Spondylolysis, Spondylolisthesis

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**SPONDYLOLYSIS**

**Spondylolysis** ("vertebral loosening") - bony defect in pars interarticularis (segment between superior and inferior articular processes, near junction of pedicle with lamina).
- usually bilateral.
- most frequently in L5 (occasionally, L4); rarely in cervical spine (C3), usually in association with spina bifida occulta at same level.
- relatively common (PREVALENCE ≈ 7%); frequent in young patients! (30% of chronic back pain in adolescents)
- vertebral body, pedicles, and superior articular facets may slip anteriorly and leave posterior elements behind - spondylolytic (s. isthmic) spondylolisthesis.

Lumbosacral junction:
A. Anterior translation of L5 on S1 (spondylolisthesis).
B. Defect in pars interarticularis (spondylolysis).

**ETIOLOGY**

1. repeated minor injuries (fatigue fracture) – esp. in sports which require spine hyperextension (such as gymnastics!).
2. single injury
3. congenitally failed fusion of posterior arch ossification centers (rare)
   - often associated with other defects: absent pedicles, absent superior articular facet, hypoplastic laminae with spinous process deviation, hypertrophy of contralateral pedicle.

**CLINICAL FEATURES**

- back pain not associated with neurological symptoms* (unless severe subluxation is present).
  - according to other sources, > 50% of patients develop radiculopathy

"Stork test" – ask adolescent to stand on one leg and hyperextend back; reproduction of pain is suggestive of spondylolysis.

**DIAGNOSIS**

1. axial CT with sagittal reformatted images – best single test!
2. standing plain X-ray (oblique perspective) – irregular lucency** traversing pars interarticularis in oblique or horizontal fashion.
   - *chronic defect often has thick, acellular borders with reactive hypertrophic bone (hypertrophic pseudarthrosis) - because of bony superimposition, AP and lateral views may not reveal defect*
   - **described as lucency across "neck of Scottie dog" (referring to appearance of posterior elements in oblique projection).

Pars defect is radiolucent "collar" on "Scottie dog" that is seen on oblique X-ray of lumbar spine.
SPONDYLOYSIS, SPONDYLOLISTHESIS

- nose — transverse process
- eye — pedicle
- neck — pars interarticularis (lamina)
- foreleg — inferior articular process
- ear — superior articular process
- tail — superior articular process of opposite side
- body — lamina and spinous process
- hindleg — inferior articular process of opposite side

Superior facet

Inferior facet

L4

L5

Collar
“Scottie dog” with pars interarticularis defect of L5 compared to intact L4 pars interarticularis:

L5 spondylolysis/spondylolisthesis:
A) gap in bony isthmus (pars interarticularis) between superior and inferior articular processes; grade 2 spondylolisthesis.
B) note hypointense borders on both sides of gap in pars interarticularis (arrows), indicating chronic spondylolysis. L5-S1 foramen is stenotic.

L5 spondylolysis:
A) normal L4-5 facet joints.
B) slice 8 mm inferior - bulky, irregular, bony mass posterolaterally (mimics degenerated facet joint)
SPONDYLOLISTHESIS

SPONDYLOLISTHESIS - displacement (slippage) of vertebra with respect to subjacent vertebra:

a) in anterior direction (anterolisthesis) - most commonly!

b) in posterior direction (retrolisthesis) - at level above lumbar anterolisthesis.

- most often L5 on S1 (occasionally L4 on L5).

MEYERDING’S classification - degree of lumbar spondylolisthesis – in lateral X-ray superior surface of sacrum is divided into four equal parts:

- spondylolisthesis can be stable (fixed) or unstable (dynamic) – only relevant for surgical indications. see p. Op220 >>

ETIOLOGY

1. Degenerative - degenerative changes of facet joints and intervertebral disc.

   - posterior elements are intact – subluxation degree is low (I or II).
   - prevalence in USA - 11.5%.
   - patients > 40 yrs.

2. Spondylolytic (s. isthmic) – spondylolisthesis (most commonly in C6) can be of high degree.

   - patients – young adults.
   - radiographic incidence in general population 3.8-8.0%.
   - spondylolisthesis occurs in 40-66% of patients with bilateral spondylolysis; spondylolisthesis is unlikely to occur in patients with unilateral spondylolysis.

3. Iatrogenic (e.g. post-laminectomy if surgeon removed too much of pars or facet*)

   *it is safe to remove up to 50% of medial facet

4. Traumatic - with fractures in structures other than pars interarticularis (e.g. posterior vertebral arch fracture, odontoid fracture); dislocation occurs gradually.

TREATMENT

Congenital, stress fractures - relative rest from hyperextension, oral pain medications, ± nonrigid brace.

- if spondylolisthesis slips to grades III and IV, pain does not respond to conservative measures, or neurological symptoms appear → fusion surgery.

Traumatic spondylolysis – brace (TLSO often does not work; need SPICA brace).

SPONDYLOLYSIS, SPONDYLOLISTHESIS
Spondylolysis, Spondylolisthesis

5. Congenital (s. dysplastic) - rare (strong hereditary component) - caused by thin, elongated pars interarticularis.
   - patients - children.

**CLINICAL FEATURES**

- May be asymptomatic.
- chronic pain & tenderness in low back, with or without positional variance.
- radiculopathy may develop (70% sciatica, 30% intermittent neurogenic claudication).
- "step" on deep palpation of posterior elements.
- in severe degrees of spondylolisthesis, trunk may be shortened and abdomen protuberant.

**DIAGNOSIS**

Standing lateral X-ray is the best test to detect spondylolisthesis! – grade often more severe than on MRI.
The best test to detect the associated stenosis – MRI (second best test – myelography, plain or CT).

- facet joint effusion > 1.5 mm on supine MRI is suggestive of degenerative lumbar spondylolisthesis.
- insufficient evidence for or against the upright seated MRI (in the diagnosis of degenerative lumbar spondylolisthesis) or axial loaded MRI (to evaluate the dural sac cross sectional area).

**TREATMENT**

**SURGERY**

Indications for therapy: debilitating pain, 3-4 degree, neurologic symptoms.

Decompression ± reduction → fusion ± PLIF

- PLIF restores disc height (improved sagittal balance, opens foramina) but prevents reduction of spondylolisthesis.

Decompression without fusion is a treatment option for lumbar stenosis associated with stable low-grade degenerative spondylolisthesis.
- concern for destabilizing effect of laminectomy; minimally invasive unilateral laminectomy for “over the top” decompression might be a less destabilizing alternative to traditional open laminectomy.


**CONSERVATIVE**

NASS Clinical Guidelines for Degenerative Lumbar Spondylolisthesis (2nd ed., 2014) Work Group Consensus Statement: medical/interventional treatment when the radicular symptoms of stenosis predominate, most logically should be similar to treatment for degenerative lumbar stenosis.

**OBESEITY**

A. Chan et al. Obese Patients Benefit, but do not Fare as Well as Nonobese Patients, Following Lumbar Spondylolisthesis Surgery: An Analysis of the Quality Outcomes Database. Obese Patients Benefit, but do not Fare as Well as Nonobese Patients, Following Lumbar Spondylolisthesis Surgery: An Analysis of the Quality Outcomes Database

- obesity (BMI > 30) was associated with inferior perioperative outcomes: higher blood loss, longer operative times, longer hospitalizations, and fewer routine discharges.
- obese patients achieve significant improvements in all PRO metrics at 12 mo.
- obesity is associated with inferior leg pain and quality of life, but similar back pain, disability, and satisfaction —12 mo postoperatively; for increasing severity of obesity—via analysis of the continuous variable BMI—outcomes are progressively worse for leg pain and EQ-5D.

**BIBLIOGRAPHY**

for ch. “Spinal Disorders” → follow this LINK >>