Imaging Degenerative Lumbar Spinal Stenosis

The Impact of Axially Loaded MR and CT/Myelo Examinations
Degenerative Changes are the most common (10/1) reasons for Spinal Stenosis.
Several elements *in and adjacent to* vertebrae and disc *contribute to* Spinal canal changes - Variation according to position
The Space in the Spinal Canal

INCREASES in Flexion

DECREASES in Extension Axial Loading
LUMBAR SPINAL STENOSIS

gives
PAIN and NEUROLOGICAL SYMPTOMS
when
WALKING and STANDING
Typical symptoms

- neurogenic claudication and/or
- sciatica
- numbness
- paresthesia
- motor impairment
SYMPTOM RELIEF
at
FLEXION - Squatting
SUPINE   Slight HiP Flexion
Diagnosis of spinal stenosis is based on Clinical Symptoms and Objective Signs.
AN OPTIMAL SURGICAL RESULT

demands

Objectively

Specified Diagnosis
MYELOGRAPHY is performed

- SUPINE - traditionally

From the 1970’s also in:

- EXTENSION and
- STANDING
  just to
  PROVOKE CANAL NARROWING
CT and MRI routinely performed in supine Psoas Relaxed Position = Spinal canal encroachment undetected ???
A Myelo CT study of the lumbar spine in FLEXION and EXTENSION showed

nerve root compression in the lateral recess and

reduction of the dural cross sectional area in lumbar extension

Penning L, Wilmink JT:

“Posture-dependent bilateral compression of L4 and L5 nerve roots in facet hypertrophy: a dynamic CT-myelographic study.”

Spine 1987;12:488-500
DynaWell® L-Spine device

A superior way to enhance CT and MR imaging of the lumbar spine
Axially loaded CT and MRI in patients with SCIATICA and/or NEUROGENIC CLAUDICATION

A decrease in DCSA was found in axial loaded vs. nonloaded in:

<table>
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<tr>
<th>CT MYELO</th>
<th>MRI</th>
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<td>80% of patients</td>
<td>76% of patients</td>
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“Dynamic effects on the lumbar spine canal. Axially loaded...”
Willén et al. Spine 1997; 22 (24): 2968-2976
Example:

Patient with **Neurogenic Claudication**

No load  |  Axial load

L5 –S1

Decrease in DCSA at axial load with DynaWell® L-Spine
Male 76 years

Operated 3 years before; 2 years severe sciatica, impaired walking and standing capacity with motor and sensory disturbances

Example:
Increasing size of synovial cyst at axial load

L3-L4
Synovial cyst dx

No load
Axial load with DynaWell® L-Spine
Additional information from axial load

was found in:

72 % of patients with neurogenic Claudication
50 % of patient with sciatica
0 % of patients with low Back Pain

- out of 172 patients

Willén J, Danielson B.
"The diagnostic effect from axial loading of...”
Spine 2001; 26: 2607-2614
Axial loading during Lumbar Spine MR imaging accentuates spinal stenosis

Does this influence the treatment decision?
Results: YES!

In a group of 20 patients, the treatment decision changed from conservative to operative:

- in 5 patients (25%) by 3 surgeons
- + in another 5 patients by at least 1 surgeon

Total: $10 / 20$ patients = 50%

Conclusion:

“the additional information gained from this technique can influence experienced neurosurgeons in their treatment decisions…”

Hiwatashi A, Danielson B, Moritani T, et al.

“Axial loading during MR imaging can influence treatment decision for symptomatic spinal stenosis.”

22 patients with \textbf{Occult} Symptomatic Lumbar Stenosis were verified at the axial loaded examination and were followed up 1 - 5 years after surgery.
Follow up (1 - 5 years postop.)

after Decompr = 16 patients
Decompr and Fusion = 6 patients

- No or slight persistent leg pain 17/22
- Walking tolerance > 1000m 14/22
- Standing tolerance > 60 min 17/22
- VAS – leg < 30/100mm 17/22
- Patient satisfaction 20/22
- At work 11/15
- Age pension 7/7
Axial loaded MR and CT preoperatively

- Good/ excellent postoperative outcome

in

80% of patients
Example

Female 55 years

2 years neurogenic claudication with sciatica

Decompression

Postop **painfree**
full time work

L4-L5

Preop

Axial load

Postop

No load
Does the DynaWell® L-Spine accurately reflect the standing position?

“The spinal compression with specially designed harness has the same effect as the physiologic loading of the spine in the kneeling upright position.”

Lee SU, Hargens AR, Fredericson M, Lang PK.
“Lumbar spine disc heights and curvature: upright posture vs. supine compression harness.”

“The axial force of 50% body weight in supine posture simulates the upright lumbar spine morphologically.”

Kimura S, Steinbach GC, Watenpaugh DE, Hargens AR.
“Lumbar spine disc height and curvature responses to an axial load generated by a compression device compatible with magnetic resonance imaging.”
Spine. 2001 Dec 1;26(23):2596-600.
AXIALLY LOADED MRI and CT should be performed on patients with:

- neurogenic claudication
- sciatica
- longstanding, unexplained LBP
The benefits of **DynaWell® L-Spine**

- Possibility to examine patients *in the position where they have their symptoms*

- The *diagnosis is made in the most exact way* available, using a standard MRI scanner

- A *firm basis for the treatment decision* is offered to the surgeon giving prerequisite for a superb patient outcome

- Patients should be referred for MRI or CT with axial load !!!!