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THE JOURNAL OF BONE & JOINT SURGERY

CONTINUING MEDICAL EDUCATION

CME

REVIEW QUESTIONS

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OCTOBER, NOVEMBER, DECEMBER  
2008

THIS CME EXAM IS ALSO AVAILABLE AT JBJS.ORG AS AN INTERACTIVE ONLINE EXAM.

THE DEADLINE TO SUBMIT YOUR ANSWERS FOR GRADING  
THIS SET OF QUESTIONS IS APRIL 15, 2009.

## OBJECTIVES

The objectives of this CME program are:

- To provide the general orthopaedic surgeon with an ability to assess his or her continuing competence in orthopaedics through the acquisition of contemporary scientific information.
- To provide a broad-based review and update of the major subspecialty areas in orthopaedics.
- To make *The Journal* reader aware of new advances in orthopaedic surgical techniques and technology.

## INSTRUCTIONS

In order to benefit most from this educational experience and qualify for Continuing Medical Education credit, please observe the following instructions:

1. Read the learning objectives listed on the Response Form and be certain that they meet your individual learning needs.
2. These CME questions have been derived from the information presented in the October, November and December issues of the 2008 American volume of *The Journal of Bone and Joint Surgery* (Vol. 90-A). A careful study of each article should yield the best response to each question.
3. Record your answers and complete all portions of the attached Response Form in the back of this document. Upon successful completion of the examination, you may claim up to ten category-1 CME credits. However, to claim up to ten credits to satisfy self-assessment examination requirements mandated by the Maintenance of Certification process, you must take the *online* JBJS quarterly examination.
4. In order for the American Academy of Orthopaedic Surgeons to document your participation in the CME activity, Academy Fellows must provide their AAOS membership number in the designated area on the Response Form.
5. In addition to providing the answers to the CME questions, you must complete the examination evaluation questions. These questions are found on the Response Form. The way you answer these evaluation questions will not in any way affect the score that you achieve.
6. All completed answer sheets will be graded, and you will be advised of the results of this examination within four weeks after it is received. In order to qualify for CME credit, a score of more than 50% correct must be achieved on the examination. The charge must be paid at the time that the answer sheet is submitted. **The deadline to submit your answers for grading this set of questions is April 15, 2009.**

1. **A twenty-five-year-old man sustains a closed Schatzker type-II fracture of the tibial plateau in a motor-vehicle accident. He has no medical comorbidities, such as diabetes, metabolic bone disease, or peripheral vascular disease, and no other injuries to the extremity. You determine that open reduction and internal fixation with bone-grafting is the best treatment option and plan to use calcium phosphate cement rather than autogenous iliac bone graft. The use of calcium phosphate cement rather than autogenous bone graft has been associated with a reduction in the prevalence of which of the following complications?**
  - A. nonunion
  - B. malunion
  - C. hardware failure
  - D. fracture displacement
  - E. articular subsidence
2. **The development of radiographic guidelines to quantify the amount of lateral compartment gapping that occurs with applied varus stresses would be helpful in the evaluation of lateral or posterolateral soft-tissue knee injuries. In a recent cadaver study, the authors performed sequential sectioning of the lateral and posterolateral ligaments and tendons and the anterior and posterior cruciate ligaments, applied a varus stress, and documented the lateral gap with radiographs. With clinician-applied varus stress, the average increase in lateral compartment gapping was 2.7 mm after an isolated fibular collateral ligament tear. The authors recommended that one should suspect a combined posterolateral knee, anterior cruciate ligament, and posterior cruciate ligament injury if the lateral gapping produced under a clinician-applied varus stress is greater than:**
  - A. 3.5 mm
  - B. 4.5 mm
  - C. 5.8 mm
  - D. 6.8 mm
  - E. 7.8 mm
3. **Many factors contribute to a patient's perception of disability. In one study, objective impairment of elbow motion correlated best with:**
  - A. general health status
  - B. arm-specific disability
  - C. activity-specific disability
  - D. pain
  - E. secondary gain
4. **Anteroposterior pelvic radiographs made with the patient alternating between right and left single-leg-stance (flamingo) views allow a dynamic evaluation of pelvic motion that may identify pathologic motion missed on traditional radiographs. The authors of one study investigated the extent of normal motion at the pubic symphysis in normal volunteers and found that:**
  - A. men have greater motion than women
  - B. multiparous women have more motion than nulliparous women
  - C. men have greater motion than nulliparous women
  - D. younger subjects of either sex have more motion than older subjects
  - E. smokers have less motion than nonsmokers
5. **A sixty-five-year-old fisherman was climbing from his boat to the dock and, without any trauma, felt a snap in his right knee. He could not walk or extend his knee. He went to the emergency room and was diagnosed with a complete nontraumatic rupture of the quadriceps tendon. Vascularity and hypoxia have been proposed as risks for tendon ruptures. Which of the following statements regarding vascularity of the quadriceps tendon is least true?:**
  - A. the blood supply of the quadriceps tendon is provided by three major vascular arcades: medial, lateral, and peripatellar
  - B. the most superficial layer of the quadriceps tendon (the rectus femoris) is less vascular than the deepest layers
  - C. different vascular zones in the quadriceps tendon have been identified; greater vascularity is observed close to the patellar insertion and close to the musculotendinous junction
  - D. the poorest vascular zone is noted between 1 and 2 cm from the proximal pole of the patella (vascular zone 2)

6. **The authors of a study of data in the Finnish Arthroplasty Registry found that, in patients between the ages of fifty-five and seventy-four years old, the use of cementless rather than cemented implants resulted in a lower risk of revision due to aseptic loosening. However, with an end point of revision for any reason, Kaplan-Meier analyses demonstrated no difference in survivorship between the two groups (cementless and cemented fixation) because the cementless group had a greater prevalence of:**
- periprosthetic fracture
  - recurrent dislocation
  - revision due to excessive wear of the polyethylene liner
  - fracture of the femoral component
  - infection
7. **In a review of the results of eighty-three total shoulder arthroplasties with use of a metal-backed, bone-in-growth glenoid component, twenty-six shoulders underwent a revision that included removal or replacement of one or both components. The most frequent finding at revision surgery was:**
- impingement restricting a full range of motion
  - a massive tear of the rotator cuff
  - polyethylene wear
  - loosening of the glenoid component
  - loosening of the humeral component
8. **A fifty-six-year-old man presents with pain in the left shoulder following a skiing accident that he had had the previous weekend. The findings of the physical examination and magnetic resonance imaging are consistent with a diagnosis of a massive rotator cuff tear. Because repairs of these types of tears have been reported to have a high surgical failure rate, the use of rhBMP-12 on a collagen sponge may be considered as an adjunct to surgical repair. It is thought that augmentation of the surgical repair with rhBMP-12 on a collagen sponge may result in accelerated healing on the basis of studies that demonstrated the mechanical properties of the repair tissue in treated sheep to be:**
- greater than those in untreated animals but less than those of normal tendon at eight weeks after surgery, with gap formation between the infraspinatus tendon and the insertion on the proximal part of the humerus
  - equal to those of normal tendon at eight weeks but with gap formation
  - greater than those in untreated animals but less than those of normal tendon at eight weeks after surgery and with elimination of gap formation
  - equal to those of normal tendon at eight weeks after surgery and with elimination of gap formation
9. **Many patients who were formerly engaged in athletic activities but were forced to quit those activities because of arthritis of the hip or knee wish to know whether they can return to athletic activities after lower-extremity total joint replacement. Although there have been no Level-I studies addressing this topic, you can advise patients that several retrospective studies suggest that, following total joint replacement:**
- there is an increase in the athletic activity of both younger and older patients
  - there is an increase in the athletic activity of younger patients but not that of older patients
  - there is a decrease in the athletic activity of older patients but not that of younger patients
  - there is a decrease in the athletic activity of younger patients but not that of older patients
  - there is a decrease in the athletic activity of both younger and older patients
10. **The development of ossification around the elbow has been considered to be a poor prognostic factor for surgery designed to restore motion. In a study comparing patients with heterotopic ossification about the elbow who underwent open elbow contracture release and removal of the heterotopic bone with patients without heterotopic ossification who underwent open elbow contracture release, the authors found that the improvement in the range of elbow motion in the group with heterotopic ossification was:**
- worse than that in the group without heterotopic ossification
  - the same as that in the group without heterotopic ossification
  - better than that in the group without heterotopic ossification
  - improved if postoperative radiation was given
11. **On the basis of a meta-analysis of randomized controlled trials of the use of pulsed electromagnetic stimulation to treat acute fractures of long bones, current evidence:**
- is insufficient to conclude that use of pulsed electromagnetic stimulation improves the rate of union
  - supports use of pulsed electromagnetic stimulation for treating tibial stress fractures
  - supports use of pulsed electromagnetic stimulation for pain relief early in fracture treatment
  - shows long-term increases (four weeks or more) in healing activity as seen with scintimetry
  - shows clinically improved outcomes in patients undergoing lengthy procedures on the lower extremities
12. **In a study of the use of knee arthroscopy in England and Ontario, arthroscopy was performed mainly for the treatment of internal knee derangement or dislocation and osteoarthritis. In contrast to patients who underwent arthroscopy for internal derangement, patients who received arthroscopy for treatment of knee arthritis were more likely to:**
- undergo total knee arthroplasty within a few years
  - be young
  - be women
  - be of a lower socioeconomic status
13. **A forty-two-year-old man presents with a four-week history of right triceps and wrist flexion weakness and increasing difficulty with balance, gait, and fine motor skills. He is found to have a large disc herniation at C6-C7 with compression of the spinal cord. The patient elects to undergo a single-level cervical disc arthroplasty rather than an anterior cervical discectomy and fusion. At two years postoperatively, he can expect that, compared with what he could expect if he had undergone an anterior cervical discectomy and fusion, he will have:**
- better neurological and gait function
  - better neurological function and equivalent gait function
  - equivalent neurological and gait function
  - worse neurological function and equivalent gait function
  - worse neurological and gait function
14. **A twenty-five-year-old male soldier presents with a grade-IIIB tibial fracture from a blast-type mechanism. During the initial surgery, you note a large zone of injury and you débride a substantial amount of muscle. You provisionally stabilize the tibial fracture with an external fixator and plan to return to the operating room in forty-eight hours for a repeat débridement and irrigation, definitive fracture fixation, and possible free tissue transfer. On the basis of a recent laboratory study, which of the following is true?**
- the débrided tissue contains multipotential progenitor cells that are similar to stem cells and may serve as precursors to heterotopic ossification
  - the débrided tissue is necrotic and acellular
  - the débrided tissue contains a substantial bacterial load that cannot be eradicated from the cells or tissue
  - the débrided tissue is traumatized but viable and as such should not have been débrided from the wound
  - the débrided tissue contains dead or dying myoblasts that have little-to-no regenerative potential
15. **A sixteen-year-old girl is to undergo a posterior spinal fusion from T4 to L3 for treatment of idiopathic scoliosis. In order to minimize blood loss, you as the surgeon are considering using an antifibrinolytic agent. Which of the following statements is most appropriate for you to make when you discuss the use of these agents with the patient and her parents?**
- these drugs are approved by the Food and Drug Administration for posterior spinal fusions
  - the cost-effectiveness of these agents has been established
  - tranexamic acid has a greater effect on reducing blood transfusions compared with epsilon-aminocaproic acid
  - these drugs would be used in an off-label manner
  - the reduction in blood loss has been well quantified in previous studies

- 16. A twenty-two-year-old right-hand-dominant college football quarterback is tackled, landing on his outstretched right hand. He complains of immediate medial elbow pain and numbness as well as tingling into the ring and small fingers. The history is negative for any prior elbow injury. Examination reveals a large hematoma at the medial aspect of the elbow and proximal part of the forearm. He has decreased sensation in the ulnar nerve distribution without any motor deficits. Clinical examination demonstrates gross valgus instability, and a stress radiograph shows 8 mm of medial joint space widening. A magnetic resonance imaging arthrogram demonstrates complete avulsion of the medial collateral ligament and flexor-pronator musculature from their origin, with distal retraction. No fractures are identified. What is the best management of this injury?**
- reconstruction of the medial collateral ligament with palmaris longus autograft
  - direct repair of the medial collateral ligament and flexor-pronator muscles
  - immobilization of the elbow in 90° of flexion for two weeks with progressive advancement of extension
  - ulnar nerve decompression and transposition
  - immobilization with the elbow in flexion and the forearm in supination
- 17. It is widely accepted that the quality of scientific evidence is highly associated with the likelihood of a manuscript being accepted for publication. In a recent study, the authors evaluated the role of nonscientific factors associated with acceptance for publication by JBJS-A. According to this study, authors were more likely to have their manuscripts accepted if they:**
- collaborated with investigators who had extensive publication experience
  - received grant support from a nonprofit organization
  - received research funding from industry
  - A and B
  - B and C
- 18. A sixty-eight-year-old woman with osteoarthritis of the hip is a candidate for total hip arthroplasty. She lives in a remote area and is concerned that the local community hospital and the staff orthopaedic surgeon perform total hip arthroplasty only once a month. She asks her internist to advise her on finding the right hospital and surgeon, and her internist reviews a recent study of Medicare patients who had undergone total hip arthroplasty. Which of the following statements describes the advice that the internist should provide the patient in terms of the risk factors for revision of the total hip arthroplasty?**
- patients operated on at lower-volume hospitals have a significantly higher risk of revision than those operated on at higher-volume hospitals
  - elderly patients have significantly higher risks of revision
  - patients operated on by lower-volume surgeons (those performing fewer than twenty-five operations per year) have a higher risk of revision in the six months following the total hip arthroplasty than those operated on by the highest-volume surgeons (those performing more than fifty operations per year)
  - patients operated on by lower-volume surgeons (those performing fewer than twenty-five operations per year) have a higher risk of revision in the five years following total hip arthroplasty than those operated on by the highest-volume surgeons (those performing more than fifty operations per year)
  - patients with fewer comorbid conditions have a lower risk of revision
- 19. A two-year and eight-month-old girl presents with progressive infantile idiopathic scoliosis. There is a large left thoracic prominence with a lumbar compensatory curve. The patient walks normally for her age and is neurologically intact, including symmetric abdominal reflexes. Radiographs demonstrate an 80° left thoracic curve with the apical vertebrae at T8 and T9 and a 45° compensatory lower lumbar curve with an apex at L1, with no congenital abnormalities. The clinical diagnosis is infantile idiopathic scoliosis with a left main thoracic curve. It is most likely that, in this patient, the apical vertebrae (T8 and T9):**
- rotate to the right and the right neurocentral synchondrosis growth is greater than the left
  - rotate to the right and the left neurocentral synchondrosis growth is greater than the right
  - rotate to the left and the right neurocentral synchondrosis growth is greater than the left
  - rotate to the left and the left neurocentral synchondrosis growth is greater than the right
  - have no rotation and the left and right neurocentral synchondroses have symmetric growth
- 20. A sixty-five-year-old man presents with a loss of lumbar lordosis and a clinical appearance of leaning forward once the hips and knees are fully extended. Radiographs show a previous spinal arthrodesis from L1 to S1. A plumbline dropped from C7 falls 13 cm anterior to S1. Radiographs do not show any evidence of a coronal imbalance. Which procedure is most likely to correct the malalignment?**
- Smith-Petersen osteotomy
  - cervical extension osteotomy
  - pedicle subtraction osteotomy
  - vertebral column resection
- 21. A seventy-two-year-old moderately heavy woman has severe osteoarthritis of the right knee. Her pain has steadily worsened over the past two years, and she has not experienced pain relief from treatment with oral pain medications or physical therapy. On examination, the range of motion is -10° of extension to 125° of flexion. Radiographs reveal complete loss of the medial joint space with sclerosis and osteophytes. This patient has an elevated risk of which of the following complications after total knee arthroplasty?**
- polyethylene wear
  - flexion contracture
  - infection
  - early loosening
  - patellar fracture
- 22. A sixty-five-year-old woman has a five-year history of progressive pain and loss of motion in the right knee. She is active, but knee symptoms and signs have forced her to give up yoga exercises. On examination, she has a mild varus deformity, but the ligaments are intact. The range of motion is 115° of flexion and -5° of extension. The unaffected knee has 130° of flexion, and the patient hopes that if she undergoes a total knee arthroplasty, flexion will be restored. In discussing the type of total knee arthroplasty that you would perform, you state that a recent study demonstrated that:**
- posterior cruciate ligament-retaining knee arthroplasty provided a superior range of motion compared with that provided by posterior cruciate ligament-substituting designs at two years postoperatively
  - posterior cruciate ligament-substituting knee arthroplasty provided a superior range of motion compared with that provided by posterior cruciate ligament-retaining designs at two years postoperatively
  - posterior cruciate ligament-retaining and posterior cruciate ligament-substituting knee arthroplasties provided comparable ranges of motion at two years postoperatively
  - patients with posterior cruciate ligament-retaining designs reported more pain than did those with posterior cruciate ligament-substituting designs at three months postoperatively
  - patients with posterior cruciate ligament-substituting designs reported greater functional improvement than did those with posterior cruciate ligament-retaining designs at three months postoperatively
- 23. To study multiple variables that influence range of motion following reverse shoulder arthroplasty, a computer model was developed to virtually simulate abduction-adduction motion and its dependence on five surgical and implant-related factors. The primary factor affecting adduction deficit was:**
- humeral neck-shaft angle
  - inferior position on the glenoid
  - center of rotation lateral to the glenoid

- D. inferior tilting of the glenosphere  
E. glenosphere diameter
- 24. A nine-year-old boy with a long leg cast presents to the clinic for cast removal. Which of the following conditions would generate the highest skin temperature during removal with an oscillating saw with a fresh blade?**
- A. plaster cast, four layers of cast padding, and the saw blade intermittently leaving the cast material during cutting (the up-and-down technique)  
B. fiberglass cast, two layers of cast padding, and the saw blade never leaving the cast material during cutting  
C. plaster cast, two layers of cast padding, and the saw blade never leaving the cast material during cutting  
D. fiberglass cast, four layers of cast padding, and the saw blade never leaving the cast material during cutting  
E. plaster cast, four layers of cast padding, and the saw blade never leaving the cast material during cutting
- 25. While orthopaedic instruments rarely break intraoperatively, there is little published information regarding guidelines for when broken instruments should be removed. A current study established guidelines for when a broken part should be retrieved. These include all except which of the following instances?**
- A. if it is loose  
B. if it penetrated both cortices of the bone  
C. if it lies near vessels or nerves  
D. if it lies near or in a joint  
E. if it is buried in one cortex of a long bone
- 26. A thirty-two-year-old man has had pain in an 18-cm amputation stump for two years following a traumatic trans-tibial amputation. On examination, there is tenderness both at the end of the amputation stump and with compression of the residual tibia and fibula. There is no drainage, but the end of the bone is covered with adherent scar. The remaining gastrocnemius is retracted and bunched just proximal to the residual tibial stump. The surgical technique that is most likely to decrease the weight-bearing symptoms is:**
- A. removal of adherent scar, application of a vacuum-assisted wound-closure device, and then distal skin-grafting  
B. free tissue transfer to the distal part of the stump  
C. shortening of the tibia enough to perform a tibiofibular bone-bridge procedure  
D. shortening of the tibia, creation of a tibiofibular bone bridge, and advancement of the gastrocnemius over the stump
- 27. An eight-year-old boy with an atrophic type of congenital pseudarthrosis of the tibia associated with neurofibromatosis type 1 underwent surgery to obtain osteosynthesis. Pathologic examination of fibrous hamartoma tissues excised during the procedure was performed. Fibroblast-like cells were enzymatically dissociated from the tissues and grown in tissue culture. Which of the following is most characteristic of this cell type?**
- A. a tendency to differentiate into chondrocytes  
B. osteoblastic differentiation by bone morphogenetic protein signal  
C. frequent malignant transformation (>1% in ten years)  
D. higher osteoclastogenicity than in normal periosteal cells  
E. no neurofibromin gene expression
- 28. A senior resident is caring for a fifty-year-old patient who was admitted to the hospital because of a complex fracture of the humeral shaft. A literature review shows that the injury can be treated either with immobilization in a sling or with open reduction and internal fixation. Because the resident has never performed this procedure and would like to gain experience with it, she considers recommending to the patient that he undergo operative treatment. This situation poses an ethical dilemma that is addressed by a principle known as the "Kantian ideal." Which of the following statements represents the Kantian ideal?**
- A. first, do no harm  
B. do only good  
C. do not treat a patient as a means to an end  
D. always respect the will of the patient
- 29. A forty-five-year-old man sustained a complex closed distal pilon fracture after jumping 10 ft (3 m) from a platform. You are planning to perform open reduction and internal fixation two weeks postinjury, after the swelling has receded. You plan an anterolateral approach with use of two incisions to address both the distal fibular and the distal tibial fracture. Of the following factors, which was found to be the least important in minimizing the likelihood of a wound complication?**
- A. width of skin bridge of >7.0 cm  
B. careful handling of the soft tissue  
C. cessation of smoking  
D. surgical timing  
E. adequate patient nutrition
- 30. A sixty-seven-year-old woman presents to you with a five-year history of low-back pain and activity-related pain that is experienced in both lower limbs. The lower-limb pain radiates from the buttocks into the posterior aspects of both thighs and calves. The patient is healthy and has no history of cardiac or peripheral vascular disease. She is a nonsmoker. Neurological examination demonstrates that the patient is neurologically intact and has good distal pulses. Plain radiographs of the lumbar spine demonstrate multilevel lumbar spondylosis with a spondylolisthesis at L4-L5. Dynamic lateral flexion and extension plain radiographs do not demonstrate segmental instability (in either translation or sagittal plane angulation). A T2-weighted magnetic resonance image of the lumbar spine demonstrates multilevel lumbar spinal stenosis with a degenerative spondylolisthesis of L4-L5. The patient has been treated with nonoperative therapies for two years. She agrees to undergo posterior lumbar spinal surgical decompression and fusion. Which of the following is true regarding the use of a lumbosacral corset following the surgery?**
- A. there is good evidence that the use of a postoperative corset will improve radiographic fusion rates  
B. as quantified by roentgen stereophotogrammetric analysis, a lumbar corset will significantly reduce lumbar intervertebral mobility  
C. there is limited evidence that bracing following lumbar spinal fusion is beneficial  
D. the use of a corset following surgery will improve patient-derived functional outcomes  
E. there is an increased prevalence of skin problems with use of a postoperative lumbar corset
- 31. A thirty-five-year-old man presents with a work-related injury of the dominant, right shoulder sustained three months ago. Clinical examination and imaging findings are consistent with a small full-thickness tear of the supraspinatus. The patient has been unable to work, and three months of physical therapy and a corticosteroid injection have failed. He is interested in discussing potential surgical intervention, but he is concerned that a coworker with a similar injury did not get better after a rotator cuff repair. On the basis of the findings of a recent study, you can tell him that, on the average, patients with a Workers' Compensation claim:**
- A. have a significant improvement after rotator cuff repair that is more robust than that of patients without a Workers' Compensation claim  
B. have a significant improvement after rotator cuff repair that is equal to that of patients without a Workers' Compensation claim  
C. have a significant improvement after rotator cuff repair that is less robust than that of patients without a Workers' Compensation claim  
D. do not have significant improvement after a rotator cuff repair
- 32. Pain developed in both hips and knees and in one shoulder of a thirty-two-year-old white woman six weeks after an uncomplicated pregnancy and delivery of a normal boy. She had three previous miscarriages, all in the first trimester. She has no history of alcohol abuse or use of steroids. Serum tests for inflammatory arthritis are negative, as are plain radiographs. Magnetic resonance imaging of the affected joints show Ficat Stage-1 osteonecrosis of all of the symptomatic joints. You conclude that the next diagnostic tests to be performed should be:**

- A. thrombophilia, hypofibrinolysis, and eNOS T-786C workup  
 B. there should be no further workup, and the femoral diagnosis should be "idiopathic"  
 C. marrow aspiration of the shoulder  
 D. core decompression of the more painful hip  
 E. determination of serum homocysteine levels
- 33. A forty-year-old man is brought to the emergency room following an automobile accident. He complains of right hip pain. The right lower extremity is shortened and has a loss of external rotation. Neurovascular examination reveals normal findings. Radiographs reveal a fracture of the femoral neck. As part of the process of obtaining his consent for the operation, you inform him that osteonecrosis of the femoral head may result from the injury because of disruption of blood supply to the femoral head. Which of the following arteries provides the major source of vascularity to the femoral head?**
- A. obturator artery  
 B. medial femoral circumflex artery  
 C. lateral circumflex artery  
 D. deep circumflex iliac artery  
 E. inferior metaphyseal artery
- 34. An infant with an idiopathic clubfoot deformity was treated with the Ponseti cast method shortly after birth. After application of a series of casts, a heel-cord tenotomy was performed. When the final cast was removed at the age of eight weeks, the foot was well corrected and had approximately 20° of ankle dorsiflexion. Bracing (shoes and bar) was then begun to maintain the correction. Now, at the age of twelve months, there has been a relapse of the foot into slight equinus and varus. The most likely explanation for this is:**
- A. excessive scar formation from the heel-cord tenotomy  
 B. poor compliance with the prescribed brace program  
 C. unrecognized teratologic clubfoot secondary to arthrogryposis  
 D. standing on the involved foot too early (at the age of nine months)
- 35. A sixty-five-year-old woman underwent uncomplicated total knee replacement. In the first twelve hours after the operation, the output in the suction drainage is 700 mL. When the dressing is changed, the knee is swollen and tense. In one study, a risk factor that was significantly associated with the development of a postoperative hematoma requiring surgical evacuation was:**
- A. a body mass index of >25 kg/m<sup>2</sup>  
 B. postoperative warfarin chemoprophylaxis against deep vein thrombosis  
 C. a history of a bleeding disorder  
 D. perioperative deep vein thrombosis  
 E. preoperative use of anticoagulation
- 36. A sixty-eight-year-old woman who is capable of community ambulation sustained a hip fracture after a simple fall. Surgery and the postoperative course were uneventful. At the time of a follow-up visit, her operating surgeon decides to initiate an osteoporosis workup. Which diagnostic set represents an adequate initial screening?**
- A. skeletal survey, parathyroid hormone, complete blood-cell count, basic metabolic panel, calcium, magnesium, and phosphate  
 B. computed tomography of the lumbar spine, parathyroid hormone, complete blood-cell count, basic metabolic panel, calcium, magnesium, phosphate, and thyroid-stimulating hormone  
 C. bone scan, 25-hydroxyvitamin D, parathyroid hormone, complete blood-cell count, basic metabolic panel, calcium, magnesium, and phosphate  
 D. dual x-ray absorptiometry scan of the lumbar spine and unaffected hip, 25-hydroxyvitamin D, parathyroid hormone, complete blood-cell count, serum electrolytes, calcium, magnesium, phosphate, creatinine, and blood-urea-nitrogen
- 37. A six-year-old boy with type-IV right unilateral radial deficiency visits the outpatient department. His index finger was pollicized one year ago. He now has poor grip strength (36% of the normal value). His activity performance at the moment:**
- A. is poor because there is a significant correlation between grip strength and activity performance  
 B. will improve after strength training  
 C. can be poor or good because the relationship between grip strength and activity performance is nonlinear  
 D. is good because good grip strength is not required for good activity performance
- 38. In comparison with two-dimensional imaging, the use of three-dimensional imaging in the preoperative planning for total shoulder arthroplasty can be expected to result in:**
- A. increased sensitivity in detecting humeral retroversion  
 B. more consistent recognition of anterior glenoid bone loss  
 C. greater discrepancy among observers regarding the location of glenoid bone loss  
 D. greater variability in glenoid version measurements compared with that on two-dimensional images
- 39. A twelve-year-old boy presents with lateral hindfoot pain of insidious onset. Physical examination demonstrates an overweight boy with pes planus. Passive inversion of the hindfoot by the examiner elicits peroneal spasm. Palpation of the sinus tarsi reproduces the patient's pain. Plain radiographs demonstrate dorsal talar beaking and pes planus. There is no evidence of tarsal coalition on magnetic resonance imaging; however, there is increased T2 signal in the lateral talar process and anterior aspect of the calcaneal neck. What anatomic variant is associated with dorsal talar beaking and may cause talocalcaneal impingement?**
- A. os subfibulare  
 B. confluent anterior and middle calcaneal facets  
 C. peroneus quartus  
 D. accessory anterolateral talar facet  
 E. os tibiale externum
- 40. A thirteen-year-old boy with a diagnosis of cerebral palsy (GMFCS Level III) is walking in a persistent crouch with approximately 40° of knee flexion. He has daily knee pain with prolonged walking and going up and down stairs. He had bilateral heel-cord and hamstring lengthening at the age of four years and a selective dorsal rhizotomy at the age of six. Physical examination indicates 15° knee-flexion contractures and external tibial torsion bilaterally. The family has noticed decreased endurance and a decline in his walking ability over the last six months. His school physical therapist advised a return visit to your office. After evaluation, you recommend surgical intervention. Which of the following procedures is the most likely to result in an optimal correction of the crouch gait?**
- A. patellar tendon advancement only  
 B. distal femoral extension osteotomy only  
 C. distal femoral extension osteotomy and patellar tendon advancement  
 D. hamstring lengthening  
 E. patellar tendon advancement and rectus femoris transfer
- 41. A twenty-year-old rugby player presents with pain in the left foot one week after sustaining an injury during a game. After falling under several players, he had immediate midfoot pain and difficulty bearing weight on the extremity. On examination, there is diffuse soft-tissue swelling around the midfoot and a plantar ecchymosis. Palpation across the tarsometatarsal joints produces pain, and any manipulation of the midfoot is resisted. You obtain bilateral recumbent anteroposterior oblique and lateral radiographs, which show negative findings. To further evaluate the possibility of a tarsometatarsal injury, the next most appropriate study is:**
- A. bilateral standing radiographs with the patient bearing as much weight as tolerated on the injured foot  
 B. stress radiographs  
 C. magnetic resonance imaging  
 D. computed tomography  
 E. injection of an anesthetic (e.g., lidocaine) into the midfoot
- 42. There is a good biologic rationale for the use of both**

- reamed and unreamed intramedullary tibial nail insertion to treat tibial shaft fractures. In a randomized controlled comparison of the two techniques, the authors found that:**
- the unreamed techniques were associated with significant reductions in reoperation risk for both open and closed fractures
  - the reamed techniques were associated with significant reductions in reoperation risk for both open and closed fractures
  - the overall reoperation rate at one year was higher than that in previous, smaller randomized trials
  - the reamed techniques were associated with significant reductions in reoperation risk for closed fractures, and the unreamed techniques were associated with a trend toward a reduced reoperation risk for open fractures
  - the dominant reason for the reoperations in the trial was infection
- 43. You are planning to conduct a randomized controlled trial of two treatment alternatives for patients with adolescent idiopathic scoliosis. You determine that it would be helpful to perform a prospective preference assessment before beginning recruitment. Prospective preference assessment is a tool used by some clinical investigators during the planning phase of a prospective study to investigate potential threats to the validity of future findings. Two of these threats are underenrollment and selective enrollment. Which of the following is another potential threat to the validity of study findings?**
- required risk reduction
  - nonadherence to protocol
  - random treatment assignment
  - physician's equipoise
- 44. An eighteen-year-old man fell on his dorsiflexed left wrist 1.5 years ago during a football game, and he has had wrist pain ever since. He thought that the wrist was "sprained" and never sought medical attention. On examination, he has limited global wrist motion and pain on palpation of the snuffbox. Plain radiographs show carpal collapse with scaphoid nonunion at the waist and increased density in the proximal pole. T1 and T2-weighted magnetic resonance images show no signal in the proximal pole. On the basis of a recent study, the preferred treatment for this problem is:**
- long arm thumb spica cast
  - arthroscopic reduction with Kirschner-wire stabilization
  - iliac crest inlay (Russe) graft
  - pedicled distal radial graft
  - volar wedge graft with a free vascularized medial femoral condyle graft and scaphoid screw
- 45. A ten-year-old girl with idiopathic scoliosis is interested in learning more about future nonfusion treatments to correct the deformity. Which of the following is a correct statement about an experimental study of spinal growth modulation with use of a tether?**
- the tether is designed to accelerate growth of the spine as tension is developed in the device
  - the proposed site of tethering is the anterior aspect of the spine on the convex side of the scoliosis
  - ideally, the tether will create lordosis of the thoracic spine as the scoliosis is corrected through growth modulation of the vertebrae
  - the tether prevents all motion of the treated motion segments
- 46. A twenty-three-year-old healthy man presents with pain in the right foot after injuring it two weeks previously in a soccer game. On examination, he has bruising under the plantar aspect of the midfoot. Initial weight-bearing radiographs made on the day of injury did not reveal a fracture or dislocation. You suspect that there might be an isolated injury to the Lisfranc ligament. The most appropriate next step is:**
- obtaining new weight-bearing radiographs of both feet
  - obtaining a magnetic resonance imaging scan of the right foot
  - prescribing non-weight-bearing gait with two crutches for six weeks
  - applying a short leg cast, allowing weight-bearing, and having the patient return for a radiograph in two weeks prescribing a removable walking boot to allow range-of-motion exercises but no weight-bearing and having the patient return for a radiograph in four weeks
- 47. A fifty-two-year-old male laborer sustained a fracture of the distal part of the humerus of the dominant arm one year ago. He was treated with a cast with the elbow in 90° of flexion for six weeks. He presents with pain and a restricted range of motion of -50° of extension with further flexion to 100°. There is no instability or malalignment of the healed fracture. He wishes to return to work as a laborer, in which occupation he routinely lifted objects weighing >10 kg. After discussing the patient's options, interposition arthroplasty is agreed to be the treatment of choice. Under these circumstances, which of the following outcomes is most likely?**
- the patient should expect almost normal restoration of flexion
  - pain relief is anticipated to be comparable with that following joint replacement
  - joint pain may not be eliminated, and function may not be fully restored
  - resection arthroplasty would be a better option for this patient
  - fusion would be a better option for this patient
- 48. A nineteen-year-old woman with a history of chronic left patellar instability has had increasing anterior knee pain for the past year, especially with climbing stairs. On physical examination of the left knee, she has patellofemoral crepitus and pain with patellofemoral grind. She also has a two-quadrant medial patellar glide and a four-quadrant lateral patellar glide with substantial lateral apprehension. Merchant radiographs demonstrate lateral patellar tilt and subluxation as well as lateral patellar joint-space narrowing. Magnetic resonance imaging demonstrates degenerative changes on the lateral patellar facet but no changes on the medial patellar facet. The patient no longer has relief with nonsteroidal anti-inflammatory drugs, physical therapy, or activity modifications. According to a cadaver study of patellofemoral loading patterns, the most appropriate surgical treatment for this patient would be:**
- arthroscopic chondroplasty
  - lateral release
  - anteromedialization of the tibial tubercle
  - trochleoplasty
  - repair of the medial patellofemoral ligament
- 49. A forty-five-year-old woman with a fifteen-year history of rheumatoid arthritis has moderate pain in the right elbow, which has a range of motion of -80° of extension to 110° of flexion. She falls and sustains a medial condylar fracture of the elbow. Radiographs are interpreted as showing grade-III arthritic involvement of the joint according to the Mayo classification. According to a study from the Mayo Clinic, which of the following factors is most important in determining whether to recommend a total elbow arthroplasty rather than open reduction and internal fixation of the fracture?**
- the patient's age
  - the preoperative arc of motion
  - the duration of the disease
  - the extent of the arthritis
  - the type of fracture
- 50. A two-year-old boy with neurofibromatosis-1 presents with progressive anterolateral bowing deformity of the left tibia. Anteroposterior and lateral radiographs of the left leg reveal increased medullary sclerosis and hour-glass reconstruction at the distal third of the tibia. In a study of ten patients with this deformity who underwent prophylactic bypass grafting with use of an allogeneic fibular graft as a concave weight-bearing strut and postoperative bracing, the authors found:**
- no increase in pseudarthrosis
  - secondary shortening in eight of the ten patients
  - no increase in varus deformity
  - procurvatum deformity in one of the ten patients
  - angular deformity of the ankle and knee joints in a minority of the patients

**RESPONSE FORM**

**EXAMINATION EVALUATION (mandatory)**

Did the January 2009 CME Review Questions meet these educational objectives\*:

1. Provide a broad-based review and update specifically in the areas of orthopaedic rehabilitation, trauma, and the knee?  
 Yes  No
2. Strengthen your problem-solving abilities related to patient care particularly in the areas of orthopaedic rehabilitation, trauma, and the knee?  Yes  No
3. Make you aware of new advances in orthopaedic surgical techniques and technology?  Yes  No

Comments (please comment on the quality of the questions and their relationship to your practice): \_\_\_\_\_

\*Note: These objectives will change every quarter.

**SURVEY (optional)**

1. Which of the following best describes your practice type?  
 General orthopaedics  
 General orthopaedics with subspecialty interest  
 Exclusively subspecialty  
 Resident or student  
 Researcher  
 Other: \_\_\_\_\_
2. What are your specialty interests? Please rank in order of importance (1 = highest importance).  

___ Adult	___ Spine
___ Geriatric	___ Hand
___ Pediatric	___ Rheumatology
___ Rehabilitation	___ Foot and Ankle
___ Sports	___ Other: _____
___ Trauma	
3. Which is your number-one priority to read when you receive *The Journal* (American volume only) each month?  
 Commercial advertising  Current Concepts  
 Classified advertising  Letters to The Editor  
 Clinical scientific articles  Basic scientific articles  
 Orthopaedic Forum  Instructional Course Lectures

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This activity has been planned and implemented in accordance with the Essential Areas and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint sponsorship of the American Academy of Orthopaedic Surgeons (AAOS) and *The Journal of Bone and Joint Surgery* (JBJS). The AAOS is accredited by the ACCME to provide continuing medical education for physicians. The AAOS designates this educational activity for up to 10 hours of category-1 credit toward the AMA Physicians' Recognition Award. Each physician should claim only those hours of credit that he/she actually spent in the educational activity.

The deadline to submit your answers for grading this set of questions is April 15, 2009.

**QUESTIONS?**

For payment questions, contact the Subscription Department at 781-449-9780, x1240. For questions regarding submitted tests, contact Kate Horgan at 781-449-9780, x1225. E-mail all other questions to [cme@jbjs.org](mailto:cme@jbjs.org).

**ANSWER KEY**

**Black out the correct answers**

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| 6. A B C D E  | 23. A B C D E | 40. A B C D E                     |
| 7. A B C D E  | 24. A B C D E | 41. A B C D E                     |
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| 10. A B C D   | 27. A B C D E | 44. A B C D E                     |
| 11. A B C D E | 28. A B C D   | 45. A B C D                       |
| 12. A B C D   | 29. A B C D E | 46. A B C D E                     |
| 13. A B C D E | 30. A B C D E | 47. A B C D E                     |
| 14. A B C D E | 31. A B C D   | 48. A B C D E                     |
| 15. A B C D E | 32. A B C D E | 49. A B C D E                     |
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