td>33%</td>
<td>54%</td>
<td>73%</td>
<td>86%</td>
<td>94%</td>
<td>97%</td>
</tr>
<tr>
<td>Disk height loss</td>
<td>24%</td>
<td>34%</td>
<td>45%</td>
<td>56%</td>
<td>67%</td>
<td>76%</td>
<td>84%</td>
</tr>
<tr>
<td>Disk bulge</td>
<td>30%</td>
<td>40%</td>
<td>50%</td>
<td>60%</td>
<td>69%</td>
<td>77%</td>
<td>84%</td>
</tr>
<tr>
<td>Disk protrusion</td>
<td>29%</td>
<td>31%</td>
<td>33%</td>
<td>36%</td>
<td>38%</td>
<td>40%</td>
<td>43%</td>
</tr>
<tr>
<td>Annular fissure</td>
<td>19%</td>
<td>20%</td>
<td>22%</td>
<td>23%</td>
<td>25%</td>
<td>27%</td>
<td>29%</td>
</tr>
<tr>
<td>Facet degeneration</td>
<td>4%</td>
<td>9%</td>
<td>18%</td>
<td>32%</td>
<td>50%</td>
<td>69%</td>
<td>83%</td>
</tr>
<tr>
<td>Spondylolisthesis</td>
<td>3%</td>
<td>5%</td>
<td>8%</td>
<td>14%</td>
<td>23%</td>
<td>35%</td>
<td>50%</td>
</tr>
</tbody>
</table>
The associations between magnetic resonance imaging findings and low back pain: A 10-year longitudinal analysis

Juichi Tonosu¹, Hiroyuki Oka²+, Akira Higashikawa¹, Hiroshi Okazaki¹, Sakae Tanaka³, Ko Matsudaira²

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Conclusions

Follow-up MRI findings consistent with Pfirrmann grading ≥4, disc bulging, HIZ, spondylolisthesis, and any type of Modic changes were not associated with LBP history during the 10 years between the baseline and follow-up study. The progresses of these findings were also not associated with the LBP history. In addition, baseline MRI findings were not associated with LBP history during the 10 years; therefore, our data suggest that baseline MRI findings cannot predict future LBP.
MRI Findings of Disc Degeneration are More Prevalent in Adults with Low Back Pain than in Asymptomatic Controls: A Systematic Review and Meta-Analysis

We performed a meta-analysis of studies reporting the presence of degenerative lumbar spine MRI imaging findings in asymptomatic and symptomatic adults 60 years of age or younger. Symptomatic individuals involved in trauma, pain with or without radiating symptoms. Two reviewers assessed each article for the following outcome: disk bulge, disk degeneration, disk herniation, disk protrusion, annular fissure, vertebral changes, and hernia. The main analysis was performed by using a random-effects model.

Findings: An initial search identified 368 unique studies. Fourteen (0.5%) met the inclusion criteria: 389 individuals (152) symptomatic, 236 asymptomatic. Imaging findings with a higher prevalence in symptomatic individuals were noted: 60 years of age or younger included disk bulge (OR: 1.54; 95% CI: 1.26-1.88; p < 0.001), disk herniation (OR: 3.24; 95% CI: 1.50-6.90; p = 0.002), disk protrusion (OR: 2.43; 95% CI: 1.52-3.85; p < 0.001), and disk degeneration (OR: 1.24; 95% CI: 1.00-1.53; p = 0.05). Imaging findings not associated with the back pain included width change (OR: 0.67; 95% CI: 0.45-0.98; p = 0.03), bone remodeling (OR: 1.03; 95% CI: 0.75-1.43; p = 0.80), and annular fissure (OR: 0.87; 95% CI: 0.47-1.64; p = 0.69).

Conclusions: This analysis demonstrates that MRI imaging evidence of disk bulge, degeneration, herniation, protrusion, vertebral changes, and annular fissure are more prevalent in adults 60 years of age or younger with back pain compared with asymptomatic individuals.

<table>
<thead>
<tr>
<th>Age strata (years)</th>
<th>Entire spine</th>
<th>Cervical</th>
<th>Thoracic</th>
<th>Lumbar</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men  Women</td>
<td>Men  Women</td>
<td>Men  Women</td>
<td>Men  Women</td>
</tr>
<tr>
<td>&lt;50</td>
<td>71.0 77.0</td>
<td>26.3 27.9</td>
<td>15.7 11.4</td>
<td>55.2 71.2</td>
</tr>
<tr>
<td>50–59</td>
<td>91.5 93.1</td>
<td>47.4 49.1</td>
<td>49.1 35.3</td>
<td>86.4 91.3</td>
</tr>
<tr>
<td>60–69</td>
<td>98.4 95.5</td>
<td>66.1 54.4</td>
<td>61.5 63.2</td>
<td>96.9 94.3</td>
</tr>
<tr>
<td>70–79</td>
<td>95.8 99.4</td>
<td>80.9 72.0</td>
<td>73.0 79.6</td>
<td>96.6 96.5</td>
</tr>
<tr>
<td>≥80</td>
<td>93.2 97.4</td>
<td>86.3 85.5</td>
<td>79.4 88.9</td>
<td>82.1 84.5</td>
</tr>
</tbody>
</table>

Values are percentage.
Aging of the Cervical Spine in Healthy Volunteers

A 10-Year Longitudinal Magnetic Resonance Imaging Study

Eijiro Okada, MD,* Morio Matsumoto, MD,† Daisuke Ichihara, MD,* Kazuhiro Chiba, MD,* Yoshiaki Toyama, MD,* Hirokazu Fujiiwa, MD,† Suketaka Momoshima, MD,† Yuji Nishiwaki, MD,§ Takeshi Hashimoto, MD,¶ Jun Ogawa, MD,ǁ Masahiko Watanabe, MD,** and Takeshi Takahata, MD††

- Progression of degeneration of cervical spine on MRI was frequently observed during 10-year period with development of symptoms in 34% of subjects.
- No factor related to progression of degeneration of cervical spine was identified except for age.
- Patients who developed clinical symptoms during 10 years, including neck pain, stiff shoulder, and numbness in the upper extremities, demonstrated significantly more frequent progression of disc degeneration on MRI than those without the clinical symptoms.
Previously, heavy physical loading—often associated with occupation—was the main suspected risk factor for disc degeneration, commonly viewed as a wear-and-tear phenomenon exacerbated by the precarious nutritional status of the disc.

However, results of studies on twins suggest that physical loading specific to occupation and sport plays a relatively minor role in disc degeneration.

Recent research indicates that heredity has a dominant role in disc degeneration, which would explain the variance of up to 74% seen in adult populations.

Since 1998, genetic influences have been confirmed by the identification of several gene forms associated with disc degeneration.

This research is paving the way for a better understanding of the biologic mechanisms through which disc degeneration occurs, including specific interactions between genes and environment.
DECISIONS

Snap a picture or warn your child of impending danger? Hard Choice.
Move from Pathology focus to ...
Biopsychosocial model of pain

- **Biological:** nociception, tissue damage and illness
- **Social:** cultural influences, social support, socio-economic status
- **Psychological:** pain beliefs, emotional response, memories
For chronic low back pain, effective therapies versus placebo, sham, no treatment, usual care, or wait list are:

- NSAIDs, opioids, tramadol, duloxetine, multidisciplinary rehabilitation, acupuncture, and exercise (SOE: moderate) and benzodiazepines, psychological therapies, massage, yoga, tai chi, and low-level laser therapy (SOE: low);
- Spinal manipulation was as effective as other active interventions (SOE: moderate).

Evidence on effects of pharmacological therapies for radiculopathy was extremely limited (Table E). There were no differences in pain or function between systemic corticosteroids versus placebo, and evidence was insufficient to determine effects of gabapentin or pregabalin.

Pharmacological therapies were associated with an increased risk of adverse events versus placebo. However, serious harms were rare in clinical trials, with no clear increase in risk based on clinical trials. In particular, trials of opioids were not designed to assess for serious harms, such as overdose, abuse, and addiction. Such harms have been reported in observational studies of opioids for chronic pain, although such studies did not meet inclusion criteria because they were not restricted to patients with low back pain.26
Recommendation 7: For patients who do not improve with self-care options, clinicians should consider the addition of nonpharmacologic therapy with proven benefits—for acute low back pain, spinal manipulation; for chronic or subacute low back pain, intensive interdisciplinary rehabilitation, exercise therapy, acupuncture, massage therapy, spinal manipulation, yoga, cognitive-behavioral therapy, or progressive relaxation (weak recommendation, moderate-quality evidence).
SYSTEMATIC REVIEW

Clinical practice guidelines for the noninvasive management of low back pain: A systematic review by the Ontario Protocol for Traffic Injury Management (OPTIMA) Collaboration

J.J. Wong¹,², P. Côté³,⁴, D.A. Sutton¹,², K. Randhawa¹,²,⁵, H. Yu¹,²,⁵, S. Varatharajan¹,²,⁵, R. Goldgrub⁶, M. Nordin⁷, D.P. Gross⁸,⁹, H.M. Shearer¹,², L.J. Carroll¹⁰, P.J. Stern¹¹, A. Ameis¹², D. Southerst¹,¹³, S. Mior²,⁴, M. Stupar¹, T. Varatharajan¹,¹⁴, A. Taylor-Vaisey¹
According to high-quality guidelines:

- Patients with acute LBP should be encouraged to return to activity and may benefit from paracetamol, nonsteroidal anti-inflammatory drugs (NSAIDs), or spinal manipulation;
- the management of chronic LBP may include exercise, paracetamol or NSAIDs, manual therapy, acupuncture, and multimodal rehabilitation (combined physical and psychological treatment); and
- patients with lumbar disc herniation with radiculopathy may benefit from spinal manipulation.

Authors

Pierre Côté, Jessica J. Wong, Deborah Sutton, Heather M. Shearer, Silvano Mior, Kristi Randhawa, Arthur Ameis, Linda J. Carroll, Margareta Nordin, Hainan Yu, Gail M. Lindsay, Danielle Southerst, Sharanya Varatharajan, Craig Jacobs, Maja Stupar
Recommendation 4

• For NAD grades I–II ≤3 months duration, clinicians may consider structured patient education in combination with: range of motion exercise, multimodal care (range of motion exercise with manipulation or mobilization) ...

Recommendation 5

• For NAD grades I–II >3 months duration, clinicians may consider structured patient education in combination with: range of motion and strengthening exercises, qigong, yoga, multimodal care (exercise with manipulation or mobilization) ...
“Medical care for low back pain in the United States is specialist-oriented, of high technology, and of high cost, but 40% of American patients seek chiropractic care for low back pain instead.”
The Global Spine Care Initiative: applying evidence-based guidelines on the non-invasive management of back and neck pain to low- and middle-income communities

Roger Chou1,2, Pierre Côté3,4, Kristi Randhawa3,4, Paola Torres5, Hainan Yu3,4, Margareta Nordin6,7, Eric L. Hurwitz8, Scott Haldeman9,10,11, Christine Cedraschi12,13

Conclusion  Guidelines developed for high-income settings were adapted to inform a care pathway and model of care for medically underserved areas and low- and middle-income countries by considering factors such as costs and feasibility, in addition to benefits, harms, and the quality of underlying evidence. The selection of recommended conservative treatments must be finalized through discussion with the involved community and based on a biopsychosocial approach. Decision determinants for selecting recommended treatments include costs, availability of interventions, and cultural and patient preferences.
Thank You