Overview

- Lumbar Anatomy
- Definition of Lumbar Stenosis/Spondylolisthesis
- Pathophysiology
- History & Physical
- Imaging Studies
- Treatment

Lumbar Anatomy

- Five lumbar vertebrae
- Lamina: provide dorsal protection of dural sac and attachment of spinous process/muscles/ligaments
- Spinal cord ends at L1-L2
Lumbar Anatomy

- Facet Joints: primarily oriented in the sagittal plane (L5-S1 coronal)
- Disc: nucleus pulposus and surrounding annulus fibrosis

L5-S1: coronal orientation

Pars Interarticularis
Lumbar Stenosis

- Reduction in the diameter of the spinal canal, lateral recess or the neural foramina (Verbiest, 1954)
- Congenital: developmental, no evidence of degenerative changes (thickened lamina, short pedicles)
- Acquired: reduction in the spaces for the neural elements due to degenerative changes in the spine, disc/facet joints

Lumbar Spondylolisthesis

- Caused by degeneration of the disc and facet joints leading to a translation of one vertebral body onto the subjacent vertebral body
- Isthmic: genetic component; 5-6% incidence 2:1 male to female; pars defect at L5-S1 most common; 20% of adults with IS have 9-30% slip progression

Lumbar Anatomy: Normal

- Transverse interpedicular diameter: 20-30 mm
- Superior facet height: 5-8 mm
- Midline diameter(AP): 15-25 mm
Anatomy: Lumbar stenosis

- Acquired disc degeneration, ligamentous hypertrophy, articular spondylosis (collapse of the facet joint)
- AP diameter of the central canal <12 mm (normal 15-25 mm)
- AP diameter of the lateral recesses and neural foramina < 4 mm (normal 5-8 mm): usually due to superior facet hypertrophy

Central Stenosis and Lateral Recess Stenosis

Pathophysiology: Theories

- Symptoms caused by ischemia or direct irritation of the nerve roots due to compression
- Venous pooling in the cauda equina between two levels of low pressure stenosis
- Failure of arterial dilatation of the congested roots in response to exercise
**History**

- Age > 50
- Pain, paresthesias, weakness or heaviness in the buttocks and legs as a result of prolonged standing or walking
- Postural dependence: leaning forward relieves the symptoms, extending aggravates them: neurogenic claudication
- Radicular symptoms (lateral recess stenosis); dermatomal symptoms

**Physical Exam**

- Often normal
- Reduced spinal mobility especially on extension: positive lumbar extension
- “Simian stance”: hips and knees flexed, trunk forward
- Neurologic deficits related to neural compression, dermatomal related findings

**Differential Diagnosis**

- Vascular claudication (pulses)
- Peripheral neuropathy (history diabetes, stocking/glove distribution)
- Hip disorders/trochanteric bursitis (examination of the hips and surrounding soft tissues)
Natural History

- After non-surgical management, 70% of patients stable at 4 years, 15% worse, 15% better
- One level progressed less than >2 level stenosis; and the outcomes were better (SPORT study)

Normal Lumbar MRI

Lumbar Stenosis MRI
Lateral Recess Stenosis

Lumbar Synovial Cyst

Notice high signal in facets; this can be a risk factor for instability

Normal Facet

Degenerative facet
CT Myelogram: LS

Degenerative, iatrogenic (previous surgery), traumatic, congenital (spodyloysis, pars interticularis defect)
Degenerative Spondylolisthesis

- Collapse of the disc space
- Facet arthritic changes

MRI: Spondylolisthesis

Non-Surgical Management

- Anti-inflammatory medications
- Physical therapy, core strengthening
- Lumbar bracing (controversial)
- Epidural/facet injections
- Behavioral/job modifications
- Quit smoking
Surgical Management

- Lateral recess stenosis with radicular components in a dermatomal pattern
  - Microhemilaminotomy, medial facetectomy, foraminotomy

- Lumbar central stenosis: signs/symptoms of neurogenic claudication:
  - Central decompressive laminectomy
  - Bilateral microhemilaminotomies
  - X-stop procedure

Central decompressive laminectomy

- Removal of spinous process, lamina, ligamentum flavum
Bilateral hemilaminotomies

- In order to preserve stability maintain 50% of facet joint on either side

X-stop

- Inserted between spinous process to simulate flexion
- 50% efficacy
- Controversial usage
- Spinous process fragile in older patients
### Io-Flex: Foraminal Stenosis

- Decompressive laminectomy, combined with a fusion procedure
- Pedicle screws
- Facet dowels/screws
- Posterolateral fusion: autologous bone, bone matrix and bone morphogenic protein/BMA
  - BMP-1: Medtronic Infuse, FDA approved anterior approach only
  - BMP-7: Stryker OP-1, FDA human exemption for revision posterolateral fusion

### Degenerative Spondylolisthesis

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### Pedicle Screws
Facet Dowels/Screws
- Option in older osteoporotic patients

Minimally Invasive Procedures
- Can perform unilateral decompression across the midline, interbody fusion, and pedicle screws

Benefits
Evidence Based Medicine

- Patients who underwent surgery for lumbar stenosis and degenerative spondylolisthesis showed significantly more improvement in all primary outcomes than did patients who were treated non-surgically

Questions?

- Thank you