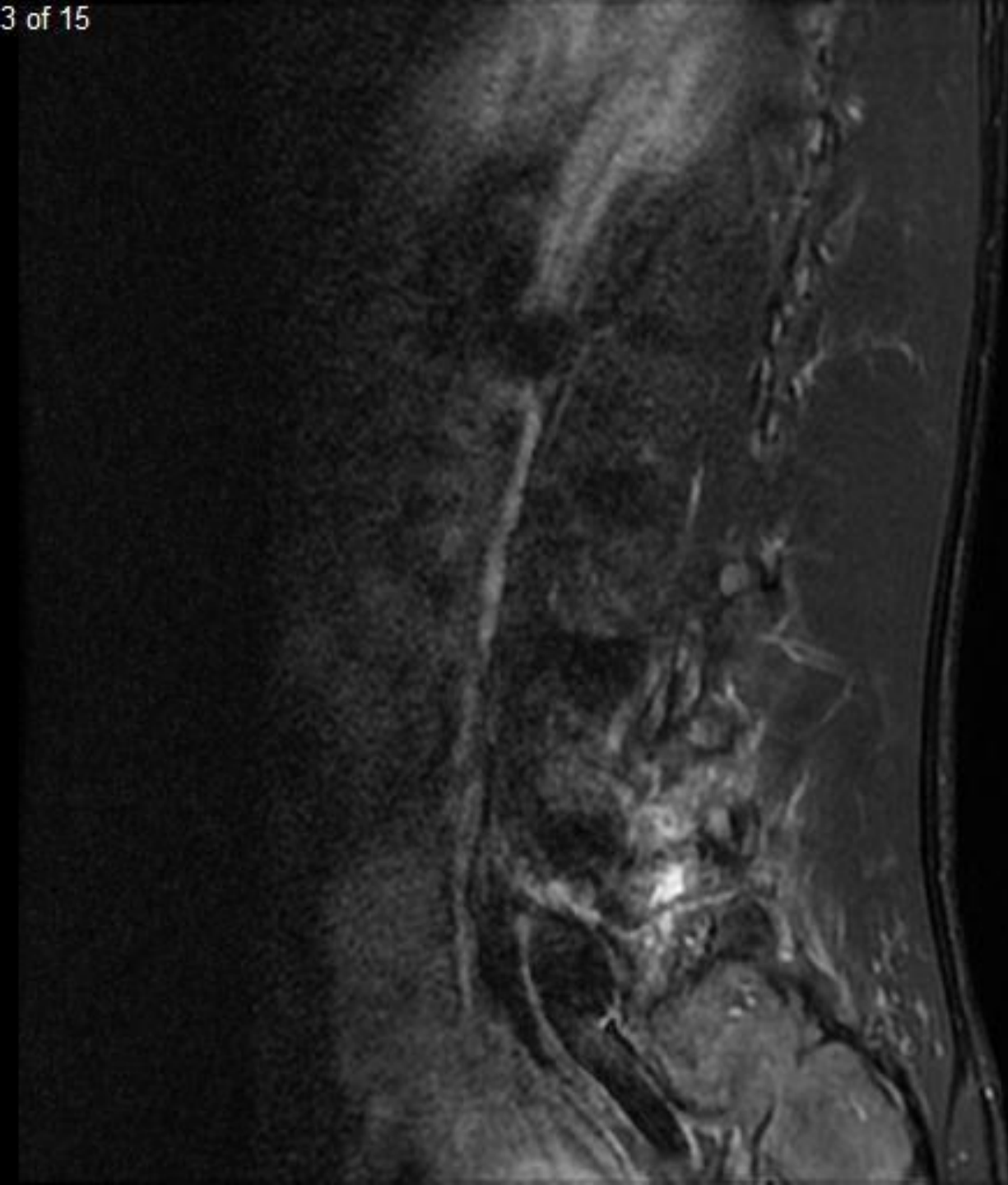


## Case 1

- 15 year-old-male with back pain x1 month. History of low back injury.











## Findings

- Increased signal intensity in the left L5 pedicle, pars interarticularis, and left L5 transverse process.
- Subtle thin linear hypointensity in the left L5 pedicle.



5 of 15



# Diagnosis

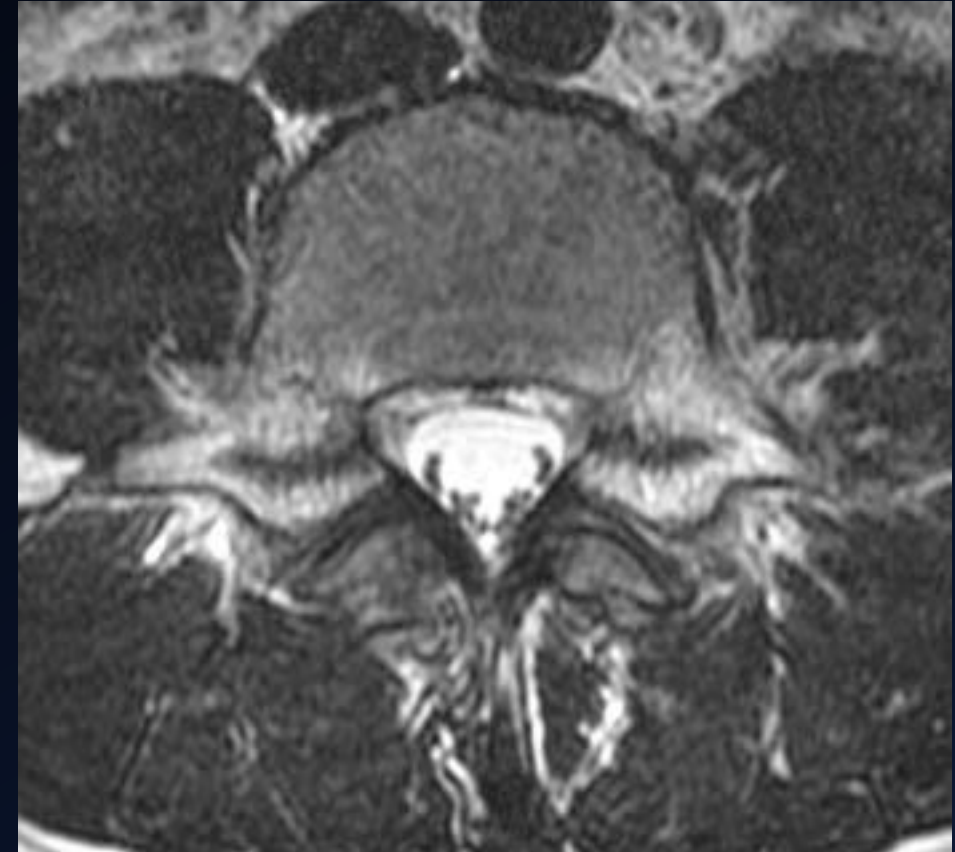
- Stress injury of the posterior neural arch.
  - In this case, involving the pedicle and pars interarticularis.
- Thin linear hypointensity in the pedicle consistent with an incomplete stress fracture and surrounding stress reaction.





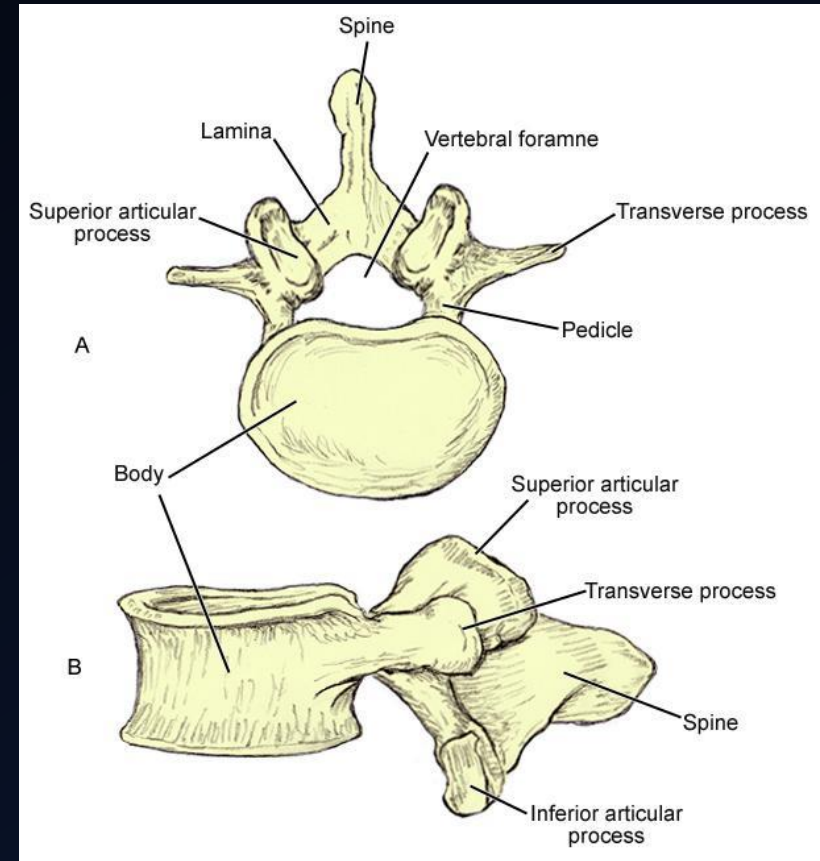
# Posterior Neural Arch Injuries

...increased signal intensity in the pedicles and pars interarticularis of L5 bilaterally, consistent with marrow edema. Linear areas of low signal intensity within both L5 pedicles (arrows) begin at the medial and superior cortical borders but do not completely traverse the body of the pedicles...



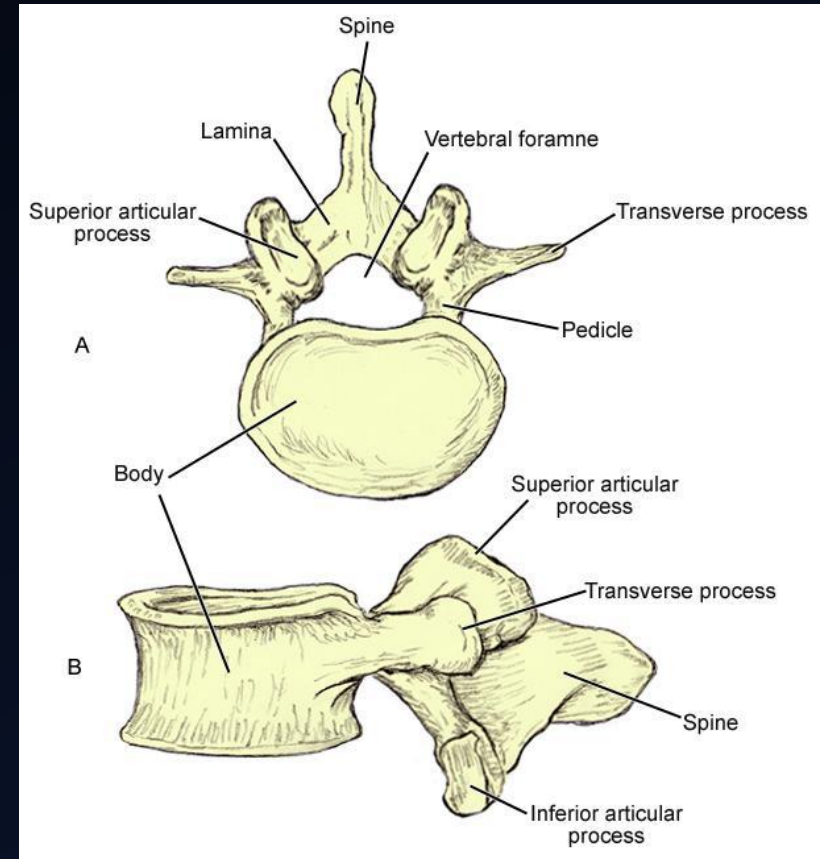
# Posterior Neural Arch Injuries

- Approximately 30% of adolescent athletes will experience low back pain while participating in sports.
- The early stages of stress injury are not well evaluated on conventional imaging.
- MR is more sensitive and enables early detection, which impacts management.



# Posterior Neural Arch Injuries

- Anatomy of the posterior arch: superior and inferior articular processes, pars, lamina, pedicles.
- The pars interarticularis is the most susceptible to stress injury.
- The pedicle is the second most susceptible.
- Repetitive motion: flexion, extension, rotation.



# Posterior Neural Arch Injuries

- Proposed classification system:

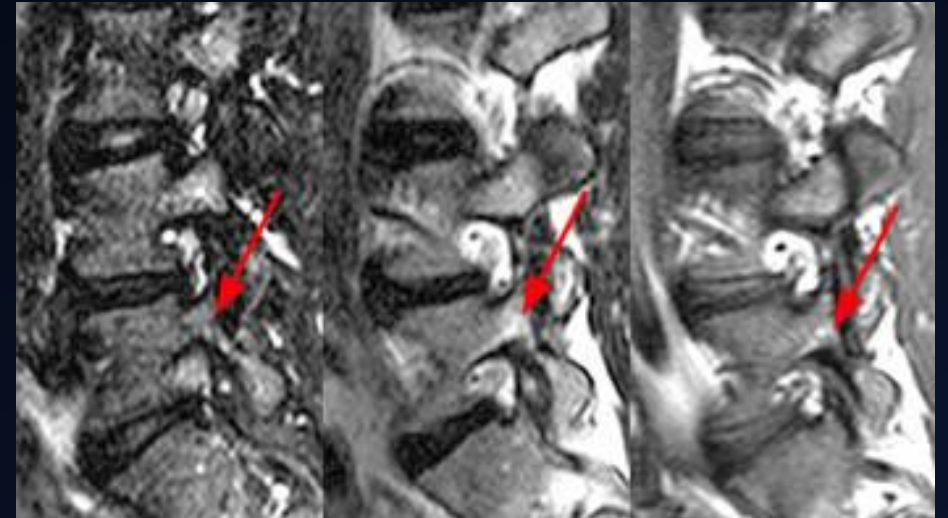
Grade	Description	MRI features
0	Normal	Normal marrow signal Intact cortical margins
1	Stress reaction	Marrow edema Intact cortical margins
2	Incomplete fracture	Marrow edema Cortical fracture extending incompletely through pars
3	Complete active fracture	Marrow edema Cortical fracture extending completely through pars
4	Fracture non-union	No marrow edema Cortical fracture extending completely through pars

5 of 15



# Posterior Neural Arch Injuries

- Repeat images 4 months after conservative treatment show resolution of hyperintensity within the pedicle on fat-saturated T2-weighted images (arrow, first image), consistent with healed stress injury. Note the small area of hyperintensity within the inferior margin of the pedicle on routine T2-weighted and T1-weighted images (arrows, second and third images), indicating development of a small area of fatty marrow replacement. This is a common finding following stress injury and should not be mistaken for true marrow edema.



<http://radsourc.us/lumbar-neural-arch/>

# References

- Olsen TL, Anderson RL, Dearwater SR, Kriska AM, Cauley JA, Aaron DJ, et al. The epidemiology of low back pain in an adolescent population. Am J Public Health, Apr 1992; 82(4):606-608.
- <http://radsourc.us/lumbar-neural-arch/>
- Cyron BM, Hutton WC. The fatigue strength of the lumbar neural arch in spondylolysis. J Bone Joint Surg Br, 1978; 60:234-238.
- Hollenberg GM, Beattie PF, Meyers SP, Weinberg EP, Adams MJ. Stress reactions of the lumbar pars interarticularis: the development of a new MRI classification system. Spine, 2002;27(2): 181-186.