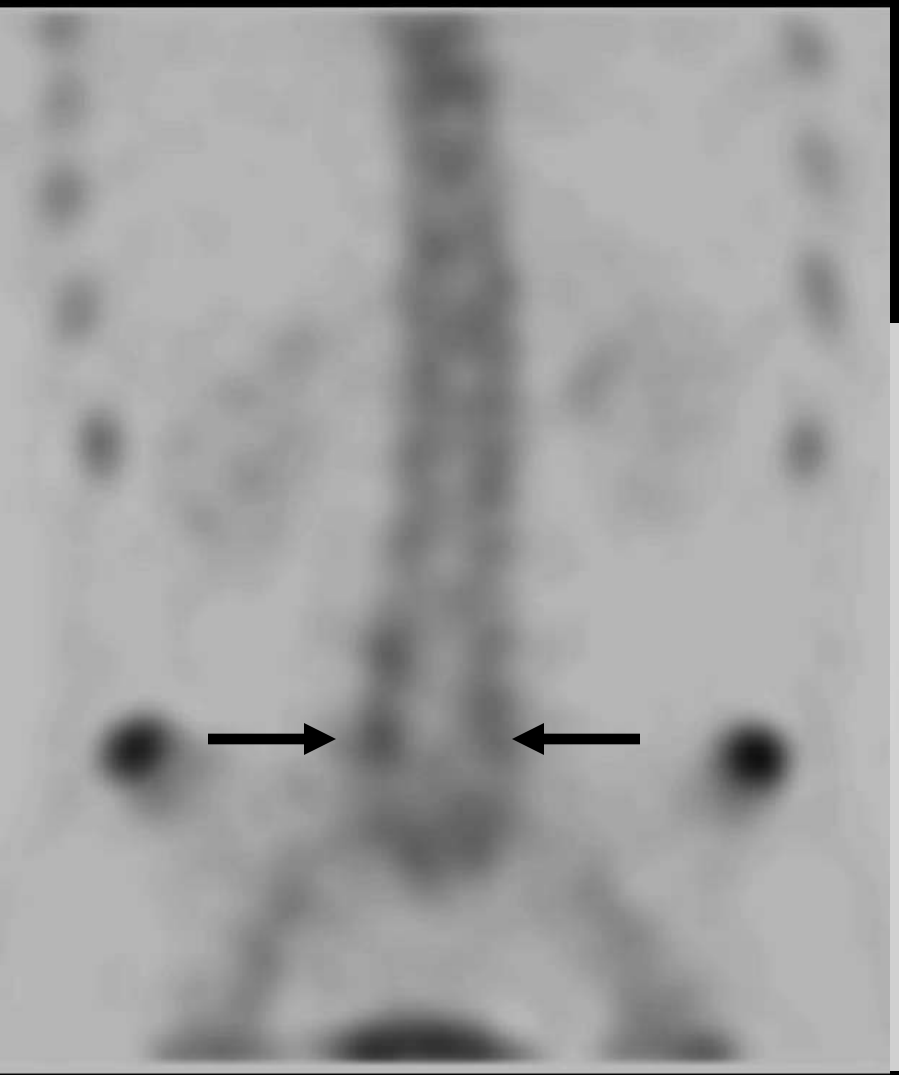
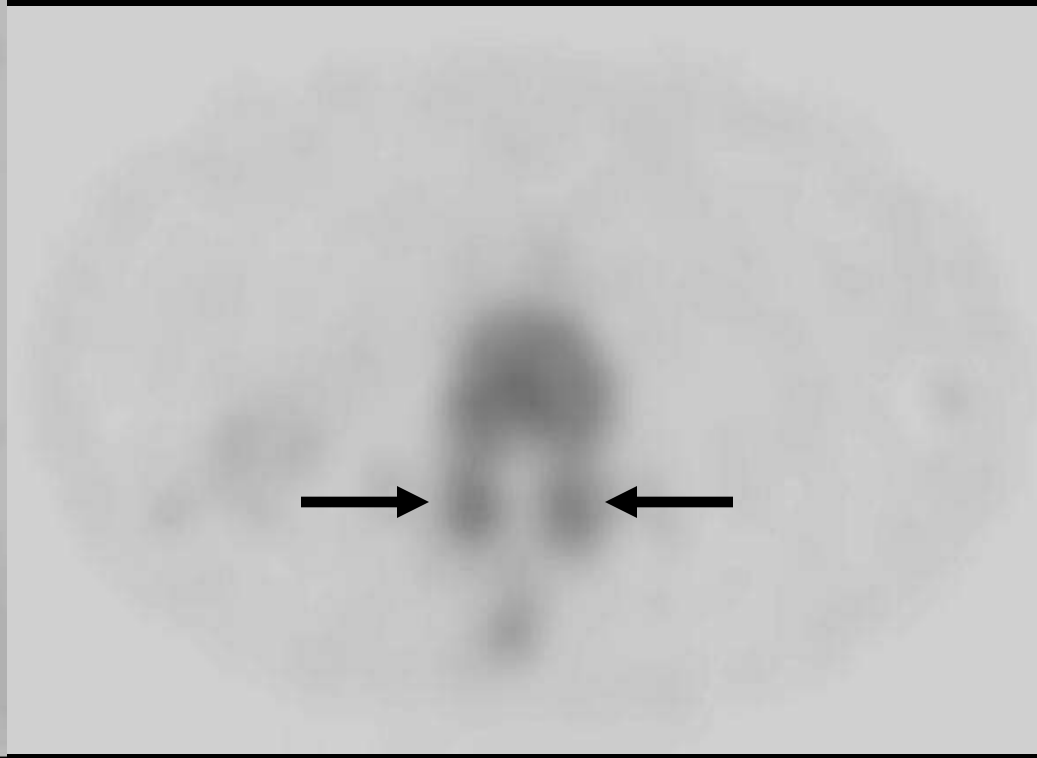
History

- 14 year old
- Male
- C/o: lower back pain

Radiography: Oblique View

SPECT: Coronal & Axial Views





Imaging Findings

- The SPECT images demonstrate slightly increased activity at the level of L5 left pedicle, consistent with pars defect; as well as stress reaction on right side.
- However, no definite corresponding radiographic evidence. There is also no evidence of spondylolisthesis.

Differential Diagnosis

- Infection
- Agenetic/hypoplastic pedicle/facet (contralateral sclerosis)
- Tumor (osteoid osteoma, osteoblastoma)
- Dysplasia (fibrous dysplasia, tuberous sclerosis)

Diagnosis

Unilateral left L5 posterior spondylolysis & right stress reaction

ACR Code

3.4231

Discussion

- Definition: Presence of a lysis or defect in the pars interarticularis.
- Prevalence of 4.4% at age 6
- 5-7% in general population
  - 22-44% in competitive athletes in diving, weight lifting, wrestling

Discussion

Location

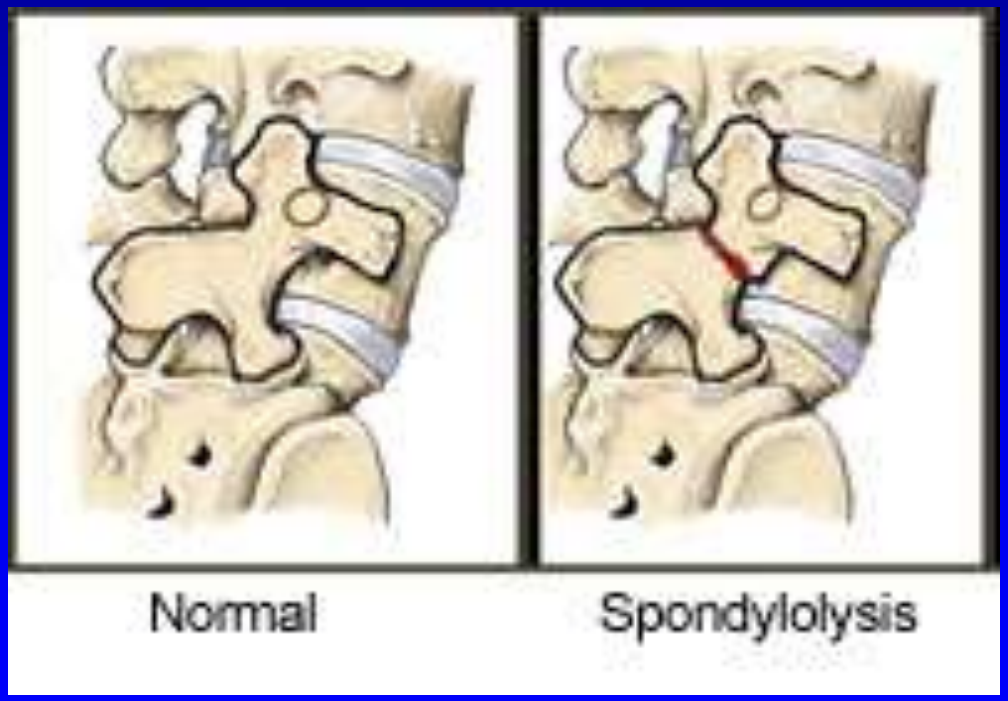
- Most common at L5: 82%
- L4 second most common: 11%
- 10-15% unilateral defects
  - Unilateral healing or union of fractures that were initially bilateral

Discussion

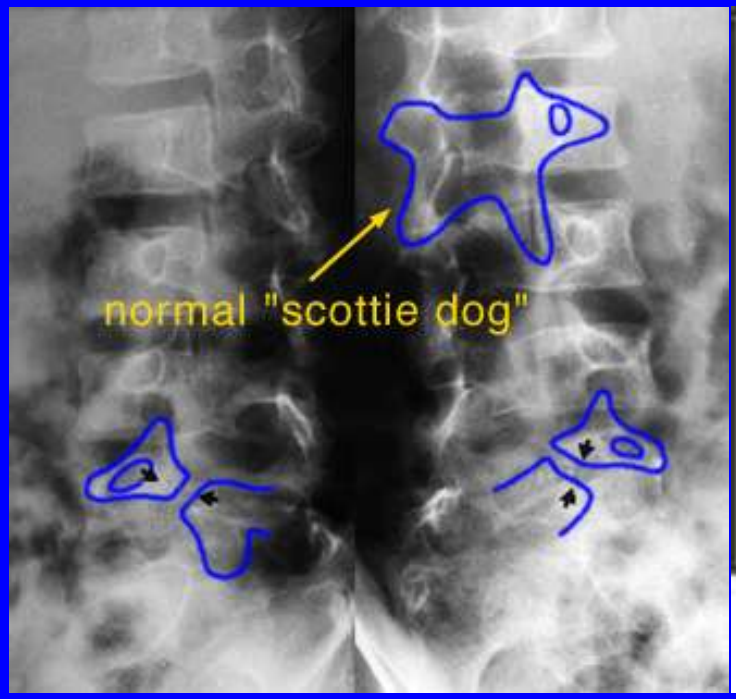
Typical Radiographic findings:

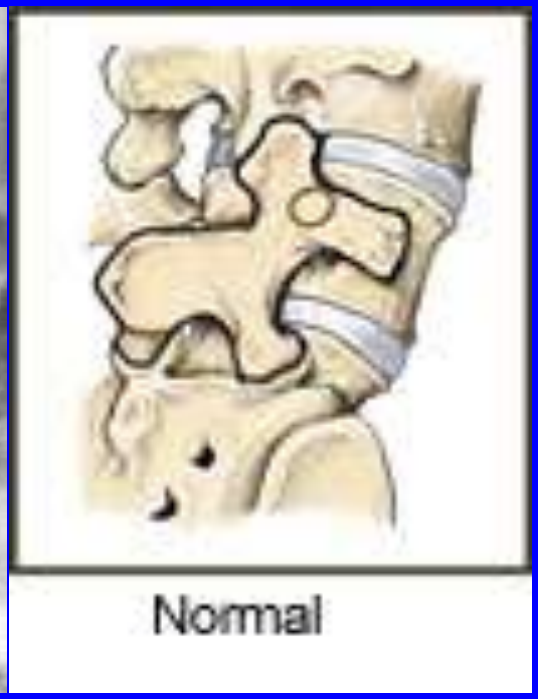
(Scottie Dog Sign on oblique view)

Collar on Scottie Dog neck: Fracture through pars



Discussion





Radiographic landmarks corresponding to "Scottie Dog"

- Head: Superior articular process
- Neck: Pars interarticularis
- Front leg:: Inferior articular process
- Body and back leg: Transverse process

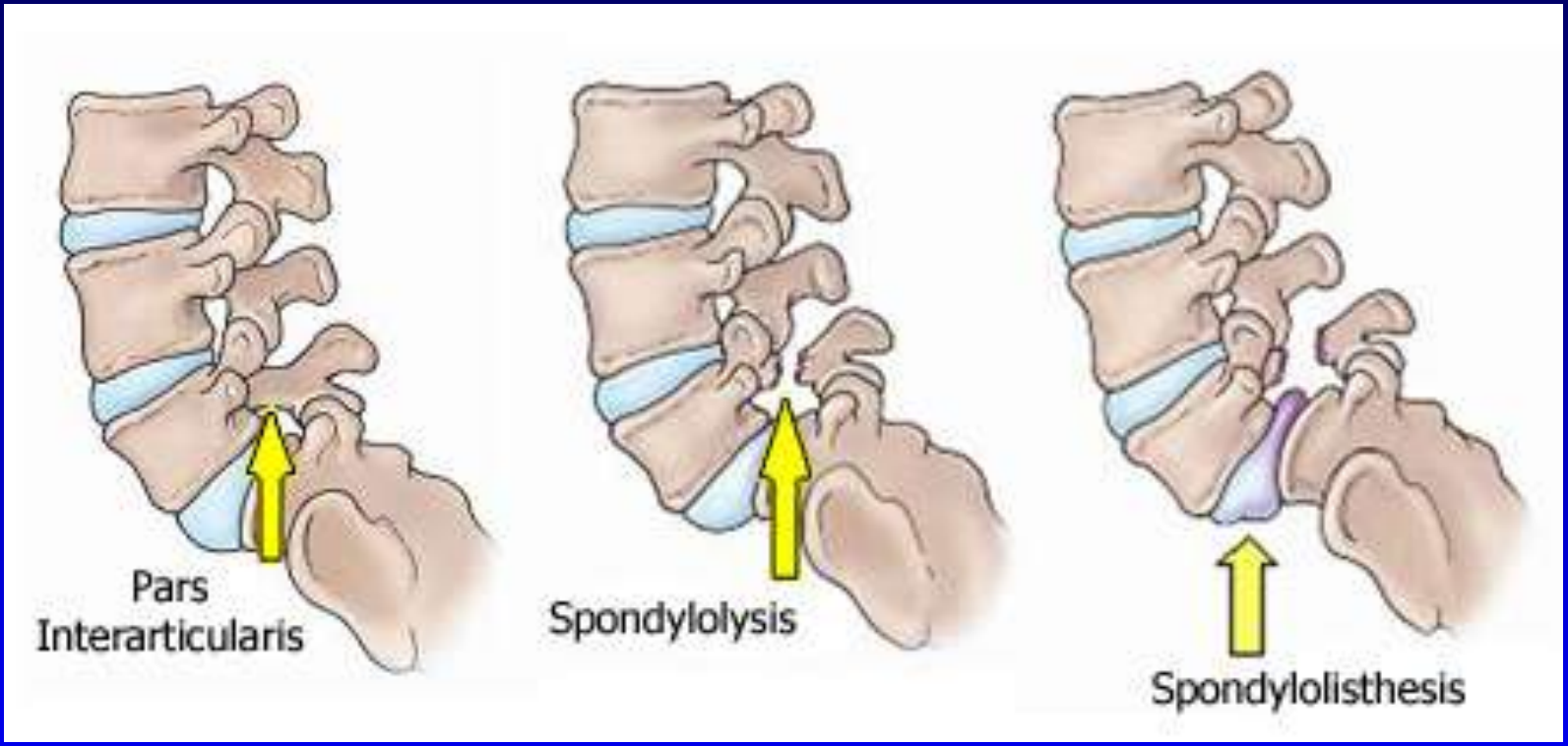
Discussion

- Nuclear Medicine:

  - Bone scintigraphy shows increased uptake at the pars defect. In the early stages, a poorly defined, slightly increased activity reflects rapid osteoclastic resorption exceeds the osteoblastic response. In addition, contralateral uptake in a unilateral pars defect probably represents a physiological response or stress fracture in the presence of an unstable neural arch. The intensity of uptake depends upon the degree of bone repair. Absence of uptake can be seen in old or stabilized, nonsymptomatic pars defects.

  - SPECT is superior in detection and accurately localizing vertebral arch abnormalities and increases sensitivity.

Discussion



Left: The pars interarticularis is found in the posteior portion of the vertebra. **Center:** Spondylolisis occurs when there is a fracture of the pars portion of the vertebra. **Right:** Spondylolisthesis occurs when the vertebra shifts forward due to instability from the pars defect.

Spondylolisthesis

- Slippage of one vertebra with respect to another. It generally occurs at the L4 level in individuals with spinal stenosis.
- There are six types: congenital, *isthmic*, degenerative, traumatic, pathologic, and post-surgical.
- *Isthmic* is the most common and occurs in older children and young adults as a result of a pars defect (spondylolysis) and repeated hyperextension (gymnastics, etc).

Spondylolisthesis

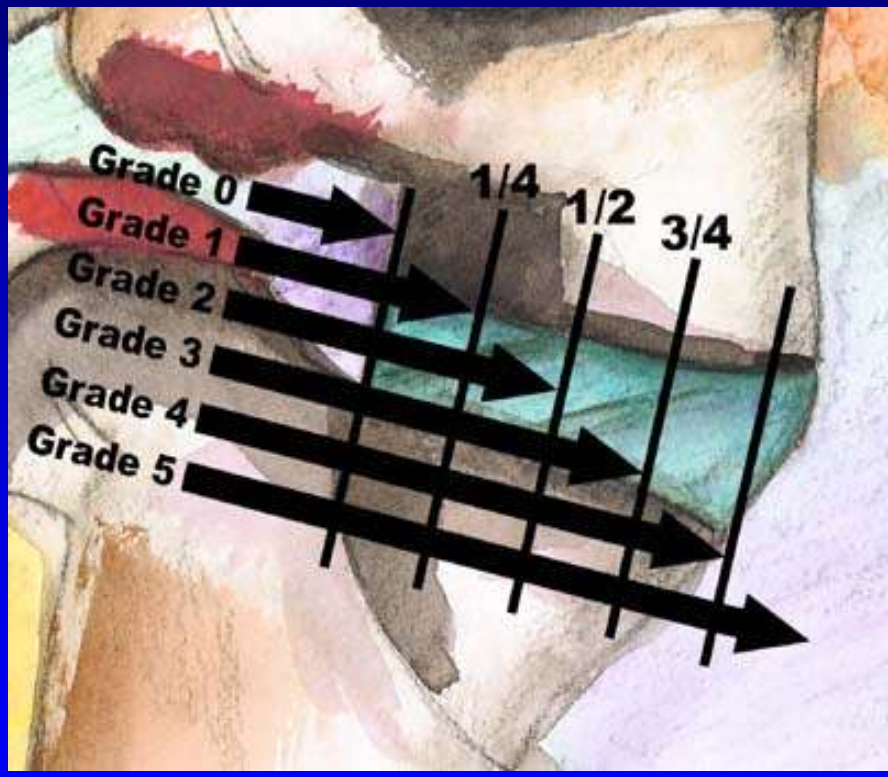
Pathophysiology:

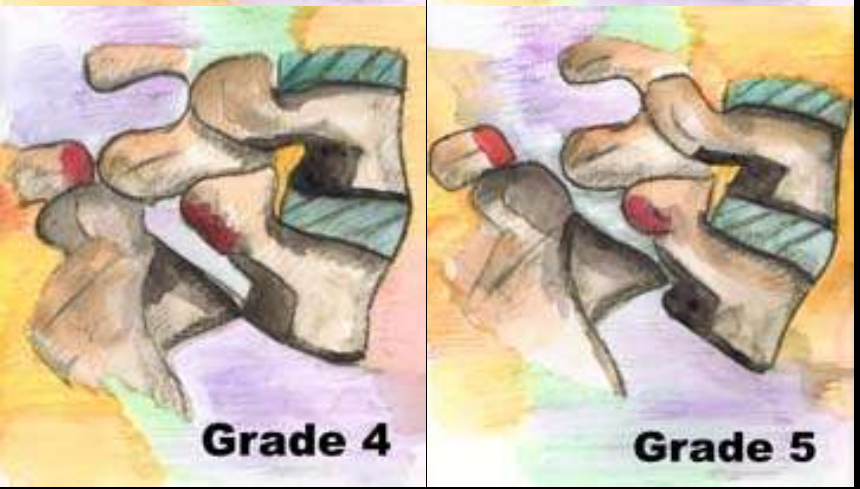
- First the disc space becomes narrowed and the facet joints become more heavily loaded ---- further joint space narrowing and hypertrophy of the facets.
- With the narrow joint space and folding of the supporting ligaments, the vertebra can then slide forward ---- severe narrowing of the spinal canal and worsens the symptoms of spinal stenosis.

Spondylolisthesis

Grade of Spondylolisthesis:

The disc is divided in quarters. The grade is equal to the number of quarters of slippage.





Grade of Spondylolisthesis

- Grade 0: no slippage;
- Grade 1: slippage equals to one quarter of the total width of the disc;
- Grade 2: slippage equals to two quarter of the total width of the disc;
- Grade 3: slippage equals to three quarter of the total width of the disc;
- Grade 4: slippage equals to four quarter of the total width of the disc;
- Grade 5: slippage is more than four quarters (the whole disc space), the spine is completely dislocated.

Treatment

- Treatment for spondylolysis is cessation of activity and strengthening of the back muscles. Patients may benefit from a brace to help stabilize the spine and prevent slippage while the pars defect is healing. Spinal fusion may be necessary in some cases to stabilize the spine

Reference

- Morrissy, RT. *Pediatric Orthopedics, Third Edition*. JB Lippincott 1990. 687-696.
- Evaluation of Back Pain in Children and Adolescents. Am Fam Physician 2007;76:1669-76.
- Resnick D: Bone and Joint Imaging. Philadephia, WB Saunders Co, 1996.