
2.1

Medical History

Evaluation of a child with scoliosis should begin with a comprehensive and complete history followed by physical examination. The history should begin with prenatal information taken from the parents including health problems, previous pregnancies, medications taken during the pregnancy, and if any sonographic surveillance was performed, whether there were abnormal findings. Inquiries regarding length of gestation, type of delivery, child's presentation at birth, birth weight, and complications during birth, if any, should also be made (Akbarnia 2007). It is important to have information regarding other medical problems especially of the genitourinary, cardiac, and nervous systems, and also of other musculoskeletal disorders such as DDH, club foot, and brachial plexus injuries (Winter 1983). General information regarding previous operations or illnesses may help to reveal disorders in other organ systems (McCarthy 2001).

It is important to ask about developmental milestones and the presence of cognitive delay, difficulties in learning, gait abnormalities, etc. (Wynne-Davies 1975).

2.2

Physical Examination

The purpose of the physical examination is both to access the spinal deformity, and to try and eliminate other associated disorders. At this young age group, the child should be examined fully undressed except for underpants. Examination starts with the inspection of

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Fig. 2.1 Port-wine hemangioma is seen around the lower lumbar spine that is indicating an occult spinal dysraphism

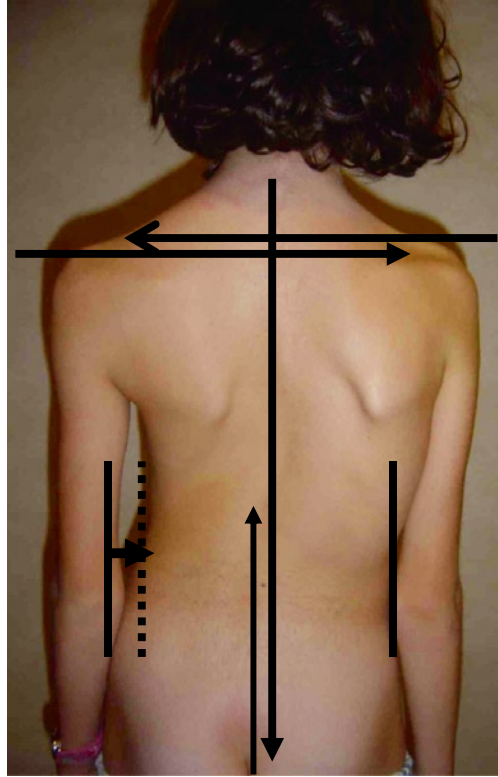


the global body balance, the child's posture and body habitus, symmetry of the limbs, arm spans, and chest or flank asymmetry as well as inspection of the skin for any pigment changes such as café-au-lait spots, axillary or groin freckles as seen in neurofibromatosis (NF), hairy patches, hemangiomas or sinuses along the back midline indicating spinal dysraphism (Fig. 2.1).

The clinical plumb-line should be accessed in both coronal and sagittal planes by using a plumb bob. The bob is dropped from the C7 spinous process down and beyond the gluteal crease (Fig. 2.2). In the normal spine it will fall within 1–2 cm of the midline. Global pelvic balance should be examined by palpating both iliac crests and if obliquity and leg-length discrepancy (LLD) are suspected, repeating the examination with small wooden blocks underneath the short extremity will allow elimination of the LLD contribution to the pelvic obliquity (Fig. 2.3a, b).

The next step should be the evaluation of the range of motion of the spine, the flexibility of the curve, and the amount of rotation as measured by the angle of trunk rotation (ATR) using the scoliometer while the child is positioned in the Adam's forward-bending test (Fig. 2.4) (Bunnell 1984). The test should be performed twice, once when the examiner is standing directly behind the child, and a second time when looking down from the head toward the buttocks. This can be sometimes difficult in very young children with early

Fig. 2.2 Shoulder height inequality, waist asymmetry, and loss of coronal balance are some of the physical features that can be observed during the physical examination of a child with early onset scoliosis



onset scoliosis (EOS) and can be simulated by laying the child in a prone position over the examiner's knee. Accessing curve flexibility can be evaluated in a similar way by placing the child in a lateral position.

Chest excursion should be examined by placing both hands over the child's chest from behind, and asking the child to take a deep breath (Fig. 2.5a, b). Limitation in chest excursion may indicate syndromic scoliosis or thoracic insufficiency syndrome (Campbell et al. 2003).

Next, the child is asked to walk in the room. First in a regular way followed by walking on tip toes and then, walking on heels. This will allow testing most of the muscle function of the lower limbs.

The child is then placed supine on an examination table. Limb range of motion is examined to detect either contractures around any of the joints or generalized hyperlaxity (Fig. 2.6a–c). Leg length should be accessed by measuring the distance between the anterior superior iliac spine and the medial malleolus of each leg, and then by repeated measuring of the distance between the umbilicus and the medial malleolus. Differences in both these measurements will detect true LLD, while by measuring of the different lengths between these types of evaluation; a component of pelvic obliquity should be suspected and further investigated.

Fig. 2.3 Limb-length inequality may be a cause of scoliosis. **(a)** Scoliosis in this patient was caused due to an overgrowth of the right leg, which was treated with epiphysiodesis of the distal femoral and proximal tibial growth plates. **(b)** Upon correction of limb-length discrepancy, the scoliotic deformity has also markedly regressed with no other treatment

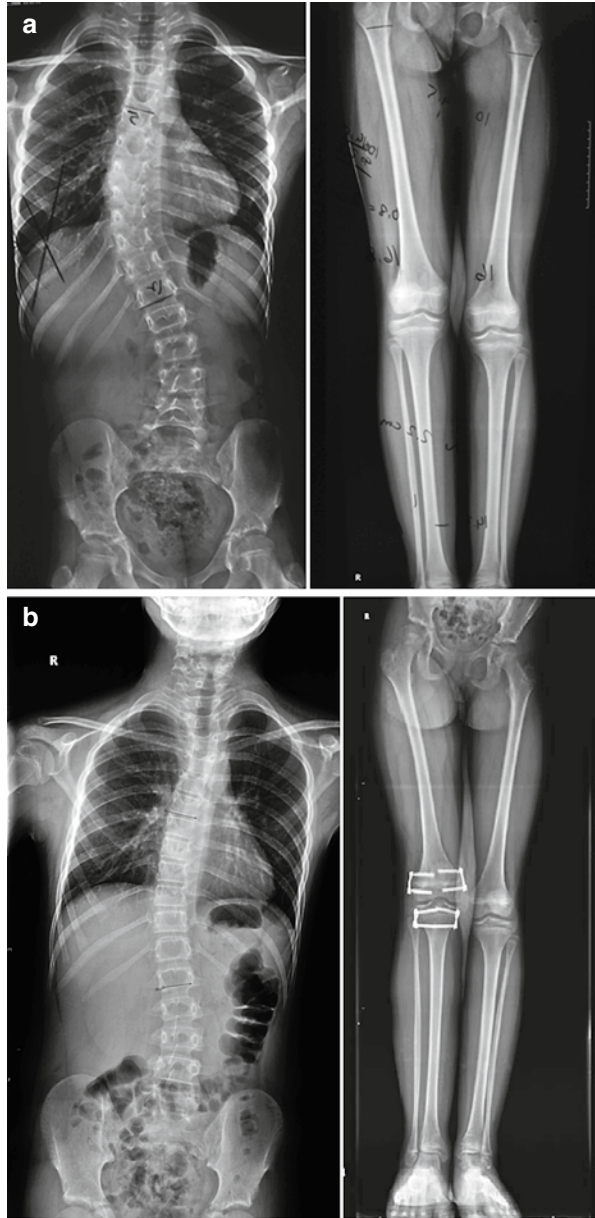


Fig. 2.4 A rib hump, thoracic in this figure, will become more prominent with the Adams forward-bending test, as explained in the test

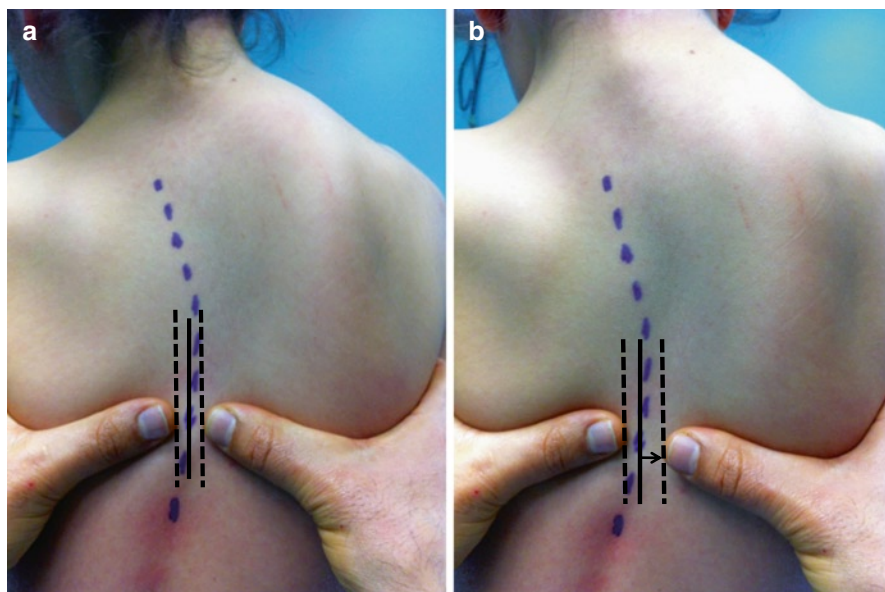
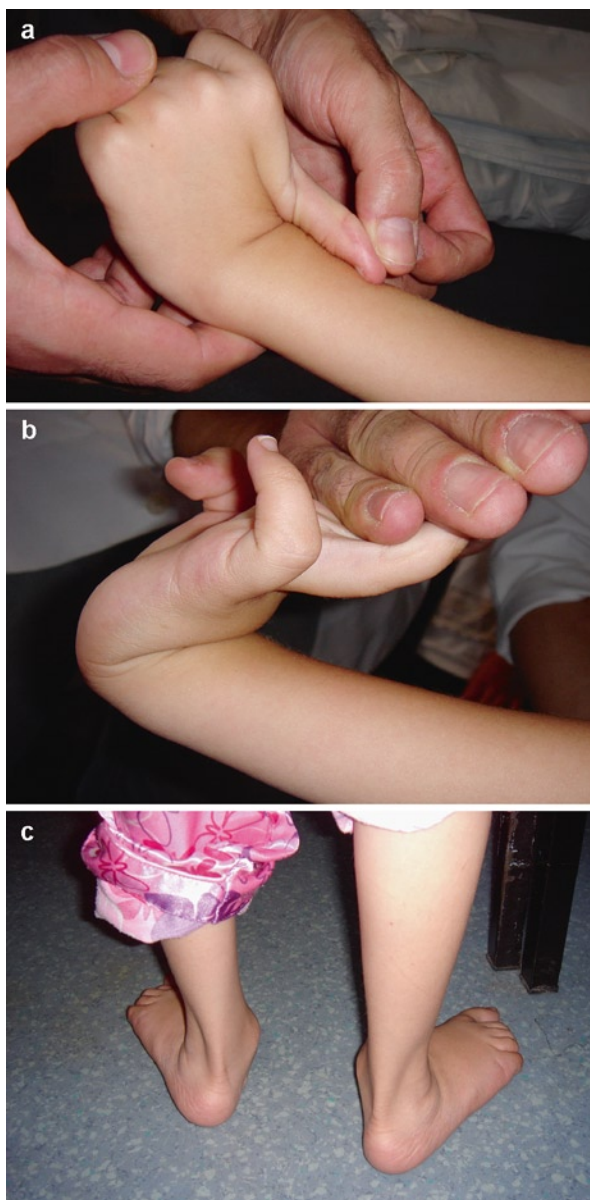


Fig. 2.5 Thumb excursion test: at rest (a) and inhale (b). During inhalation, while right thumb moves laterally away from the spine, left one stays at the same position because of chest hypokinesia secondary to rib fusion

Fig. 2.6 (a) Hyperlaxity may be associated with scoliosis and its diagnosis depends on several findings. Thumb hyperlaxity is demonstrated in this figure. The patient's thumb can be painlessly brought to contact the dorsal aspect of the forearm. (b) Another finding of hyperlaxity is the ability to bring the fingers to a position that is parallel to the forearm. (c) Flexible pes planus may be another indicator of generalized hyperlaxity



Finally, the neurologic examination is completed by performing clonus and Babinski testing of the feet, tendon reflex testing on both upper and lower extremities, followed by abdominal reflexes. Absence of this latter reflex may be indicative of underlying neurologic problems (Zadeh et al. 1995).

After completing a full physical examination, a radiological evaluation of the child should be carried out (Dobbs 2001, Schwend 1995). The plain radiograph evaluation is discussed in a separate chapter.

2.3

Pulmonary Evaluation

The pulmonary system can be significantly affected by the structural changes brought about by scoliosis and this is one of the reasons for increased morbidity and even mortality in children with EOS. This is due to both intrinsic (amount of alveoli) and extrinsic (thoracic volume) factors. Some of these children with severe deformities might even suffer from thoracic insufficiency syndrome (TIS), defined as the inability of the thorax to support normal respiration & lung growth (Campbell and Smith 2007). The most common respiratory defect in scoliosis is restrictive, with a decrease in vital capacity (VC) and forced expiratory volume in 1 s (FEV1) in correlation with the severity of the deformity. Therefore, it is advisable that all children with EOS should undergo pulmonary evaluation prior to any surgical treatment. Pulmonary function tests are the best means to perform preoperative assessment, yet some of these children are too young to collaborate and successfully perform these tests. In such cases a multispecialty evaluation should be performed separately by the pediatric orthopedist, pediatric pulmonologist, and pediatric anesthesiologist.

2.4

Cardiac Evaluation

In patients with congenital anomalies, preexisting morbidities, and those with severe scoliosis curves, the cardiac system might be affected. There can either be primary additional congenital cardiac anomalies or secondary impairment related to the severity of the deformity possibly leading to cor pulmonale. In such cases it is advisable to refer the child to a pediatric cardiologist for examination and to perform investigations including ECG and echocardiogram.

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