McCance: Pathophysiology, 6th Edition

Chapter 43: Alterations of Musculoskeletal Function in Children

Key Points – Print

SUMMARY REVIEW

Musculoskeletal Development in Children

1. Skeletal growth and development consists of two phases: (1) delivery of bone cell precursors to sites of bone formation, and (2) the aggregation of these cells at primary centers of ossification where they mature to secrete osteoid.
2. Ossification takes place in two centers in long bones: (1) the primary center, or the diaphysis (the long, central portion of the bone); and (2) the secondary center, or the epiphysis (the end portions of the bone).
3. Peak bone mass is achieved by the mid- to late 20s.
4. By 1 year of age 50% of the total growth of the spine has occurred, and most children have achieved 50% of their adult height by 2 years of age.
5. The appendicular skeleton (extremities) grows faster during childhood than does the axial skeleton.
6. Muscle fibers reach their maximal size in females at 10 years of age and at 14 years of age in males.

Musculoskeletal Alterations in Children

1. The most common congenital defect of the upper extremities is syndactyly (webbing of the fingers).
2. Developmental dysplasia of the hip is a serious and disabling condition in children if not diagnosed and treated.
3. Congenital muscle disorders (myopathies) include absence of muscles, hypoplasia, hyperplasia, and faulty intrinsic development.
4. Osteogenesis imperfecta (brittle bone disease) is genetic disorder of collagen that affects primarily bones and results in serious fractures of many bones.
5. Rickets is a condition caused by deficiencies in vitamin D, calcium, and usually phosphorus that is characterized by the failure of bones to become mineralized (ossified) and results in skeletal deformity.
6. Scoliosis is a lateral curvature of the spinal column that can be caused by congenital malformations of the spine, neuromuscular disease, trauma, extraspinal contractures, bone infections, metabolic bone disorders, joint disease, and tumors.

7. Osteomyelitis is a local or generalized bacterial infection of bone and bone marrow. Bacteria are usually introduced by direct extension from a nearby infection, through the bloodstream, or by trauma.
8. JRA is an inflammatory joint disorder characterized by pain and swelling.
9. Avascular diseases of the bone are collectively referred to as osteochondroses and are caused by an insufficient blood supply to growing bones.
10. Legg-Calvé-Perthes disease is one of the most common osteochondroses. This disorder is characterized by epiphyseal necrosis or degeneration of the head of the femur followed by regeneration or recalcification.
11. Osgood-Schlatter disease is characterized by inflammation or partial separation of the tibial tubercle caused by chronic irritation, usually as a result of overuse of the quadriceps muscles. The condition is seen primarily in muscular, athletic adolescent males.
12. The muscular dystrophies are a group of genetically transmitted diseases characterized by progressive atrophy of symmetric groups of skeletal muscles without evidence of involvement or degeneration of neural tissue. There is an insidious loss of strength in all forms of the disorder with increasing disability and deformity.
13. Benign bone tumors include nonossifying fibroma, simple bone cysts, aneursysmal bone cysts, osteoid osteoma, and fibrous dysplasia.
14. The two main types of malignant childhood bone tumors are osteosarcoma and Ewing sarcoma.
15. Osteosarcoma, the most common malignant childhood bone tumor, originates in bone-producing mesenchymal cells and is most often located in the distal end of the femur or proximal end of the tibia.
16. Most childhood osteosarcoma tumors occur between the ages of 10 and 18 years.
17. Ewing sarcoma originates from cells within the bone marrow space and is located most often in the midshaft of long bones or in flat bones.
18. Ewing sarcoma is more common in males and is diagnosed most often between the ages of 5 and 15 years.
19. Pain is the usual presenting symptom for either osteosarcoma or Ewing sarcoma.
20. The primary treatments for osteosarcoma are surgery and chemotherapy. The primary treatment for Ewing sarcoma is a combination of chemotherapy, radiation, and surgery.
21. The most common type of childhood soft-tissue tumor is rhabdomyosarcoma.
22. Rhabdomyosarcoma originates from embryonal rhabdomyoblasts that normally differentiate into mature striated muscle.
23. Clinical manifestations of rhabdomyosarcoma depend on the anatomic location; superficial tumors exhibit a painless palpable mass, whereas deep-seated tumors cause functional impairment.
24. Rhabdomyosarcoma is treated with a combination of surgery, radiation, and chemotherapy.

Nonaccidental Trauma

1. Nonaccidental trauma must be considered with any long bone injury in a preambulatory child.
2. Evidence of soft tissue injury, corner fractures, and fractures at different stages of healing are extremely helpful in making a diagnosis of nonaccidental trauma.
3. When nonaccidental trauma is suspected, a child must be evaluated radiographically for other fractures, head trauma, and retinal hemorrhage.
4. All social strata are at risk.
5. The healthcare provider is legally responsible to report suspected nonaccidental trauma.