

# Spondylolysis, Spondylolisthesis

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## SPONDYLOLYSIS

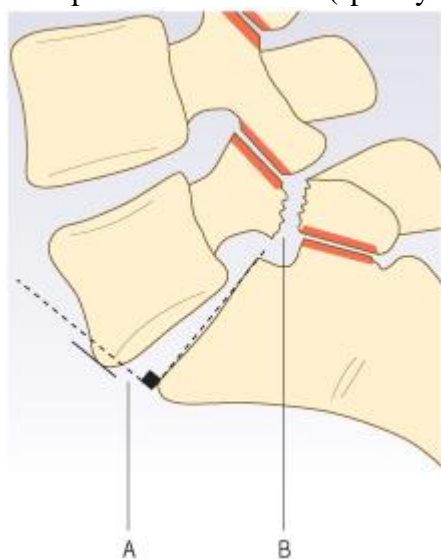
**SPONDYLOLYSIS** (“vertebral loosening”) - **bony cleft in pars interarticularis** (segment between superior and inferior articular processes, near junction of pedicle with lamina).

- usually bilateral.
- most frequently in **L5** (occasionally, L4); rarely in cervical spine (C2), usually in association with spina bifida occulta at same level.
- relatively common (PREVALENCE ≈ 7%); frequent in young patients! (50% of chronic back pain in adolescents)
- vertebral body, pedicles, and superior articular facets may slip anteriorly and leave posterior elements behind – spondylolytic **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).

“**Stork test**” – ask adolescent to stand on one leg and hyperextend back; reproduction of pain is suggestive of spondylolysis:

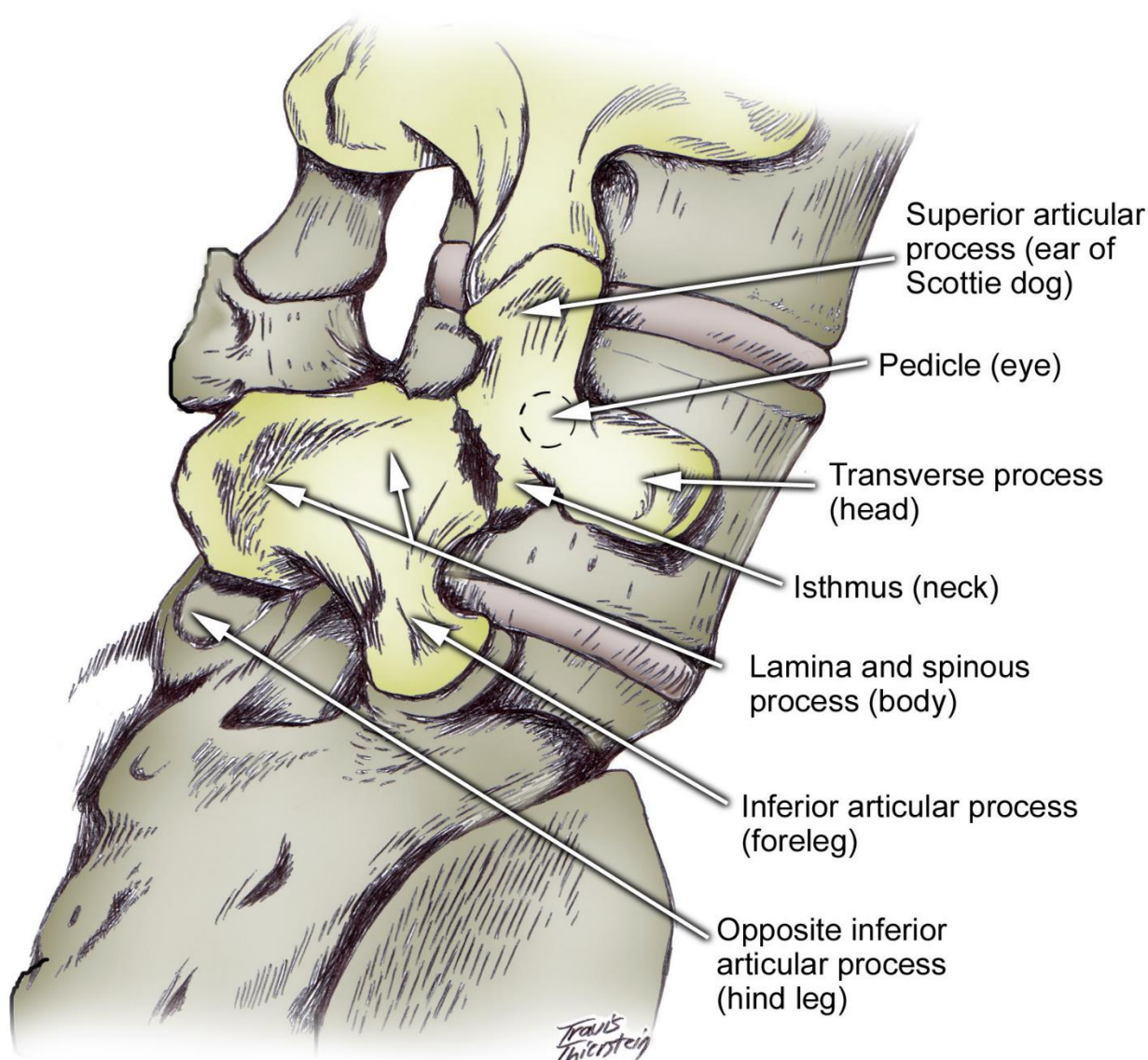
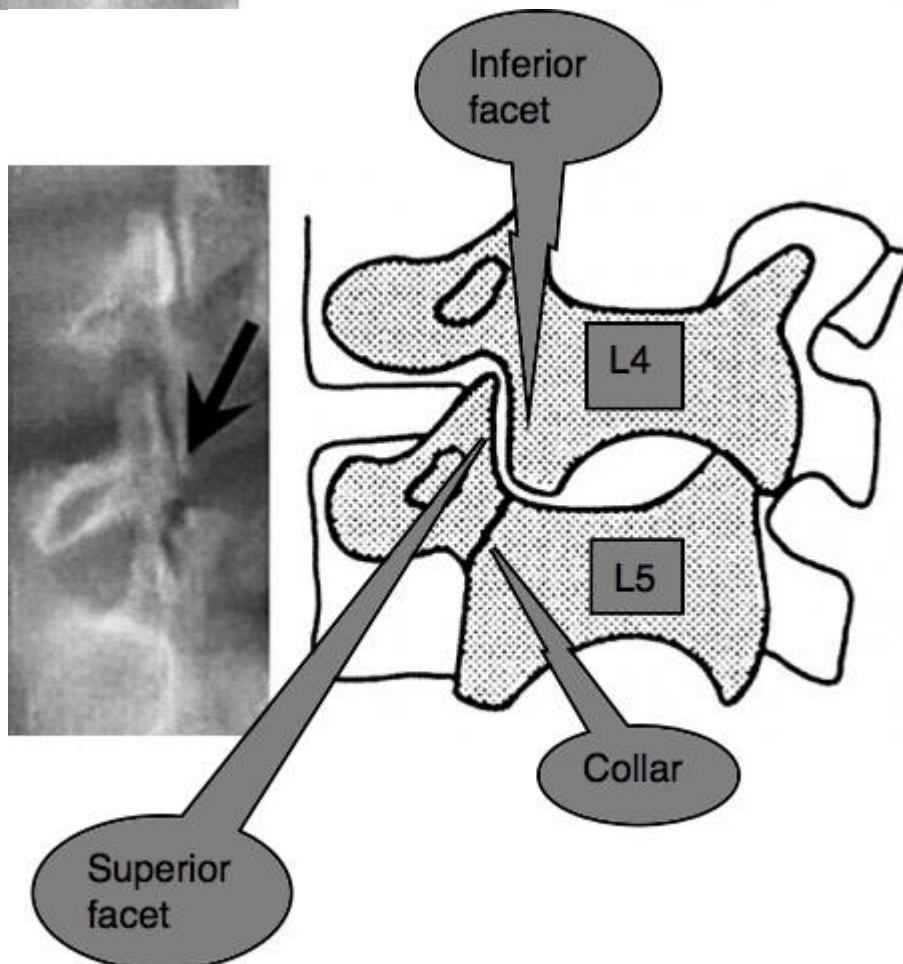
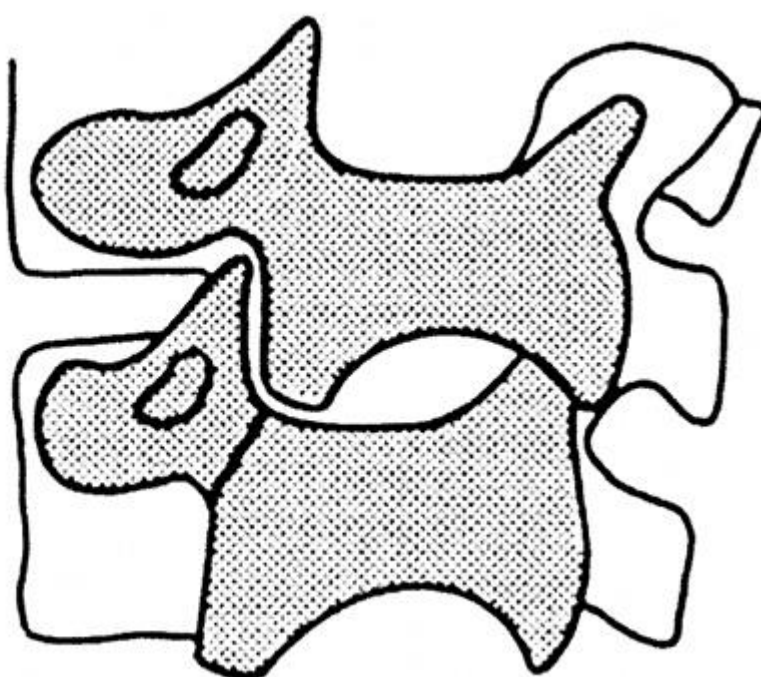
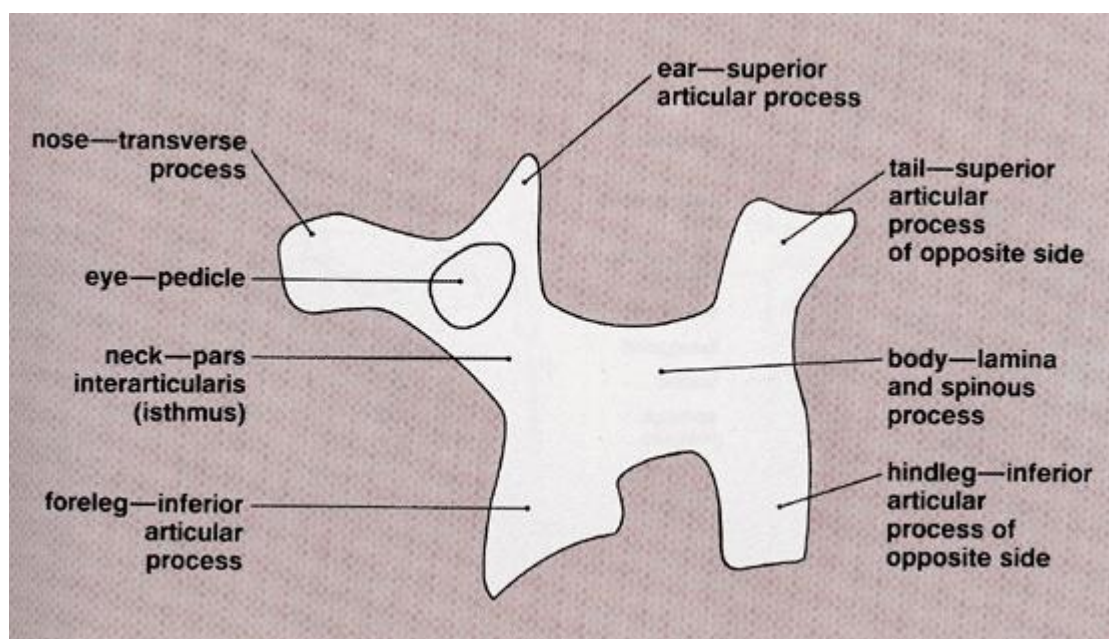


Source of picture: Edward J. Shahady “Primary Care of Musculoskeletal Problems in the Outpatient Setting” (2006); Springer; ISBN-13: 978-0387306469 >>

### DIAGNOSIS

- 1) **axial CT with sagittal reformatted images** - best single test!
- 2) **plain X-ray (oblique\* projection!)** - **irregular lucency\*\* traversing pars interarticularis** in oblique or horizontal fashion.
  - \*chronic defect often has *thick, sclerotic 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 Xray of lumbar spine:

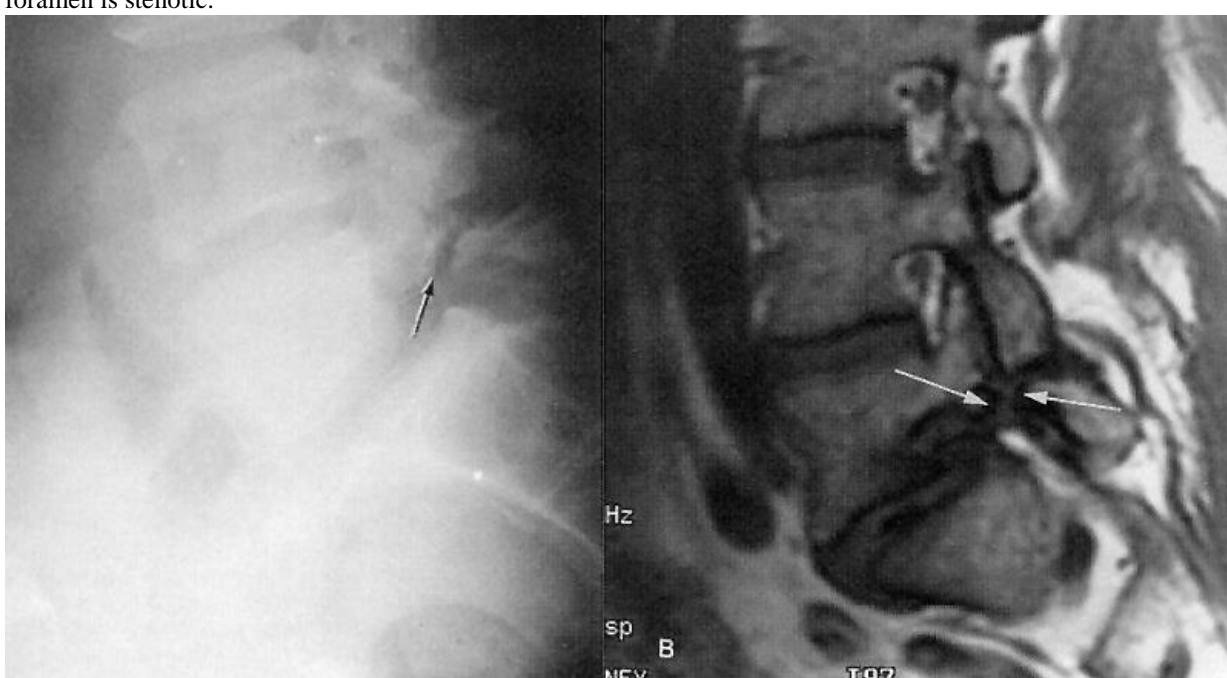


“Scottie dog” with pars interarticularis defect of L5 compared to intact L4 pars interarticularis:



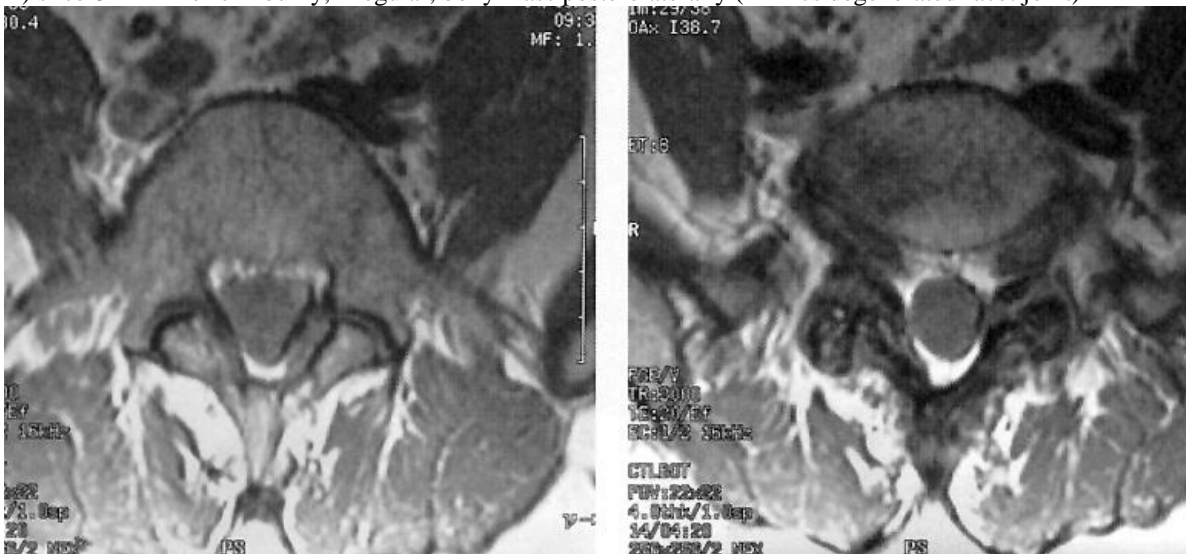
**L5 spondylolytic spondylolisthesis:**

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.

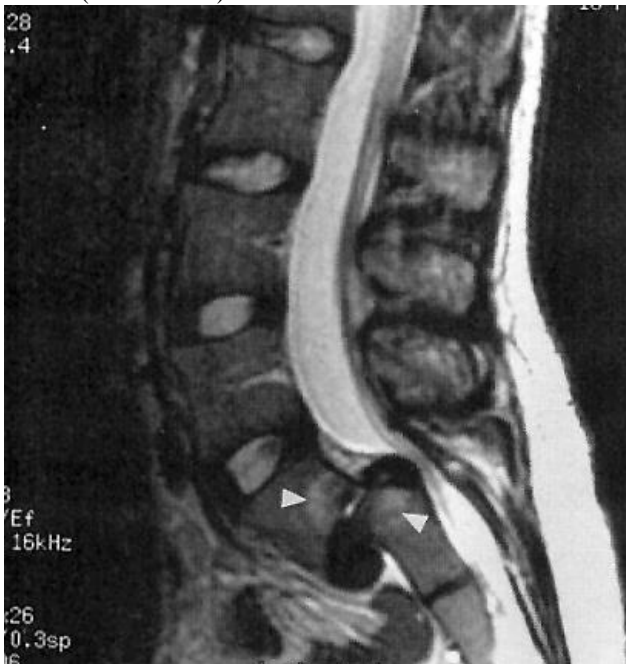


**L5 spondylolysis:**

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



**L5 spondylolytic spondylolisthesis (grade 3) and disc degeneration** in 18-year-old gymnast (T2-MRI): central canal stenosis at L5-S1 level; compare normally hydrated upper lumbar discs with involved level and with sub-end-plate marrow edema (arrowheads):



**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.

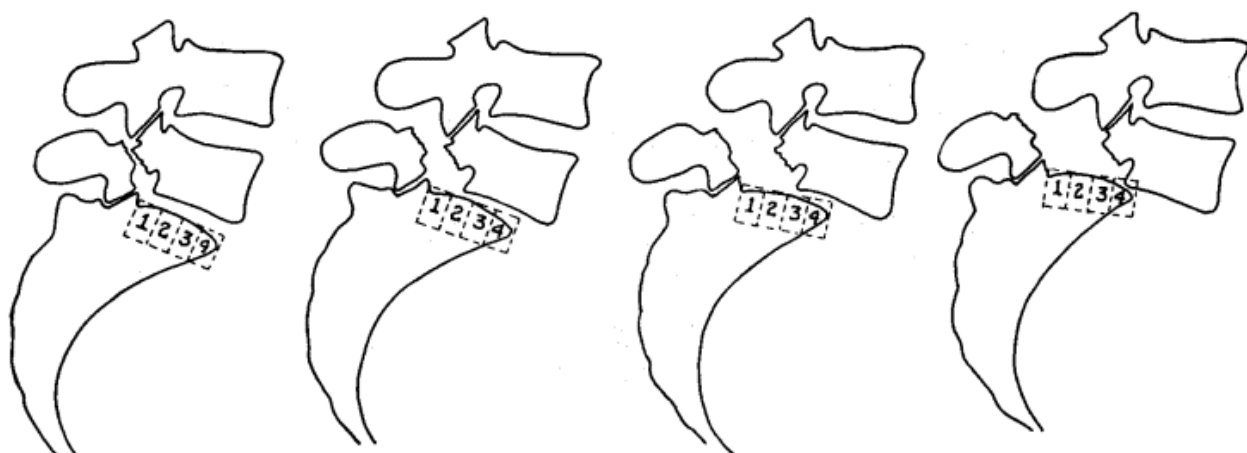
Traumatic spondylolysis – brace (TLSO often does not work; need SPICA brace)

**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:



**ETIOLOGY**

1. **Degenerative** - degenerative changes of facet joints and intervertebral disc.
  - additional cause in neck – inflammatory softening of transverse ligament of atlas (e.g. RA).
  - posterior elements are intact – subluxation degree is low (I or II).
  - women : men = 6 : 1.
  - patients > 40 yrs.
2. **Spondylolytic (s. isthmic)** – spondylolisthesis (most commonly in C6) can be of *high degree*.
  - patients – young adults.
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.
5. **Congenital (s. dysplastic)** - rare (strong hereditary component) - caused by thin, elongated pars interarticularis.
  - patients – children.

**CLINICAL FEATURES**

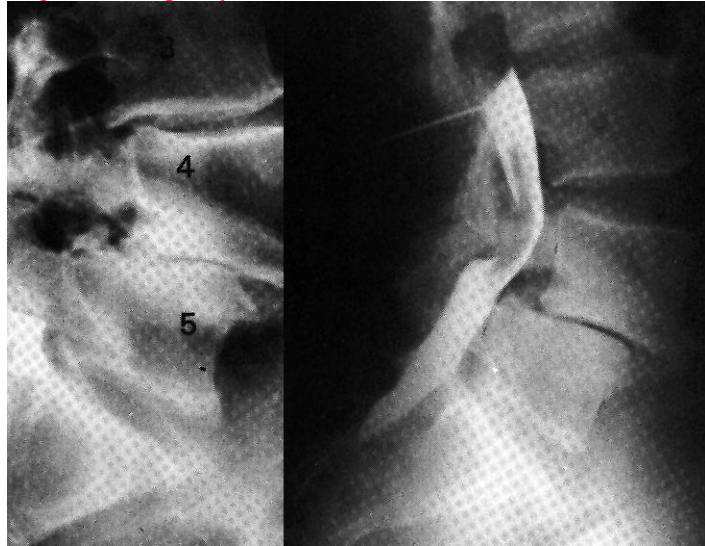
May be asymptomatic!

- **pain & tenderness** in low back.
- **"step"** on deep palpation of posterior elements.
- trunk may be shortened and abdomen protuberant.
- **radiculopathy** may develop (70% sciatica, 30% neurogenic claudication).
- in *severe degrees* of spondylolisthesis, **cauda equina syndrome** may occur.

**Degenerative spondylolisthesis** (T1-MRI) - anterior slip of L4 on L5 and degeneration in posterior joints at this level:



**Degenerative spondylolisthesis** L4-L5:



**TREATMENT**

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

**Decompression ± reduction → fusion ± PLIF\***

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

BIBLIOGRAPHY for ch. "Spinal Disorders" → follow this [LINK >>](#)