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Current Evidence Regarding the Diagnostic Methods for Pediatric Lumbar Spondylolisthesis: A Report From the Scoliosis Research Society Evidence Based Medicine Committee

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Abstract

Study Design: Structured literature review.
Objectives: The Scoliosis Research Society (SRS) requested an assessment of the current state of peer-reviewed evidence regarding pediatric lumbar spondylolisthesis with the goal of identifying what is known and what gaps remain in further understanding the diagnostic methods for pediatric spondylolisthesis.
Summary of Background Data: Spondylolisthesis in the lumbar spine is common among children and adolescents and no formal synthesis of the published literature regarding diagnostic methods has been previously performed.
Methods: A comprehensive literature search was performed. Abstracts were reviewed and data from included studies were analyzed by the committee. From 6600 initial citations with abstract, 663 articles underwent full-text review. The best available evidence for the clinical questions regarding diagnostic methods was provided by 26 included studies. Six of the studies were graded as Level III (retrospective comparative), and represent the current best available evidence whereas 20 of the studies were graded as Level IV (retrospective case series) evidence. No Level V (expert opinion) studies were included in the final list. None of the studies were graded as Level I or Level II.
Results: Plain radiography is the workhorse imaging modality for diagnosing spondylolisthesis. No association between radiologic grade of spondylolisthesis and clinical presentation were noted; however, grade III and IV slips more often required surgery, and increasing slip angles were associated with worse baseline outcome scores.

There is Level III evidence that the Meyerding grade appears to be more accurate for measuring slip percentage whereas the Lonstein Slip angle and Dubousset Lumbosacral Kyphosis angles are the best for measuring lumbosacral kyphosis in spondylolisthesis. In addition, higher sacral table index, pelvic incidence, sacral slope, and lower sacral table angle were associated with spondylolisthesis. True incidence

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could not be determined by the current literature available. However, studies in adolescent athletes demonstrated an incidence of 6% to 7% across studies.

Conclusions: The current ''best available'' evidence to guide the diagnosis and characterization of pediatric spondylolisthesis is presented. Future studies are needed to provide more high-quality evidence to answer these clinically relevant questions.

Level of Evidence: Level III, review of Level III studies.

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Keywords: Pediatric; Spondylolisthesis; Lumbosacral kyphosis

Introduction

The progress of published medical knowledge, changes in societal expectations, and developments in health care economics have lead medical organizations to develop evidence-based documents and products such as clinical practice guidelines, appropriate use criteria, and performance improvement modules. The initial step of each is to perform a structured literature review to assess the current state of peer-reviewed evidence. The Evidence Based Medicine Committee of the Scoliosis Research Society recently undertook a structured literature review of Pediatric Lumbar Spondylolisthesis. Clinically relevant questions regarding diagnostic modalities were proposed by the committee.

Methods

A working definition for pediatric lumbar spondylolisthesis was developed by group consensus. Relevant clinical questions were proposed and refined by group consensus.

Data sources

A thorough, comprehensive literature search was performed with the assistance of a professional medical librarian. Databases searched for this project included PubMed (U.S. National Library of Medicine), Ovid Medline (Wolters Kluwer), Cochrane Database of Systematic Reviews (Cochrane Collaboration resources) and Web of Science (Thomson Reuters Web of KnowledgeSM) and Scopus (Copyright 2013 Elsevier B.V.). A search strategy was discussed, revised, tested, and finalized first in Ovid Medline, then translated into appropriate search terms and syntax for each database. Both subject headings and free text were searched for spondylolisthesis and variant word endings. Results were limited to English language articles and foreign language articles with English abstracts and human studies. Publication types ''comment'' and ''letter'' were omitted when possible.

The Ovid Medline strategy was run in PubMed with slight variations to pick up newly added records that were not yet fully indexed. The strategy was also slightly changed for the remaining databases to accommodate differences in search terminology and mechanics. Citations and abstracts were retrieved. Abstracts were reviewed for obvious exclusions (ie, those studies not associated with pediatric lumbar spondylolisthesis).

Study selection criteria

Independent review of the abstracts for inclusion/exclusion was performed, and articles were recommended for full-text review if the study was expected to provide evidence to answer the clinical questions. Disputes regarding inclusion/exclusion were resolved by group consensus, with preference given to inclusion in unresolved cases. From 6,600 initial citations with abstract, 663 articles were included in the full-text review. The same inclusion/exclusion process was repeated during full-text review. Additionally, a hand search of the bibliographies revealed 20 articles that underwent the inclusion/exclusion process. A total of 51 articles, which provided the best available evidence for the clinical questions regarding treatment, were included in the data extraction list.

Grades of evidence were determined as follows: Good (High Quality) Evidence from Level I studies with consistent findings, Fair (Moderate Quality) Evidence from Level II or III Studies with consistent findings, Poor (Low Quality) Evidence from Level IV or V Studies, and Insufficient Evidence from insufficient data or conflicting studies. None of the studies were graded as Level I or Level II evidence. Eighteen of the studies were graded as Level III (retrospective comparative) evidence. These 18 Level III studies represent the current ''best available'' evidence to guide the treatment of pediatric spondylolisthesis. Thirty-three of the studies were graded as Level IV (retrospective case series) evidence. No Level V (expert opinion) studies were included in the final list.

Results

Working definition

Pediatric lumbar spondylolisthesis refers to an anterior displacement of the cranial lumbar vertebral body relative to the subadjacent caudal vertebral body in a patient less than 21 years of age. The anterior displacement of the vertebra is often associated with a bony defect (spondylolysis) or dysplasia of the pars interarticularis of the same vertebral level.

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