

Back Pain in Childhood and Adolescence: A Neurological Point of View

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Abstract

Back pain is a very frequent symptom in children. Its incidence shows a rising trend in recent years. It has also direct impact in the everyday life of the child. In most cases (95 - 99%) we cannot identify a clear etiology of the pain, and it is classified as inorganic or unspecified. Among organic causes, spondylolysis and Scheuermann's disease are the most frequent. Spondylodiscitis, disc herniation and tumors are relatively infrequent. Elimination of risk factors (e.g. sedentary lifestyle, incorrect holding of the body, overweight, etc.) is important in the therapy of inorganic pain. In the cases of organic pain the therapy depends on the etiology.

Keywords: Back Pain; Neck Pain; Low Back Pain; Children

Introduction

Back pain is an increasingly common reason to visit a pediatrician. A sedentary lifestyle, lack of physical activity, overweight, improper posture, sitting, carrying backpacks, or using mobile phones, tablets and similar devices, are causing this rising trend. According to various foreign works, the prevalence of back pain in children at annual intervals ranges from 7 to 58% [1], while there are some differences according to the age and location of pain - in the work of Kjaer, et al. [2] the prevalence of cervical (C) pain at 9, 13 and 15 years of age was 10%, 7% and 15%, respectively, and thoracic (Th) pain at 20%, 13% and 35% and lumbosacral (LS) region 4%, 22% and 35%.

Back pain has a direct impact on a child's life - 10 to 28% of such children have problems at school, 23 to 50% stop playing sports, 28% have trouble carrying school bags and 16 to 26% stop going out with friends. The risk of recurrence of back pain in children is high, up to 50% and in 8% pain becomes a chronic problem [3].

Child patient management with back pain

History

Key are data on the nature of pain (location, onset and duration of difficulty, factors improving or worsening the condition, nocturnal pain), possible trauma (acute macrotrauma, repetitive microtrauma, sports activities), relationship to physical activity (worsening/improvement), rheumatological symptoms (worsening in the morning, improvement with physical activity), systemic symptoms (fever, night sweats, weight loss), neurological symptoms (radical type of pain with propagation according to dermatoma, muscle weakness, sphincter problems, gait disorders), lifestyle of the child (sedentary lifestyle, way of carrying school bags), medical history, and impact on the patient's life.

Pain that worsens with physical activity and at the end of the day is typical of Scheuermann's kyphosis, spondylolisthesis, and nonspecific pain. Radicular pain points to pressure on nerve structures and is typical of hernia discs, less for severe spondylolysis and tumors.

Spondylodiscitis should be considered in a child who refuses to stand up for no explanatory reason and has back pain. Nocturnal pain accompanied by neurological symptoms or weight loss may be a manifestation of the oncological cause of back pain. Quite a worse response to conventional analgesic treatment and a more significant impact on the child's life tend to be with organic causes of back pain.

Within the family history, information on the incidence of orthopedic, neurological and rheumatic diseases, especially associated with HLA-B27 positivity (ankylosing spondylitis, reactive arthritis, psoriasis, inflammatory bowel diseases) is also important.

Objective examination

Gait: In a posterior view of the patient, we assess asymmetries of the torso, which are common in scoliosis, contractures and different lengths of the lower limbs. We also look for changes in the midline (increased hairiness, sinuses in the LS area). In a lateral view, we evaluate the curvature of the spine (highlighting/flattening). The presence of significant contracture in the lumbar region with subsequent flattening of lumbar lordosis is typical of disc herniation and spondylodiscitis.

Range of motion: We evaluate active movements of the spine - flexion (forward tilt of the head or torso with extended lower limbs), extension (tilt of the head or torso with extended lower limbs), bows (movements of the head to the shoulders or torso to the sides, while the patient should be able to touch fibula head), lateral rotation.

Palpation: The surface structures of the back are better evaluable when standing. The point of the most pronounced reaction must be correlated locally to the relevant anatomical structure - spinosi processes (severe spondylolisthesis, vertebral arch closure disorders), paravertebral muscles (spasms, contractures), sacroiliac motions (pain in inflammatory processes, spinal cord), gut trochanters, etc.

Flexibility: Shortening the hamstrings (ischiotibial muscles) causes a reduction in the popliteal angle. This angle changes with age, but is considered pathological if it lacks more than 50° to full extension.

Special maneuvers

Adams test: The patient leans forward in his shaft, his legs outstretched, his heels together and his hands hanging freely. In this position, scoliosis is accentuated, while the thorax is asymmetrical - one side is higher than the other. A more detailed examination with a scoliometer could be done by an orthopedist. Angular kyphosis typical of Scheuermann's disease can be identified from the lateral view.

Modified Schober test: In a standing position, a point 10 cm above the L5 vertebra is marked. At the maximum forward bend in the shaft, this distance should be extended by 4 - 6 cm. Lower values indicate poorer spinal mobility, which may be present in spondyloarthropathies (Figure 1).

Lassegue test: It is a passive flexion of the lower limb in the lumbar joint with extension in the knee joint. Induction of pain in the LS area with propagation to the lower limb according to a certain dermatoma is common in discopathy. Hamstring pain tends to shorten.

Patrick's test: Patient is lying on his back, we perform flexion, abduction and external rotation with the foot resting on the knee of the other leg (Flexion, Abduction, External Rotation = FABER test). The pain of this maneuver is usually in pathologies in the sacroiliac bend or hip joint (Figure 2).

Trendelenburg test: We ask the patient to stand on one leg and bend the other ("like a stork"). It is positive if there is a decrease in the hip in the case of weakness of the plexus muscles for the lower limbs (e.g. in neuromuscular diseases).

Neurological examination: We evaluate muscle trophics, muscle strength, sensitivity (loss of sensitivity of the "riding pants" type is typical for cauda equina syndrome), tendon-periosteum reflexes, pyramid symptoms (Babinski, Rossolimo, etc.), abdominal reflexes, cremaster and anal reflex.

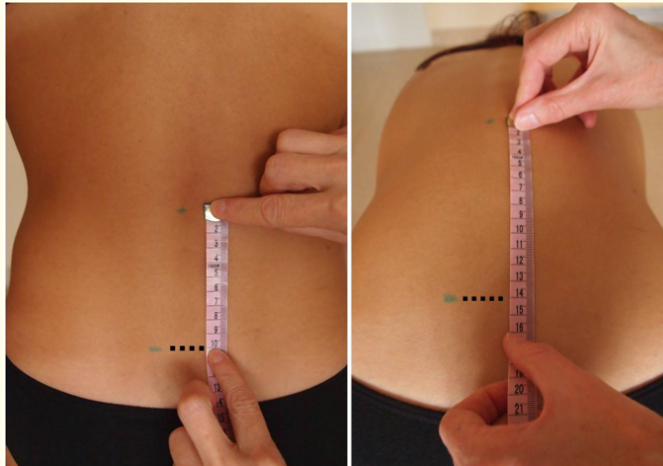


Figure 1: Modified Schober test.



Figure 2: Patrick's test.

Imaging examinations

- X-ray of the spine is indicated when an organic cause of pain is suspected or if the duration of pain is 4 weeks or more. The basic are anteroposterior (AP) and lateral projections in a standing position. The curvature and arrangement of the spine, pedicles (deleted in the AP projection are used in tumor processes), vertebral height, etc. are evaluated. Oblique images are recommended for the display of spondylosis, with the “Decapitated Scottish Terrier sign”. Very valuable are dynamic tests for bending and tilting and assessing the stability, mobility event. displacement of vertebrae in a given segment.
- Computed tomography (CT) shows better tumors, fractures and spondylolysis without listhesis.

- Magnetic resonance imaging (MRI) is indicated for better imaging of soft tissues, especially neurological structures and paraspinal muscles. It is very useful in tumors, infections and discopathy.
- Bone scintigraphy is used to visualize occult fractures, spondylolysis, infections, bone metastases and to distinguish from degenerative changes.

Other complementary examinations

- Laboratory tests may confirm an infectious, rheumatological, or oncological process (e.g. leukemia).
- Electromyography is suitable for objectifying the involvement of peripheral nerves.

As part of the anamnesis and objective examination, some data are often associated with more serious diagnoses and should therefore be given more attention. They are so-called “Red flags” and could be interpreted as signs of danger. Table 1 shows the “red flags” for the management of back pain [4].

“Red flags” in personal history	“Red flags” in objective examination
Oncological disease	Severe or progressive neurological deficit
Weight loss / loss of appetite	Loss of sensitivity in the saddle area
Pain at night or during rest	Decreased anal reflex
Sphincter difficulties	Fever
Unexplained fever	Severe or progressive neurological deficit
Recent infection	
Imunosupresia	
Morning stiffness	
Trauma	
Age < 4 years	
Duration of pain > 1 month	

Table 1: ‘Red flags’ for back pain in children [4].

Figure 3 shows a design of a management algorithm for a pediatric patient with back pain. Care must be taken in indicating and choosing radiological examinations - incorrect indications can ultimately be counterproductive for the patient (possible radiation exposure or incorrect indications for surgical treatment of radiological findings) and for the health care system (increased healthcare costs and unnecessary workload for medical staff).

Causes of back pain

Back pain is a symptom, not a diagnosis. In some cases, we reveal a clear etiology of pain, but in most cases the cause is unknown. Then we talk about non-specific back pain. An overview of the causes of back pain is given in table 2.

Non-specific back pain

It is a back pain without a clearly known or provable basis. It is the most common form of back pain (95 - 99%), but it is a diagnosis made by exclusion. The pain can be localized in any part of the back and can propagate in various ways, so it can also act as radicular

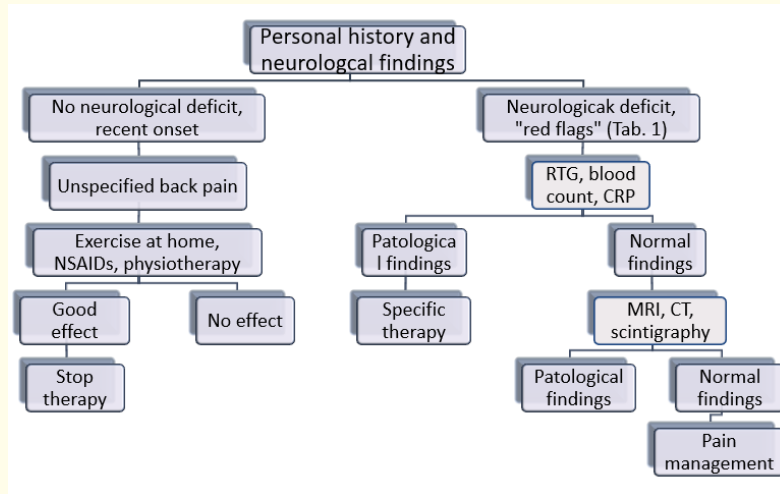


Figure 3: Proposed management of a pediatric patient with back pain (adapted according to 5).

Causes of back pain	
Organic causes	Spondylolysis and spondylolisthesis
	Scheuermann’s disease
	Spondylodiscitis
	Herniated disc
	Spinal tumors
	Scoliosis and other deformities of the spine
	Rheumatic cause
	Traumatic cause
Inorganic causes	Non-specific pain

Table 2: Causes of back pain.

pain. The intensity of the pain depends on physical activity and often limits the movement. It is thought to be the result of minor physical changes (e.g. rupture) in muscles, ligaments, intervertebral discs or posterior joints of vertebrae that cannot be accurately identified by imaging. Some studies with PET (positron emission tomography) have revealed lesions at the junction of the spine and muscles. In further studies with standing MR and school bags, an imbalance in the distribution of the load on the intervertebral discs was found. Numerous studies have pointed to factors associated with genesis or pain perception: lifestyle (sedentarism, excessive sports activity), obesity, school-related factors (carrying bags, posture), and psychological (depression, low self-esteem). Treatment consists in the identification and elimination of the above-mentioned factors (active lifestyle), in the administration of analgesics, in physiotherapy, and often in psychological counseling [3].

Spondylolysis and spondylolisthesis

Spondylolysis is a defect in the pars interarticularis of the vertebral arch. It can be uni- or bilateral and most often affects the L4 and L5 vertebrae. It occurs mainly in boys and athletes who strain the spine with repeated extension, flexion and rotation. It can occur acutely, but more often with excessive and repeated physical activity.

Spondylolisthesis occurs in bilateral spondylolysis with subsequent ventral displacement of the vertebra to the next vertebra. According to the degree of displacement of the vertebral bodies, spondylolisthesis is divided into 4 grades: in the first one, the ventral displacement is up to 25% of the AP dimension of the body of the second vertebra, in the second grade 25 - 50%, at third grade 50 - 75% and at fourth grade > 75%. It occurs more often in girls, especially during the spurt period.

According to the literature, these processes are the most common cause of organic back pain in children between the ages of 10 and 15 [1,3]. In the clinical picture, we encounter pain in the LS area associated with physical activity or long standing. If listhesis is significant, it can cause pressure on the nerve roots and cause radicular pain or neurological deficit. In the objective finding we see lumbar hyperlordosis, spasms and palpable pain of the paravertebral muscles ipsilaterally, and shortening of the hamstrings. In diagnosis, oblique X-rays are used in spondylolysis, where we find the so-called "Sign of a decapitated Scottish Terrier" (Figure 4) and in spondylolisthesis lateral and AP X-rays, event. CT and SPECT examinations. As part of the treatment, it is important to limit physical activity until the pain subsides. wearing a corset. For high-grade spondylolisthesis, a surgical solution is needed.

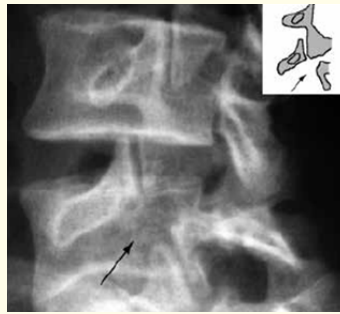


Figure 4: Image of a "decapitated Scottish Terrier" on oblique X-rays in spondylolysis.

Scheuermann's disease

It is the second most common cause of organic back pain in children [3]. The onset of the problem is before puberty and is commonly assessed as poor posture, which can delay the diagnosis. Patients are usually asymptomatic, but pain may be present mainly during prolonged standing, late hours, and exercise. In the objective finding, we see a rigid Scheuermann's kyphosis (mainly in the Th region, less often in the LS), which does not disappear with ventral flexion. Neurological and cardiological difficulties occur in severe conditions with a spinal curvature of more than 100°. X-rays in lateral and AP projection are key in diagnostics. The treatment consists of physiotherapy, wearing a corset event. surgical solution, according to the degree of disability.

Spondylodiscitis

It is an infection of the intervertebral disc and adjacent vertebrae. The most common cause is *Staphylococcus aureus* (in endemic areas we must not forget about tuberculosis!). They are most common in young children, with a maximum incidence at the age of 3 years, as the infection is usually of hematogenous origin and vascularization of the discs is still present at this age. Younger children are often unable to express their difficulties correctly and the only symptom is refusal to walk or sit. Older children, on the other hand, report very severe back pain with propagation to the lower limbs and paravertebral muscle contractures. Fever, elevation of inflammatory markers and changes in blood counts are not always present, so diagnosis may be delayed. Changes in normal X-rays (reduction of intervertebral spaces, irregularities of the edges of adjacent vertebrae) are present for up to 2 - 4 weeks from the beginning of the problem, so MRI is the first choice imaging method in this case (Figure 5). Treatment consists of antibiotics. In case of refractory to treatment, biopsy puncture of the vertebra should be considered to identify the agent.



Figure 5: MR finding in spondylodiscitis at L5 level in 17r. patients.

Disc herniation

This represents a displacement of the disc beyond the boundaries of the vertebral cover plates. According to the degree of ejection, we distinguish “bulging”, protrusion, extrusion and sequestration of the disk. According to the location in relation to the vertebrae, central, paramedial, foraminal and extraforaminal hernias. The incidence in the pediatric population is very low - around 0.2 to 3.2%. In the clinical picture, we encounter radicular pain, most often in the LS area or in the gluteal region, together with lumbar muscle contractures up to flattening of lumbar lordosis. The pain is often exacerbated by leaning forward, sneezing or coughing. We objectively detect weakness in the respective myotome, sensory disturbances with distribution according to the given dermatome, reduced deep tendon reflexes and in some cases a positive Lasegue test. The method of selection in the display is MR (Figure 6). Analgesics, muscle relaxants (often in infusion form), physical therapy and, in severe cases, surgical treatment are used in the treatment.

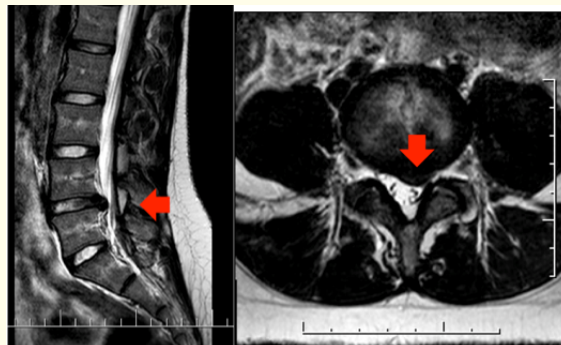


Figure 6: MR finding of L4/5 disk protrusion in 17r. patients.

Tumors of the spinal cord and spine

They are manifested by severe pain that is not related to physical activity and has a night predominance. They can cause oppression on nerve structures and consequently radicular pain or paraparesis/paraplegia of the lower limbs. Among benign tumors, osteoid osteoma,

osteoblastoma, eosinophilic granuloma and bone cysts are the most common. Among malignant tumors, the most common are Ewing's sarcoma, osteosarcoma, leukemia, metastases from neuroblastomas or rhabdomyosarcoma. There are key imaging examinations in diagnostics, especially MR (Figure 7).



Figure 7: MR finding of meningeoma at the level of L4-5/S1 in 11r. patients.

Scoliosis

Mild scoliosis usually does not cause pain. These occur in about 23% of patients with scoliosis, especially with a curvature of more than 50° [3]. Management is highly individual and belongs to the hands of orthopedists. Conservative procedure, physiotherapy, orthoses and surgery are possible therapeutic strategies.

Rheumatological causes

Juvenile rheumatoid arthritis mainly affects the C spine, while spondyloarthropathy is more of the LS area and sacroiliac lesions. Reactive arthritis, psoriatic arthritis and inflammatory bowel disease may present with spondyloarthropathy. Clinically, these processes are manifested by back pain with classic morning stiffness and relief of pain during physical activity. In the objective finding, the mobility of the LS area is usually limited (Schober test). A detailed examination of the other joints is important. X-rays can show widening of the joint spaces and erosion. MR examination reveals inflammatory changes in the earlier stages (Figure 8). Treatment consists of physiotherapy, non-steroidal anti-inflammatory drugs, antirheumatic drugs and biological therapy [1].



Figure 8: MR finding of sacroiliitis in 12r. patients.

Conclusion

Back pain is a common symptom in children. Although in most cases it is non-specific pain, more serious causes (such as tumor processes or spondylodiscitis) must be ruled out. Imaging tests are key in the diagnostic process, but their unnecessary use can be counter-productive for the patient and the healthcare system. Treatment depends on the etiology of the condition and in the case of non-specific back pain, the removal of risk factors is important.

Bibliography

1. Houghton KM. "Review for the generalist: evaluation of low back pain in children and adolescents". *Pediatric Rheumatology Online Journal* 8 (2010): 28.
2. Kjaer P, *et al.* "Prevalence and tracking of back pain from childhood to adolescence". *BMC Musculoskeletal Disorders* 12 (2011): 98.
3. García Fontecha C. "Dolor de espalda". *Pediatrics Integral* 18.7 (2014): 413-424.
4. Kordi R and Rostami M. "Low Back Pain in Children and Adolescents: an Algorithmic Clinical Approach". *Iranian Journal of Pediatrics* 21.3 (2001): 259-270.
5. Bernstein RM and Cozen H. "Evaluation of Back Pain in Children and Adolescents". *American Family Physician* 76.11 (2007): 1669-1676.

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