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Original article

Adolescent spinal pain: The pediatric orthopedist's point of view

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ABSTRACT

Introduction: Ten to twenty percent of persons experience spinal pain during growth. Causes are diverse in adolescents, and it is essential to determine etiology rapidly so as to guide optimal management.
Hypothesis: It is important for the pediatric orthopedist to understand the natural history of conditions inducing spinal pain.
Material and methods: A retrospective study included 116 adolescents presenting with spinal pain at the Hôpital Nord (Marseille, France) between January 1, 2009 and January 1, 2014. Malignant tumoral etiologies were excluded. Mean patient age was 13.6 years. Risser ranged between >0 and <5. Interview and clinical examination (skin, spine, neurologic examination, general clinical examination) were systematic; depending on results, complementary examinations (imaging, biology, biopsy) were prescribed.
Results: There were 32 cases of non-specific adolescent low back pain, 31 of lumbar or thoracolumbar scoliosis, 23 of spinal growth dystrophy (Scheuermann's disease), 13 of isthmic lysis, 5 of spondylolisthesis, 8 of transitional lumbosacral hinge abnormality, 2 of discal hernia, 1 of osteoid osteoma and 1 of eosinophil granuloma. Treatment was often non-operative when diagnosis was sufficiently early. In case of failure, surgery could generally be considered.
Discussion: Correctly indicated non-operative management or surgery changes the natural history of these pathologies. The aim of treatment is to resolve pain in adolescence, as it risks becoming chronic and disabling by adulthood.
Level of evidence: IV.

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1. Introduction

Ten to twenty percent of persons experience spinal pain during growth [1]. In adolescents, it is essential to determine etiology so as to guide optimal management, taking account of potential progression. The pediatric orthopedist is treating a symptom but also needs to understand the natural history of these etiologies so as to be able to change it. He or she should provide socio-occupational advice, guiding the adolescent toward an adult life free of spinal pain. Spinal pain is often a social problem.

2. Materials

A retrospective study included 116 adolescents (49 female, 67 male) presenting with spinal pain at the Hôpital Nord (Marseille, France) between January 1, 2009 and January 1, 2014. Malignant tumoral etiologies and dysraphism were excluded.

Mean age was 13.6 years (range, 11–17.5). Risser ranged between >0 and <5. Fifty-one patients were not sports players, 42 played leisure sports and 23 played competitive sports (17 footballers, 3 tennis players, 2 skiers and 1 handball player).

Seven patients had cervicothoracic pain, 40 mid-thoracic pain and 69 low back pain (58 pure lumbar and 11 L5 or S1 lumboradicular). Pain was of moderate intensity, heightened by effort. Six patients had nocturnal pain.

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3. Methods

Interview and clinical examination are systematic in case of spinal pain [2]. Depending on results, complementary examinations were prescribed. Interview determined type of pain, life-style, associated signs, age and medical history. Clinical examination screened for abnormal cutaneous signs. The spine was examined with the patient standing, frontally, dorsally and dynamically. With the patient bent forward, the finger-to-floor distance was measured. Decompensation of spinal balance and gibbosity were assessed. Spinal flexibility was assessed globally and segment by segment, following Schöber [3]. Paravertebral muscle contracture, retreat of a lumbosacral spinous process and painful points around the sacroiliac joints were screened for. Specific tests assessed muscle endurance: Sorensen-Biering test (trunk extensors), Shirado test (trunk flexors), Killy test (femoral quadriceps), and spinal extensor endurance test (lumbar and hip) [4]. Examination was completed by neurological assessment. General examination ruled out organic [5] or psychogenic [6] etiology.

Imaging comprised plain standing AP and lateral radiographs. In case of doubt as to isthmic origin, oblique views were prescribed. MRI served as screening examination in case of negative X-ray; if unavailable, scintigraphy screened for hyperfixation sites. CT served to identify bone deformity.

In case of general signs, biological examinations were prescribed. In case of persisting doubt, biopsy was performed.

4. Results

4.1. Non-specific adolescent low-back pain

Thirty-two patients had non-specific adolescent low-back pain. Pain was heightened by effort and relieved by rest. The patients included 23 leisure and 6 competitive sports players. All were managed by physiotherapy (specific posterior chain self-stretching exercises). Six were given a brace to reduce contracture. Mean rehabilitation time was 10 weeks (range, 4–30 weeks). Symptoms resolved in 21 cases, improvement was incomplete in 5 and 6 were unchanged.

4.2. Lumbar and thoracolumbar scoliosis

Thirty-one patients had a single unbalanced thoracolumbar or lumbar curve or a predominantly lumbar double curve. Pain was lumbar, relieved by rest. Nine of these patients were leisure sports players.

Eighteen were managed non-operatively, with a full-time 3-point Lyon brace for 20–30° curvature in 10 cases and part-time brace in 8 cases of <20° curvature.

Thirteen adolescents with curvature exceeding 30° underwent surgical correction on an anterolateral approach, with instrumentation of 5 (T11-L3: 7 patients) or 4 levels (T12-L3: 6 patients).

Minimum follow-up for assessment was 20 years.

4.3. Spinal growth dystrophy (SGD) or Scheuermann's disease

Twenty-three patients showed SGD. Pain was mid-thoracic, heightened by effort and relieved by rest. The patients included 5 leisure and 6 competitive sports players.

All were managed non-operatively. A cast was produced, the lumbar part being made with the patient standing in decreased lordosis and the thoracic part with the patient lying down with a support under the shoulders and included sternal and scapular supports. After 4–6 weeks, the cast was replaced by a 2-valve brace with scapular support, which was worn continuously until Risser 4 was achieved. Depending on the results, it was then abandoned during daytime and worn for at least 12 hours. Follow-up was insufficient to assess efficacy in terms of vertebral body reconstitution and disc outcome in adulthood.

4.4. Isthmic lysis and spondylolisthesis

Eighteen patients showed either isthmic lysis (13 patients) or spondylolisthesis (5 patients).

Spondylolisthesis included 2 spondyloptoses and 1 grade 3 and 2 grade 2 spondylolisthesis. All had lumbar radiculalgia. None were sports players. All were operated on with double anterior and posterior instrumentation on 2 separate approaches. Mean follow-up was 23 months (range, 16–48 months). Fusion was systematically achieved, and radiculalgia resolved in all cases; reduced low back pain persisted in 2 cases.

The 13 with isthmic lysis had low back pain and 4 had radiculalgia. There were 4 leisure and 3 competitive sports players. All were managed non-operatively, by simple brace immobilization in 9 cases or Bermuda cast in 4 cases. Four showed favorable response. Treatment lasted a mean 4 months (range, 3–6.5 months). Nine patients with residual pain underwent surgical isthmus reconstruction. Mean follow-up was 21 months (range, 16–50 months). The Buck technique was used in 3 cases [7]. Pedicular screwing with sublaminar hooks and compression of the lysis region was used in 6 cases [7]. Six patients achieved fusion.

4.5. Lumbosacral hinge transitional abnormality

Eight patients had lumbosacral hinge transitional abnormality. Pain was lumbar. Three were competitive sports players. All were managed by physiotherapy. Five wore a brace. All showed improvement, but were obliged to respect rules for lumbosacral spine locking. Three showed partial lumbarization of the first sacral vertebra and were treated surgically, with complete fusion of the first sacral vertebra. Two showed improvement. Low back pain persisted in 1 case.

4.6. Rare etiologies

4.6.1. Discal hernia (DH)

Two patients had L5-S1 DH, with S1 lumbar radiculalgia. One played leisure sport. Periradicular infiltration was ineffective; subsequent surgery consisted in simple resection of the protruding disc fragment, without disc curettage. Radiculalgia resolved, and the patients recovered a normal life.

4.6.2. Osteoid osteoma

One patient with painful thoracic scoliosis had an osteoid osteoma in the posterior arch of T6. It was treated by radiofrequency ablation.

4.6.3. Eosinophil granuloma

One patient had neck pain caused by an eosinophil granuloma in C7. The unusual nature of the pain and doubt persisting after imaging led to surgical biopsy. A Minerva brace was prescribed for 3 months.

5. Discussion

When an adolescent consults in pediatric orthopedics for spinal pain, it is important to determine etiology.

In the present study, non-specific adolescent low back pain was the main etiology, often affecting non-athletic, tall and thin adolescents at puberty. Muscle growth is slower than bone growth and contracture induces pelvic retroversion and pain [2]. Exercise and physiotherapy are sufficient. Physiotherapy and back training

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