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Diagnostic Imaging Evaluation in Suspected Pediatric Lumbar Spondylolysis
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**Abstract:** This column discusses how a doctor of chiropractic might utilize the literature to effectively deal with a third-party provider that denies an examination for a patient.

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Recently, you have been treating a juvenile patient with low-back pain that has not been improving with conservative management. You are aware of several common causes of low-back pain in children and adolescents, including muscle strain, herniated disc, spondylolisthesis, scoliosis, and Scheuermann's disease. Your patient's clinical history and physical examination correlate to those seen in patients who have active spondylolysis in the lumbar spine. Radiographic evaluation of the patient, which included oblique images of the lumbar spine, revealed no evidence of spondylolytic defects. Still concerned that there may be radiographically occult spondylolysis, you consider appropriate follow-up diagnostic imaging procedures.

A speaker at a recent continuing education session advised that MRI has been increasingly utilized to evaluate patients with active spondylolysis, with the added benefit of not requiring ionizing radiation for image generation. Based on this information, you elect to order an MRI examination of the lumbar spine rather than computed tomography or SPECT imaging/nuclear scintigraphy.

The parent's health insurance provider sends the request for coverage to a third-party review group for approval. The group rejects the request for MRI coverage in this case and sends you a letter summarizing its perspective on the utility of MRI in evaluating spine pain. This document does not include spondylolysis evaluation as a reason to order MRI.

Perhaps you misunderstood the continuing education speaker? In an effort to qualify the MRI examination, you find the following study:

Campbell RS, Grainger AJ, Hide IG, Papastefanou S, Greenough CG. Juvenile spondylolysis: a comparative analysis of CT, SPECT, and MRI. *Skeletal Radiol.* 2005 Feb;34(2):63-73. Epub 2004 Nov 25[1]

**OBJECTIVE:** To evaluate whether MRI correlates with CT and SPECT imaging for the diagnosis of juvenile spondylolysis, and to determine whether MRI can be used as an exclusive image modality.

**DESIGN AND PATIENTS:** Juveniles and young adults with a history of extension low-back pain were evaluated by MRI, CT, and SPECT imaging. All images were reviewed blindly. Correlative analyses included CT vs. MRI for morphological grading and SPECT vs. MRI for functional grading. Finally, an overall grading system compared MRI vs. CT and SPECT combined. Statistical analysis was performed using the kappa statistic.

**RESULTS:** Seventy-two patients (mean age 16 years) were recruited. Forty pars defects were identified in 22 patients (31 percent), of which 25 were chronic non-union, five acute complete defects, and 10 acute incomplete fractures. Kappa scores demonstrated a high level of agreement for all comparative analyses. MRI vs. SPECT (kappa: 0.794), MRI vs. CT (kappa: 0.829), and MRI vs. CT/SPECT (kappa: 0.786). The main causes of discrepancy

were between MRI and SPECT for the diagnosis of stress reaction in the absence of overt fracture, and distinguishing incomplete fractures from intact pars or complete defects.

**CONCLUSIONS:** MRI can be used as an effective and reliable first-line image modality for diagnosis of juvenile spondylolysis. However, localized CT is recommended as a supplementary examination in selected cases as a baseline for assessment of healing and for evaluation of indeterminate cases.

***Comment:*** The paper provides ranges for kappa values and the associated levels of agreement: <0.2, poor; 0.21-0.4, fair; .041-.06, moderate; 0.61-0.8, good; 0.81-1.0, excellent. The kappa value tells the reader the likelihood that the different studies will agree by chance. If the value is 0, then there is no agreement between the studies other than what could be attributed to chance. A value of 1 indicates that the studies are in complete agreement. In all comparisons, MRI evaluation was good or excellent in agreement with SPECT, CT, and SPECT/CT evaluations. This study shows that it is reasonable to utilize MRI for evaluation of pediatric patients with suspicion of spondylolysis. Multi-slice computerized tomography with three-dimensional image reconstruction is an accurate test for spondylolysis. There is, however, a strong movement in the diagnostic imaging community to use MRI as a primary imaging modality to evaluate pediatric patients with suspected stress reactions in the lumbar pars interarticularis.[2] Essentially, this situation is an example of a shift in what is considered "standard of care" for evaluation of suspected pediatric spondylolysis. Radionuclide bone imaging in suspected spondylolysis of the lumbar spine in children has been discussed in the literature since 1981.[3] Using SPECT imaging to evaluate spondylolysis has been noted in the literature as early as 1985.[4] Combining SPECT with CT examination has been a popular mode of spondylolysis evaluation. MRI evaluation has been examined for this purpose since at least 1989.[5]

Earlier generations of MR units were not capable of producing images with enough resolution to detect pars reactions with the reliability of SPECT/CT. Technology advancements have improved image resolution with MR, and pricing for the examinations has decreased, making MR a more attractive imaging option. Using MR to evaluate active spondylolysis also has the benefit of an examination that carries no radiation risk to the pediatric patient, a hot topic in the health care community.

Third-party reviews are a common process in preauthorizing requested diagnostic studies. If these groups deny coverage for a study you request, such as in this example, it is important that you gain timely access to information to support your decision.

New information is constantly being incorporated into health care decision making, a significant component of evidence-based clinical practice. What is considered a "gold standard" or "standard of care" can be expected to change with time. As revealed in this case, literature supports utilizing MRI to evaluate active pediatric spondylolysis instead of SPECT/CT. Clinicians' ability to discover supportive information to explain their rationale for patient management is important in providing patients appropriate evidence-informed health care.

**References**


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