Chapter 6
The Musculoskeletal System

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Questions

1. Cerebral palsy, a movement and posture disorder:
   1. Is seen in 1–2/1,000 children, making it the most common childhood movement disorder
   2. Is initially diagnosed when the child exhibits delayed motor development
   3. Does not have identifiable risk factors in most cases
   4. Has a changing clinical picture despite the static nature of the neurologic damage
      A. 1, 2, 3
      B. 1, 3
      C. 2, 4
      D. 4 only
      E. All of the above

2. Even though many cases of cerebral palsy (CP) do not have an identified etiology, there are known associations such as:
   1. Birth asphyxia
   2. Prematurity
   3. Intrauterine growth restriction (IUGR)
   4. Family history
      A. 1, 2, 3
      B. 1, 3
      C. 2, 4
      D. 4 only
      E. All of the above

3. Children with CP may also have which of the following:
   1. Seizures
   2. Normal intellect
   3. Mental retardation
   4. Communication disorders, hearing and visual dysfunction
      A. 1, 2, 3
      B. 1, 3
      C. 2, 4
      D. 4 only
      E. All of the above

Answers

1. E. All of the above

This condition is the result of an anomaly or insult to the immature CNS, but in many, if not most cases, a specific antecedent event or cause cannot be identified. The term static encephalopathyis often used synonymously with cerebral palsy. The incidence of CP is 7:1,000 live births and prevalence is 5:1,000 of the population. Cognitive impairment is not a consistent feature of CP, although many affected children do have a lower than normal IQ. Between 30–70 % of children with CP do have impaired intellect. Many children with CP also have seizures. CP is described by the clinical appearance:

Spastic diplegia
Spastic quadriplegia
Spastic hemiplegia
Extrapyramidal atonic
Mixed

2. A. 1, 2, 3

The association of CP with prematurity is changing as neonatal care improves. The incidence is decreasing in heavier preterm newborns, but VLBW (very low birth weight) infants have a higher incidence.
Clinical types of CP:

Spastic diplegia: Lower extremity involvement, seen in low birth weight infants, after intraventricular hemorrhage. Severe mental deficits less common than in other types.
Spastic quadriplegia: All four extremities involved. More severe mental deficiencies, seizures likely. Scoliosis, feeding problems more common.
Extrapyramidal: Decreased tone, choreoathetosis seen. Fewer seizures and more normal development seen in these patients.
Atonic: Hypotonia, brisk reflexes seen only in this type, severe cognitive delays.

3. E. All of the above

Overall, approximately 60 % of CP patients have mental retardation (MR). Children with spastic forms have a higher incidence of MR, which increases with the number of limbs involved. Learning disorders, deafness, and sensory impairment are also seen in these children. Impaired oromotor function may lead to difficulties with speech or aspiration pneumonia. One-third of children with CP have seizures.

4. Treatments for CP include:
   1. Braces and/or splints
   2. Intramuscular injections of botulinum toxin and/or phenol
   3. Surgery
   4. Neuraxial administration of baclofen to decrease spasticity
      A. 1, 2, 3
      B. 1, 3
      C. 2, 4
      D. 4 only
      E. All of the above

5. Septic arthritis:
   1. Is slightly more common than hematogenous osteomyelitis in children
   2. Occurs more often in infants and young children
   3. May present in infancy with fever, poor feeding, and subtle asymmetry of soft tissue folds
   4. In infants most often, involves the hip
      A. 1, 2, 3
      B. 1, 3
      C. 2, 4
      D. 4 only
      E. All of the above

6. Talipes equinovarus congenita (clubfoot):
   1. Has an incidence of 1:1,000
   2. May be bilateral or unilateral
   3. May be treated conservatively until the second birthday
   4. May be effectively treated with casting in up to 70 % of cases
      A. 1, 2, 3
      B. 1, 3
      C. 2, 4
      D. 4 only
      E. All of the above

7. Which of the following are associated with or characteristic of osteogenesis imperfecta?
   1. Defects in collagen formation
   2. Bones with thin cortices
   3. Deafness
   4. B-cell immunodeficiencies
      A. 1, 2, 3
      B. 1, 3
      C. 2, 4
      D. 4 only
      E. All of the above

4. E. All of the above

Treatments are directed toward maximizing motor function. Physical therapy and positioning techniques may delay the development of contractures. Bracing is most often used for foot and ankle problems. Botulinum toxin or phenol injection may temporarily decrease spasticity.

5. E. All of the above

The role of arthrotomy vs. needle aspiration in the treatment of septic arthritis is controversial although many would opt for arthrotomy in cases involving the hip joint. IV antibiotics should be given for 4–6 weeks. The differential diagnosis of an infant with fever, joint pain, and elevated WBC count includes juvenile rheumatoid arthritis, cellulitis, and toxic synovitis.

6. A. 1, 2, 3

Clubfoot is more common in males. Casting, if done early (in the neonatal period), with the casts being changed every few days, may successfully treat mild forms of talipes equinovarus (from the Latin *talus* [ankle] + *pes* [foot]; *equino* indicates the heel is elevated like a horse's and *varus* indicates it is turned inward) in about one-third of cases.

7. A. 1, 2, 3

OI is a group of disorders characterized by brittle bones. Still's classification system has six types, with varying degrees of bone fragility, different associated findings, and inheritance patterns.

Associated findings in these patients include middle-ear deafness, blue sclerae, short stature, andthin skin.

8. Regarding developmental dysplasia of the hip (DDH), formerly called congenital dislocated hips (CDH):
   1. It can be diagnosed in the newborn with the Barlow and Ortolani tests.
   2. In the newborn it is diagnosed with plain X-rays of the hips.
   3. It is more common in girls and newborns who were born in breech presentations.
   4. It is treated with surgery followed by bracing for 6 months.
      A. 1, 2, 3
      B. 1, 3
      C. 2, 4
      D. 4 only
      E. All of the above

9. Slipped capital femoral epiphysis (SCFE):
   1. Is more common in males
   2. Often presents with limp
   3. Is often accompanied by obesity
   4. Is commonly bilateral
      A. 1, 2, 3
      B. 1, 3
      C. 2, 4
      D. 4 only
      E. All of the above

10. Scoliosis:
    1. Is defined as a lateral curvature of the spine
    2. May compromise pulmonary function
    3. Has both congenital and acquired etiologies
    4. Involves rounding of the back in the thoracolumbar area of the spine
       A. 1, 2, 3
       B. 1, 3
       C. 2, 4
       D. 4 only
       E. All of the above

8. B. 1, 3

DDH occurs more frequently in firstborns. More than 20 % of children with DDH have a positive family history, and it occurs six times more frequently in girls than in boys. The degrees of hip dysplasia (in order of increasing severity) are dislocatable, subluxable, and dislocated hips. X-rays are of little value as a diagnostic aid before 6 months of age since bony changes are not apparent. Ultrasonography is used in some centers and in Europe, but interpretation is difficult.

9. A. 1, 2, 3

In SCFE, the femur is rotated externally from under the epiphysis. About one-fourth of children have bilateral involvement, but not simultaneously. Obesity is commonly seen in affected children. In Legg-Calve-Perthes (LCP) disease, which is seen in younger (4–8 years) children than SCFE, there is ischemic necrosis of the proximal femoral epiphysis and later resorption. With subsequent reossification, there may be collapse of the femoral head. As a group, affected children have shorter stature and delayed bone age compared to their peers.

10. A. 1, 2, 3

Types of scoliosis include idiopathic (80 %), congenital (5 %), neuromuscular (10 %), and miscellaneous (5 %). Miscellaneous causes include genetic disorders and connective tissue diseases.

Although idiopathic scoliosis requiring correction is much more common in girls than boys, mild curves are found equally in both genders. Scoliosis curves >25° are likely to increase if the child is still growing. Curves of 40–50° will increase even if growth is complete, and curves >75° will affect pulmonary function.

Congenital scoliosis can be complete or partial and is often associated with other congenital anomalies. Associated anomalies include renal agenesis or obstructive uropathy, congenital heart disease, or spinal dysraphism. Congenital scoliosis is seen in children with VATER or Klippel-Feil syndrome and meningomyelocele.

11. Which of the following organisms are associated with sepsis occurring after orthopedic surgery?
    A. *Haemophilus influenzae* type B
    B. *Neisseria gonorrhoeae*
    C. Staphylococci
    D. Enteric gram-negative rods

12. Juvenile rheumatoid arthritis:
    1. Has a prevalence of 60–100/1,000,000
    2. Is much more common in females
    3. Is divided into three subtypes: systemic-onset, polyarticular, and pauciarticular
    4. Generally first presents in young children, before the age of 6–7 years
       A. 1, 2, 3
       B. 1, 3
       C. 2, 4
       D. 4 only
       E. All of the above

11. C.

Staphylococci. While perioperative antibiotics are important in the prevention of postoperative sepsis, overuse or extended administration of antibiotics has been implicated in the increased incidence of *Clostridium difficile* toxin-related diarrhea.

12. E. All of the above

JRA is one of the more common chronic illnesses of children. This disease affects approximately 200,000 children in the USA. It commonly presents at either 1–3 years of age or in adolescence.

Girls are affected twice as frequently as boys with both polyarticular and pauciarticular forms, while the sex incidence is equal in systemic-onset disease. Affected children often have growth retardation, anemia, and chronic uveitis. Severity is based on the degree of impairment in tasks of life. Treatment includes NSAIDs, disease-modifying antirheumatic drugs (DMARDs) such as methotrexate and sulfasalazine, tumor necrosis factor (TNF) blockers such as etanercept (Enbrel) and adalimumab (Humira), immune suppressants such as abatacept (Orencia), rituximab (Rituxan), anakinra (Kineret) and tocilizumab (Actemra), steroids, and gold to decrease inflammation.

Physical therapy, occupational therapy, and surgery are used to preserve function, and counseling and nutritional support round out the picture for interventions in this chronic disease. Differential diagnosis includes systemic lupus erythematosus, Lyme disease, or Kawasaki disease.

Clinical types:

Systemic: Ill appearance associated with high fevers, irritability, rash, splenomegaly. Polyarticular: Involvement of >5 joints for 6 months or more. Subdivided into seronegative or seropositive. More common in girls.

Pauciarticular: Peak age at 2 years; large joints are generally involved.