

Chapter 5

Physical Examination of the Child or Adolescent with Back Pain



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A careful, detailed history is an essential prerequisite to the physical examination and guides the focus of the examination [1, 2]. The onset, location, duration, severity, frequency, and exacerbating or relieving factors of the pain should be documented. A story of trauma should be noted. A history of fever, night pain, or weight loss should be ascertained, as these can indicate a more serious problem. Morning stiffness suggests an inflammatory problem. The history suggests a short differential diagnosis. The physical examination helps to further refine the list of causes or potentially confirm the diagnosis. After these two critical parts of the evaluation are completed, the physician can determine if investigation with additional imaging modalities is needed. The best initial imaging test is usually a posteroanterior (PA) and lateral plain radiograph of the area of the spine causing pain. Advanced imaging studies such as an MRI scan are ordered on a case by case basis in collaboration with the specialist physician.

Evaluation of the child with back pain starts with the overall condition of the child. Obtain height, weight, and temperature if infection is suspected. If the child is excessively short with a spine deformity, suspect a skeletal dysplasia. Compare weight to previous weight to determine if there has been a marked change. Is the child well or sick? Note the maturity status, nutrition, overall appearance, presence of generalized laxity, or unusual stiffness.

Spine examination starts with inspection of standing posture and gait. Is the child comfortable and well balanced, off to the side, or pitched forward? Limping should be noted or the inability in a younger child to walk. The child should be given adequate space for proper assessment of the gait cycle, typically outside the examination room in the hallway. A heel-toe gait pattern suggests normal function of the L4 and S1 nerve roots [1]. A waddling Trendelenburg gait indicates weakness of the gluteal muscles, often from hip pathology, but could be from L5 or S1 weakness due to spinal pathology.

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For inspection, the child should wear a gown with the opening in the back. The child should wear underpants or shorts for complete evaluation of the lower back and extremities. The examiner looks for skin lesions such as the café au lait spots of neurofibromatosis, hairy patches, lipomas, or birth marks as these can indicate an underlying neurologic or bone problem [3] (Fig. 5.1). The child should stand with

Fig. 5.1 (a) A photograph of the skin of the lumbar spine with a hairy patch. (b) A 12-year-old girl with neurofibromatosis type 1. Notice the numerous large café au lait marks and upper right thoracic dystrophic scoliosis. There is also a cervical-thoracic plexiform neurofibroma with previous biopsy incision in the upper thoracic spine



Fig. 5.2 Photograph of a high-arched or cavus foot. (From Dreher et al. [8]. Reprinted with permission from Springer Nature)



knees straight to identify any pelvic obliquity, which could represent a possible limb length discrepancy. The spine is inspected for obvious curvature, which can be confirmed by palpation. The examiner should look for symmetry of the shoulder blades and of the waist or difference in shoulder heights. The head should rest centered above the pelvis, and a truncal shift suggests an abnormal curvature of the spine.

The contour of the trunk should be inspected from the front, behind, and sides. Looking from the side, the examiner should note the presence or absence of the normal cervical lordosis, thoracic kyphosis, and lumbar lordosis. Inspection should always include the feet, as a high-arched or cavus foot could indicate intraspinal pathology (Fig. 5.2).

Palpation starts with the posterior elements in the midline. The examiner feels for areas of tenderness, deviation, or a step-off. The paraspinal muscles and the facet joints are palpated for tenderness. The sacroiliac joints and the iliac crests are also palpated [2].

Range of motion should be assessed, with forward flexion to touch the floor expected (Fig. 5.3). Inability to do so could reflect anterior spine column pathology or hamstring tightness. Back extension may cause pain coming from the posterior elements of the spine. To assess rotation, the examiner stabilizes the pelvis with both hands while the patient rotates in each direction. Lateral bending to each side completes the range of motion assessment.

A careful, detailed neurologic examination comprises the next portion of the exam. Strength, sensation, proprioception, and reflexes are tested. It can be helpful to try to do the exam by the neurologic levels of function [3]. A focused exam can be achieved by asking the patient to walk on the heels, toes (gastrocnemius), and outsides of the feet (tibialis anterior), squat down, and rise up from squatting position (quadriceps and hamstrings and gluteus maximus). The Gower maneuver is

Fig. 5.3 A patient doing the Adams forward bend test with a scoliometer



done by asking the child to sit on the floor and then to stand up. Proximal weakness, such as seen in Duchenne muscular dystrophy (DMD) or other muscle diseases, will be evident if the hands are needed to assist in becoming upright. If the examiner personally does these maneuvers and asks the patient to do them as well, it can be perceived as a game with younger children. Since so many children have chronic lifestyle-related weakness of their core muscles associated with their back pain, in this context, consider specifically testing their trunk and hip core muscle strength. Ask the child to do ten well-executed push-ups, five deep squats, and ten sit-ups. Stressing the body a little can help bring out weakness that would not be apparent with just static testing.

The sensory dermatomes are delineated as follows:

- L1. The sensory distribution of the L1 root is anterior hip in the inguinal area.
- L2. The dermatome for L2 resides on the anterior thigh.
- L3. Sensory distribution of the L3 root covers the anterior aspect of the knee.
- L4. L4 sensory distribution is the anteromedial aspect of the lower leg.
- L5. The L5 dermatome is the anterolateral aspect of the lower leg.
- S1. The S1 dermatome includes the perineum and the posterior aspect of the leg extending to the lateral two toes.

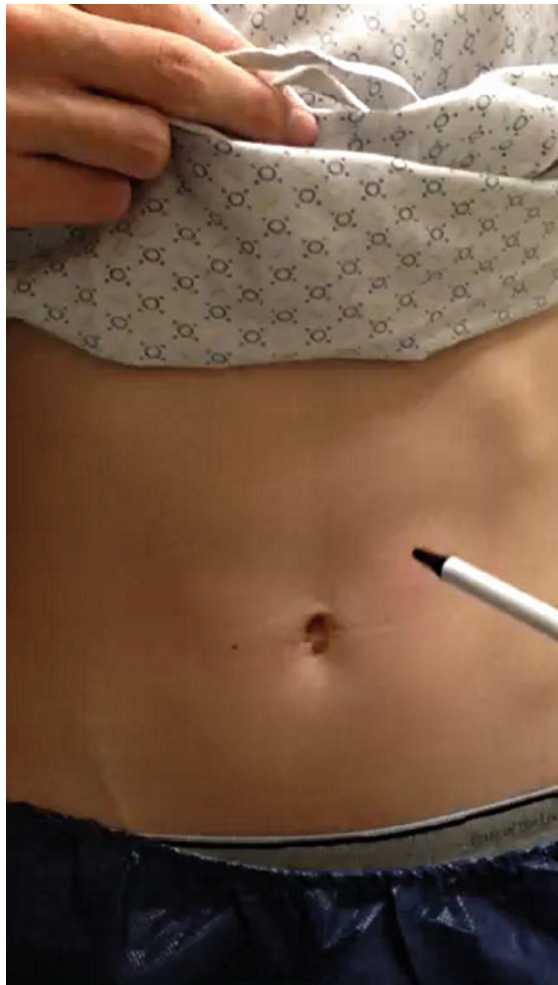
Motor strength is tested by neurologic level, as outlined in Table 5.1. Deep tendon reflexes like the knee jerk and ankle jerk should be tested as well as the plantar response, looking for a Babinski sign. With the patient supine, abdominal reflexes should be tested. Each quadrant of the abdomen should be stroked diagonally toward the umbilicus to elicit a response (Fig. 5.4). Asymmetry or absence of abdominal reflexes can indicate spinal cord pathology, most commonly syringomyelia [4].

Special testing can provide focused information. The flexion, abduction, and external rotation (FABER) test is used for the sacroiliac joints. One leg is placed in figure four position with the foot crossed at the knee. Pressure on the inside of the

Table 5.1 Motor function by neurologic level

Motor test	Nerve root(s)	Nerve
Hip abduction	L5	Superior gluteal
Hip adduction	L2–L4	Obturator
Hip flexion	T12–L3	Nerves from T12 to L3
Hip extension	S1	Inferior gluteal n.
Knee extension	L2–L4	Femoral n.
Foot dorsiflexion, inversion	L4	Deep peroneal n.
Great toe extension	L5	Deep peroneal n.
Foot eversion	S1	Superficial peroneal n.

Data from Hoppenfeld [3]

Fig. 5.4 Photograph of the umbilical reflex

flexed knee and the contralateral iliac crest elicits back pain if there is sacroiliac joint pathology [5]. The single leg extension or “stork” test isolates unilateral posterior element pathology [1]. The patient stands on one leg, and the back is gently extended. Straight leg raising in the supine position assesses hamstring tightness or lower back pathology.

One challenge is differentiating between organic back pain and nonorganic or functional pain. Traditionally, several signs known as Waddell signs – symptom magnification, pain with axial compression or rotation, diffuse tenderness, nonanatomic sensory distribution, and changing exam with distraction – were consistent with a nonorganic cause [6]. Another author, however, suggests that Waddell signs do not adequately discriminate between organic and nonorganic causes of pain [7].

Pearls

- The child with such stiffness that it is painful to touch the knees or is very slow to touch the knees may have painful enough back pain to warrant further evaluation.
- If the child can bend so far forward that they can touch the floor with their palms, they likely have ligamentous laxity.

Editor Discussion

For the young child under 5 years of age with back pain, one should always think about discitis as an etiology. Always assess their temperature, although it may not be elevated. For more chronic discitis, appetite may be affected and weight loss is possible. Finally, the child with discitis may walk a little slower than usual, have a mild limp, and be reluctant or slow to bend forward to touch the floor.

For video on how I perform the 2 minute screening examination of the child’s spine, visit POSNAcademy.org.

R.M. Schwend

The physical exam and the history are the foundation in the workup of a child with back pain. Simple findings on a focused physical exam such as a cavus foot, tight hamstrings, kyphosis, a hair patch at the bottom of the spine, or a fever can alert the physician as to the need for complementary imaging and laboratory tests.

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