
THE JOURNAL OF BONE & JOINT SURGERY

CONTINUING MEDICAL EDUCATION

CME

REVIEW QUESTIONS

APRIL, MAY, JUNE
2009

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 OCTOBER 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.

DISCLOSURE

- Robert Poss, MD, Deputy Editor for Electronic Media, and Editor, JBJS CME Program, receives royalties from Stryker Corporation for development of a total knee arthroplasty design.
- James D. Heckman, MD, has no financial relationships or interests to disclose.

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 April, May, and June issues of the 2009 American volume of *The Journal of Bone and Joint Surgery* (Vol. 91-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. The online subspecialty CME activities repeat some questions that appear in the quarterly general CME activities. If you are participating in both activities and claiming CME credits, you must consider this duplication when determining the number of credits you claim for each activity. 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. The written quarterly CME activity cannot be used to satisfy SAE requirements as mandated by the ABOS. To claim SAE credit, you must successfully participate in the electronic version of this activity.
7. 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 October 15, 2009.**

1. **Maximizing knee flexion is a primary goal of successful total knee arthroplasty, and recently there has been interest in whether so-called high-flexion designs can improve the range of motion. In a study from Korea, patients undergoing bilateral total knee arthroplasty for a diagnosis of osteoarthritis were treated with a high-flexion design and retention of the posterior cruciate ligament on one side and a high-flexion design and substitution of the posterior cruciate ligament on the other side. An excellent range of motion was achieved, and the range of motion did not differ significantly between the two sides at two years postoperatively. Which of the following may have been a factor in producing the excellent results?**
 - A. a preponderance of women
 - B. low body mass index
 - C. excellent preoperative flexion
 - D. effective restoration of the joint line and posterior condylar offset
 - E. all of the above
2. **In a study of United States military personnel, age was found to be an independent risk factor for shoulder dislocation, with individuals between the ages of eighteen and thirty years old being at greatest risk. Which of the following potential confounding variables may best help explain this effect?**
 - A. sex
 - B. activity level
 - C. race
 - D. income
 - E. obesity
3. **You are asked to evaluate a healthy full-term male infant in the newborn nursery because of a lower-limb abnormality. The right lower extremity is 15% shorter than the left, and the right foot is missing the most lateral (fifth) toe. Radiographs show complete absence of the right fibula and fifth ray of the foot. In counseling the parents, you state that, on the basis of a long-term follow-up report, you believe that:**
 - A. the child will not need surgery
 - B. treatment with amputation of the right foot will require only one surgical procedure and fitting of a prosthesis
 - C. compared with amputation, lengthening and reconstruction of the right lower extremity will result in poorer lower-limb function
 - D. regardless of whether he is treated with amputation or limb-lengthening, the child can be expected to have a normal quality of life compared with that of controls
 - E. job satisfaction will be higher if the child is treated with limb-lengthening
4. **Knowing the precise mechanism of ankle fracture is important because it helps surgeons to assess the extent of soft-tissue injury and the sequence of injury on the basis of the fracture pattern seen on radiographs. In an in vitro study, the authors subjected cadaver ankles to**

- fracture loading that replicated the Lauge-Hansen pronation-external rotation mechanism with or without application of an external lateral force. They found that the most important factor determining the type of ankle fracture was:**
- bone quality
 - external rotational moment
 - foot position
 - the ratio of external rotational moment to abduction moment
- 5. During a total knee arthroplasty procedure on a sixty-eight-year-old woman with osteoarthritis of the right knee, the surgeon is informed by the operating room nurse that the conventional tibial liner that was gamma sterilized in inert gas by the manufacturer has been on the operating room shelf for five years. The surgeon is aware that the manufacturer changed its barrier packaging techniques two years ago and orders the nurse to discard the implant and open a newly arrived implant from the same manufacturer. His reasoning is that the newer implant is:**
- more likely to be sterile
 - less likely to be highly oxidized
 - more likely to resemble highly-cross-linked polyethylene in strength
 - less likely to be as mechanically strong as a liner gamma sterilized in air
- 6. When attending the annual meeting of the American Academy of Orthopaedic Surgeons (AAOS), you listen to a presentation of a study designed to assess the accuracy of the so-called saline-load test in determining the presence of a traumatic arthrotomy. Sixty consecutive patients undergoing knee arthroscopy were prospectively studied; all had the involved knee distended with saline solution after a single arthroscopic portal was made. The amount of fluid that had to be instilled in order to recognize extravasation of fluid from the portal (a positive test) was recorded. This study's level of evidence is:**
- therapeutic Level II
 - therapeutic Level IV
 - prognostic Level II
 - diagnostic Level I
- 7. A newborn baby is noted to have a complete brachial plexus birth palsy of the right upper extremity a few days after a breech delivery. He is seen for follow-up at the age of six months and is noted to have limited active shoulder abduction and external rotation. The biceps brachii is weak. Otherwise, the shoulder muscles are atrophic but have improved albeit weak motor function. The authors of a recent study of mice used botulinum toxin injections to determine the effects of muscle paralysis on shoulder development. On the basis of their findings, which of the patient's abnormalities is most likely to completely resolve as he gains full neurologic recovery?**
- glenoid retroversion
 - humeral hypoplasia
 - scapular hypoplasia
 - flattening of the humeral head
 - adduction contracture of the shoulder
- 8. A twenty-four-year-old male football player who sustained an axial load injury against the heel of a plantar flexed ankle is suspected of having a Lisfranc injury. Standard radiographs show equivocal findings with regard to instability, and the patient is unable to tolerate a weight-bearing radiograph. A recent study has shown that the strongest predictor of instability on magnetic resonance imaging is disruption of the:**
- plantar middle cuneiform-second metatarsal ligament (pC2-M2)
 - dorsal medial cuneiform-second metatarsal ligament (dC1-M2)
 - plantar medial cuneiform-first metatarsal ligament (pC1-M1)
 - plantar medial cuneiform-second/third metatarsal ligament (pC1-M2M3)
 - medial-middle cuneiform interosseous ligament (C1-C2)
- 9. An eight-month-old girl is diagnosed with developmental dysplasia of the hip with dislocation of the femoral head. The surgeon recommends closed or, if necessary, open reduction. A preoperative radiograph shows that the ossific nucleus of the proximal femoral epiphysis of the affected hip has not appeared. The surgeon recognizes that the treatment is associated with a risk of osteonecrosis of the femoral head. On the basis of a recent meta-analysis, which of the following statements is correct?**
- when all grades of osteonecrosis were considered, there was a decreased prevalence of osteonecrosis when the ossific nucleus was present
 - when all grades of osteonecrosis were considered, there was no significant difference in the prevalence of osteonecrosis when the ossific nucleus was present
 - when only grades-II, III, and IV osteonecrosis were considered, there was no significant difference in osteonecrosis when the ossific nucleus was present
 - When only grades-II, III, and IV osteonecrosis were considered, there was a higher prevalence of osteonecrosis when the ossific nucleus was present
- 10. A seventy-two-year-old woman presents with a soft-tissue mass in the right thigh that has been present for five months and has increased in size. It is not painful. Magnetic resonance imaging reveals a mass measuring 6 by 6 cm located in the sartorius muscle. An open biopsy is performed. The pathological diagnosis is high-grade myxofibrosarcoma. Which of the following is the most likely finding in a tumor sample?**
- telomerase activity without human telomerase reverse transcriptase (hTERT)
 - telomerase activity with telomere elongation (alternative lengthening of telomeres [ALT])
 - telomere shortening without telomerase activity
 - telomere shortening without hTERT
 - telomerase activity with a high level of alkaline phosphatase
- 11. A twenty-eight-year-old professional pitcher is referred to you because of shoulder pain with pitching. The pain is worst in the follow-through phase of the pitching motion. On physical examination, the pitching shoulder has a loss of >25° of internal rotation in comparison with that of the non-throwing shoulder. What is the most likely diagnosis?**
- a Type-I SLAP tear causing mechanical locking of the glenohumeral joint
 - a tight posterior aspect of the joint capsule causing a glenohumeral internal rotation deficit
 - internal impingement
 - scapular dyskinesis caused by nerve injury
 - a tear of the long head of the biceps tendon
- 12. A thirty-one-year-old man is admitted to the emergency room after being involved in a motor-vehicle accident. His chief symptom is lower-back pain. On examination, his vital signs are stable. There is tenderness on percussion of the L2 spinous process and the paraspinal muscles of the lumbar spine. There is no neurologic deficit. Plain radiographs and a computed tomography scan reveal a burst fracture of L2. The load-sharing score is 4 points. On the basis of a recent study, the appropriate surgical intervention would be:**
- posterior long-segment fixation
 - percutaneous reduction and cement fixation of the fracture
 - posterior short-segment fixation without posterolateral fusion
 - laminectomy and posterior short-segment fixation with posterolateral fusion
 - anterior decompression, fusion, and internal fixation
- 13. Conjunctival contamination from splashed debris during orthopaedic surgery places surgeons at risk for communicable diseases such as human immunodeficiency virus and hepatitis B and C. In a study that tested the effectiveness of various types of protective eyewear in preventing conjunctival contamination, the authors found that the least protective device was:**
- modern prescription glasses
 - standard surgical telescopic loupes
 - hard plastic contoured glasses
 - disposable plastic glasses
 - combination facemask and eye shield
- 14. A sixty-two-year-old woman presents with a four-month history of progressive right shoulder pain. Radiographs reveal a destructive calcified lesion in the proximal right**

- humeral metaphysis. After biopsy, the histologic diagnosis is low-grade chondrosarcoma. Staging studies reveal no evidence of metastatic disease. In this patient, the factor that is associated with a poor prognosis is:
- tumor grade
 - stage of disease
 - appendicular location of the tumor
 - female sex
 - her age
15. Heterotopic ossification is a common complication following high-energy wartime trauma. In a recently reported multivariate analysis, which of the following factors was significantly associated with an increased risk for the development of heterotopic ossification?
- lower-extremity trauma
 - the number of surgical procedures
 - the method of fracture fixation
 - blast injury
16. An active forty-year-old woman presents with right hip pain that occurs with everyday activity and at night. She has excellent motion on examination but a positive impingement sign. Plain radiographs show acetabular dysplasia with a normal joint space of 4 mm and a lateral center-edge angle measuring 10°. A magnetic resonance arthrogram shows a labral tear. The dGEMRIC index is 450 msec. Medical treatment with nonsteroidal anti-inflammatory drugs and physical therapy has not decreased the symptoms. What should be your next step?
- observation
 - intra-articular cortisone injection
 - hip arthroscopy with labral débridement
 - referral for possible pelvic osteotomy
 - total joint replacement
17. An ischemic insult to the proximal femoral epiphysis of a young child can result in conditions such as Legg-Calvé-Perthes disease. In an experimental study on piglets, a suture ligature was placed tightly around the femoral necks of sixty-five animals. When the animals were killed between two and eight weeks postinjury, the authors found that the majority had:
- complete infarction of the physis
 - continued growth of the femoral neck, albeit at a slower rate
 - no widening of the neck with time
 - complete cessation of neck growth
18. A forty-five-year-old man presents with a six-month history of right shoulder pain. There is no history of trauma. He is a construction worker and has been able to work but continues to have daily pain in the shoulder. Physical therapy for eight weeks has not helped to control the pain. Physical examination reveals 5/5 strength of the rotator cuff muscles. He has positive impingement signs. A magnetic resonance imaging scan is negative for rotator cuff tear. You think that the patient may benefit from a corticosteroid injection. A study of rats showed that a subacromial steroid injection has which of the following effects on the rotator cuff tendon?
- no effect on strength
 - transient weakness
 - long-term weakness
 - rupture
 - calcification
19. A seventy-two-year-old man who has a history of rheumatoid arthritis presents with increasing pain and poor function of the right shoulder. Examination reveals shoulder elevation of 60°, poor external rotation strength, and tenderness to palpation of the acromioclavicular joint. Magnetic resonance imaging of the shoulder reveals a massive rotator cuff tear and a large Hill-Sachs lesion that involves >50% of the humeral head. Which of the following factors might be a contraindication to humeral hemiresurfacing?
- a diagnosis of rheumatoid arthritis
 - poor shoulder elevation
 - acromioclavicular joint tenderness
 - massive rotator cuff damage
 - large Hill-Sachs lesion
20. A twenty-five-year-old right-hand-dominant man is referred for evaluation of the right shoulder. He sustained a traumatic anterior dislocation of the shoulder in a fall six years ago. There have not been any additional episodes of instability since. He is quite satisfied to maintain a strengthening program and moderate his physical activities to avoid the possibility of another dislocation. Physical examination demonstrates a full active and passive range of motion when compared with that of the contralateral shoulder. Although he has full strength, he has mild apprehension when the shoulder is in the abducted, external rotation position. Which is the most appropriate statement regarding his current shoulder function?
- it would be the same even if he had sustained recurrent dislocations
 - it would be better if he had undergone a Bankart repair following the initial dislocation
 - it is better than it would have been had he sustained recurrent dislocations
 - he will require a stabilization procedure in the future because of the high likelihood that he will sustain another dislocation
21. A seventy-year-old woman is visiting her grandchildren who live in Great Falls, Montana. While there, she falls on her outstretched right hand and sustains a closed fracture of the distal part of the radius. She is seen by a local orthopaedic surgeon, who recommends open reduction and internal fixation. She calls her daughter, who is an orthopaedic surgeon in Covington, Kentucky. The daughter's advice is for her mother to be treated nonoperatively. In a study that documented variations in treatment patterns, which of the following factors were most likely to be associated with the recommendation for treatment of this fracture?
- age and race
 - age and sex
 - sex and race
 - age and geography
 - geography and sex
22. A sixty-seven-year-old woman presents with back pain of two weeks' duration. The pain originated after she bent over to pick up her two-year-old grandchild. The patient reports that she is approximately 2 in (5 cm) shorter than she was when she was fifty. One year ago, she was diagnosed with a vertebral fracture at L1, after complaining of persistent back pain that had begun when she was unloading groceries from the trunk of her automobile. She underwent menopause at the age of fifty-two and had undergone hormone replacement therapy for two years, from the age of fifty-three to the age of fifty-five, to alleviate hot flashes. After the age of fifty-five, she began taking a daily multivitamin with 500 mg of calcium and 400 IU of vitamin D. Physical examination reveals tenderness in the thoracolumbar region. Lateral spine radiographs confirm a new severe vertebral fracture. What is the relative risk that the new vertebral fracture is at a level that is adjacent to the preexisting fracture rather than at a level that is not adjacent to the preexisting fracture?
- none
 - 2.5-fold
 - 5.0-fold
 - 10.0-fold
23. A sixty-nine-year-old woman presents with a seven-year history of intermittent knee pain that has worsened. Radiographs show end-stage arthritis. Despite treatment with anti-inflammatory medications and multiple steroid injections, the patient continues to have daily symptoms. She would like to undergo a total knee replacement and asks about the advantages of minimally invasive total knee arthroplasty, a concept that sounds attractive to her. With regard to the difference between a patellar eversion and a patellar subluxation technique, you can tell her that:
- patellar eversion is associated with a better range of motion postoperatively
 - patellar subluxation is associated with a better range of motion postoperatively
 - patellar eversion is associated with greater quadriceps strength postoperatively

- D. patellar subluxation is associated with greater quadriceps strength postoperatively
- E. there is no significant difference between the results, in terms of knee function and strength, provided by patellar eversion and those provided by patellar subluxation
- 24. You are called to the newborn nursery to evaluate a four-day-old male infant with bilateral foot anomalies. The infant was delivered full-term and has an L5-level myelomeningocele, which is being addressed by neurosurgery. The feet are rigid on attempted passive manipulation. The Achilles tendon is tight on examination, and the forefeet are adducted. What is the likely diagnosis?**
- A. metatarsus adductus
B. clubfoot
C. calcaneovalgus
D. vertical talus
E. skewfoot
- 25. A twenty-year-old man is admitted to the emergency room one hour after being involved in a motor-vehicle accident. The emergency medical technicians tell the admitting physician that the patient had sustained a closed fracture of the left tibial and fibular diaphyses. On examination, the leg is found to be compressible, there is no pain with passive or active motion of the toes, and there are easily palpable 2+ pulses in the distal parts of both lower extremities. What is the vascular response to the injured lower extremity?**
- A. an increase in arterial resistance
B. an increase in the arteriovenous oxygen difference
C. an increase in the hemoglobin oxygen concentration in the venous capillary system
D. no change in blood flow to the site of injury
E. an increased shunting of blood through larger vessels away from the site of injury
- 26. A fifty-five-year-old man with a two-year history of lower back pain that has been refractory to nonoperative treatment regimens has been diagnosed with lumbar degenerative disease and grade-1 spondylolisthesis isolated to a single level. He has agreed to undergo single-level posterolateral arthrodesis with instrumentation, but he would like to avoid the morbidity associated with harvesting an autogenous iliac crest bone graft. A recent randomized prospective study compared the use of autogenous iliac crest bone graft and recombinant human bone morphogenetic protein-2 (rhBMP-2) for this indication. In contrast to patients who received autogenous iliac crest bone graft, patients who had received rhBMP-2 had significantly:**
- A. shorter mean operative time and less blood loss
B. more pain at the time of follow-up
C. lower rates of fusion at twenty-four months postoperatively
D. higher rates of failure because of nonunion
E. higher rates of requiring a second surgical procedure
- 27. A fifty-five-year-old laborer has a five-year history of right shoulder pain that has not decreased with anti-inflammatory medication. He has undergone ultrasonographic examination, which demonstrated a full-thickness tear of the supraspinatus measuring 200 mm². Which of the following factors is most closely related to proximal humeral migration in patients with a painful full-thickness rotator cuff tear?**
- A. the severity of shoulder pain (as measured with a visual analog scale)
B. the active range of motion of the shoulder
C. the size of the tear
D. the chronicity of the tear
E. the patient's age
- 28. A sixty-seven-year-old woman underwent a right modular posterior stabilized total knee arthroplasty with cement ten years ago. She now reports a three-month history of painless swelling and states that she is becoming more knock-kneed. Standing radiographs show 6° of knee valgus and a complete radiolucent line around the tibial component. An aspiration is performed, and the aspirate is interpreted as containing no organisms but many polyethylene particles. In a study of 117 knees treated with this prosthesis and followed for a minimum of ten years, eight had osteolysis. With the numbers available, a significant association was shown between osteolysis and:**
- A. mean patient age
B. male sex
C. body mass index
D. polyethylene thickness
E. polyethylene sterilization method
- 29. A thirty-seven-year-old healthy man presents with pain and swelling around the right elbow after falling on his outstretched arm. Examination shows tenderness around the medial humero-ulnar joint and the lateral epicondyle of the elbow. Range-of-motion and stress tests are limited by pain. Varus laxity is mildly detectable. Examination shows the neurovascular status to be intact. Radiographs demonstrate a 5-mm fracture of the antero-medial facet of the coronoid. On the basis of a cadaver study performed to evaluate the effects of fracture severity on elbow stability, which of the following treatment scenarios is most likely to restore elbow stability?**
- A. open reduction and internal fixation of the coronoid, repair of the lateral collateral ligament, and intraoperative assessment to rule out injury to the medial collateral ligament
B. open reduction and internal fixation of the coronoid and intraoperative assessment to rule out injury to the medial collateral ligament
C. repair of the lateral collateral ligament and intraoperative assessment to rule out injury to the medial collateral ligament
D. nonoperative treatment with early motion and an appropriate rehabilitation protocol
E. repair of the lateral collateral ligament and use of a hinged external fixator for six weeks followed by physiotherapy
- 30. A fourteen-year-old girl presented to her pediatrician with unresolved lower back pain four weeks after being struck in the lumbar region while playing soccer. She began experiencing paresthesias in the left lower extremity. On examination, there is a firm, fixed palpable mass in the lumbar paraspinal muscles. Magnetic resonance imaging performed with intravenous contrast medium showed a 9 × 5 × 11-cm soft-tissue mass extending from L2 to the sacrum with osseous invasion of the L3 and L4 pedicles and osseous erosion of the L3, L4, and L5 posterior elements with extension of the tumor into the spinal canal. Chest, abdominal, and pelvic computed tomography demonstrate no evidence of metastatic disease or adenopathy. The differential diagnosis should include all of the following except:**
- A. synovial sarcoma
B. Ewing sarcoma
C. lymphoma
D. fibromatosis
E. osteoblastoma
- 31. A sixty-seven-year-old man with a history of renal cell carcinoma and lung metastases presents with a three-week history of a progressively more painful limp and a forty-eight-hour history of night pain in the hip when rolling over in bed. Plain radiographs show an avulsion fracture of the lesser trochanter and an osteolytic lesion in the intertrochanteric area. After other sites of metastatic involvement have been ruled out, initial management of the hip should consist of:**
- A. open biopsy
B. prophylactic fixation
C. radiation therapy
D. chemotherapy
E. bisphosphonates
- 32. A seventy-four-year-old woman underwent a lumpectomy for breast cancer (ductal carcinoma in situ) ten years ago and was asymptomatic until she began to have pain in the left hip three weeks ago. Plain radiographs show a 4-cm lytic lesion in the subtrochanteric region of the femur. You suspect that this is a metastatic lesion. Initial evaluation should include all of the following except:**
- A. a complete history and physical examination
B. plain radiographs of the involved bone and chest
C. whole-body bone scintigraphy
D. computed tomography of the chest, abdomen, and pelvis
E. positron emission tomography (PET)
- 33. Bisphosphonate therapy has been shown to be effective**

- in reducing the number and severity of skeletal complications secondary to osseous metastatic disease. Recently, there have been a number of reports of an unusual complication being seen in some patients who have taken bisphosphonates for five years or more. This complication is:**
- vertebral osteosclerosis
 - dysphagia
 - low-energy subtrochanteric femoral fracture
 - heterotopic ossification
- 34. A sixty-nine-year-old man with single-level degenerative lumbar disc disease is referred to you for a second opinion. The referring surgeon recommended that the patient undergo posterolateral decompression and arthrodesis with instrumentation and iliac crest bone grafting. The patient is concerned that he may be too old to undergo this procedure. On the basis of a recent study, you can tell him that, in comparison with patients undergoing the same procedure at an age of less than sixty-five years old, he can expect:**
- a higher risk of complications, deterioration of general health, and decreasing disability from back pain
 - a lower risk of complications, no deterioration of general health, and decreasing disability from back pain
 - a higher risk of complications, no deterioration of general health, and decreasing disability from back pain
 - a higher risk of complications, deterioration of general health, and no relief of back pain
- 35. A fifty-year-old woman sustained a low-energy fracture of the distal part of the radius and will undergo plate-and-screw fixation. Preoperative radiographs also reveal a fracture of the ulnar styloid that is displaced 1 mm. In comparison with patients who underwent open reduction and internal fixation of a distal radial fracture and who did not have an untreated associated fracture of the ulnar styloid, patients who had an associated ulnar styloid fracture were found to have, at the time of final follow-up, clinically relevant:**
- greater pain
 - reduced grip strength
 - diminished forearm rotation
 - decreased DASH (Disabilities of the Arm, Shoulder and Hand) scores
 - none of the above
- 36. A twenty-year-old female professional soccer player is referred to you because of pain in the left knee that is associated with a localized cartilage defect in the medial femoral condyle. Arthroscopic examination has established that the defect is 9 mm in diameter and extends to, but not through, subchondral bone. The patient has been offered surgery consisting of microfracture of the lesion but has heard that the lesion might be treatable with an implant. You can tell her that, in a recent article, the results of using zirconium implants in goats were compared with those of a microfracture technique in the contralateral knee of the same animals. The authors reported that there was:**
- no generalized cartilage degeneration in either knee
 - less cartilage degeneration in the knees treated with the zirconium implant than in the knees treated with microfracture
 - more cartilage degeneration in the knees treated with the zirconium implant than in the knees treated with microfracture
 - more degeneration in the apposing tibial plateau cartilage in the knees treated with the zirconium implant than in the knees treated with microfracture
- 37. A fifty-year-old man who sustained a work-related injury in a construction job two years ago is referred to be admitted to an interdisciplinary functional restoration program. Although his injuries are deemed to be healed by the referring physician, he has not been able to return to work because of chronic pain. At the time of this evaluation, he has been taking opioids daily for eighteen months. He estimates his current dose to be approximately 130 mg/day. Part of the functional restoration program includes the participant's willingness to taper off the use of opioids. On the basis of a recent study, if this patient is admitted to the program he will be more likely than a patient who is not a chronic user of opioids to:**
- not complete the program
 - not return to work on a full-time basis
 - have a high rate of utilization of health-care services
 - receive Social Security disability income
 - all of the above
- 38. A thirty-two-year-old male unemployed truck driver is seen in the emergency room for the third time in a month for unexplained abdominal pain. At the last visit, he was found to have "gastric irritation" on esophago-gastroduodenoscopy but no ulcer. The patient has mild diffuse abdominal tenderness with normal bowel sounds. He has a remote history of a gunshot wound to the knee treated with surgery. The knee has well-healed surgical incisions and is swollen. Previous radiographs show retained bullet fragments "in the soft tissue." A routine complete blood-cell count shows a white blood-cell count of $11.1 \times 10^9/L$, hemoglobin level of 11.2 g/L (normal, 135 to 170 g/L), mean corpuscular volume of 65 fl (normal, 80 to 100 fl), and mean corpuscular hemoglobin of 22 pg (normal, 26 to 34 pg). The most appropriate next step in management would be to:**
- obtain a serum toxicology screen
 - obtain a whole blood or serum lead level
 - obtain a serum protoporphyrin level
 - obtain a serum calcium level
 - obtain a serum iron level
- 39. A seventy-six-year-old woman sustained a twisting injury of the right ankle and was admitted to a local hospital, where a diagnosis of an open trimalleolar fracture of the ankle is established. The hospital rarely admits patients for fractures. The patient has a medical history of peripheral vascular disease and diabetes mellitus. A recent study showed that several factors had a significant association with the aggregate risk of short-term complications (within ninety days postoperatively). These include all of the following, except:**
- uncomplicated diabetes
 - complicated diabetes
 - peripheral vascular disease
 - an age of more than seventy-five years
 - a low-volume hospital
- 40. A thirty-four-year-old man sustained a Grade-IIIB open tibial fracture seven months ago and was initially treated with serial débridements, a gastrocnemius rotation flap, and an intramedullary nail. The soft tissues are now well-healed, and there are currently no signs of infection. However, there is a 4-mm bone gap at the fracture site without evidence of new bone formation in the past three months. On the basis of a preclinical study conducted in a rat femoral defect model, which of the following methods was found to most reliably increase the volume of bone formed?**
- mixing the bone marrow aspirate with demineralized bone matrix
 - concentrating the bone marrow aspirate, which increases the number of mesenchymal stem cells, and then mixing with demineralized bone matrix
 - using a quick intraoperative assay to determine the number of mesenchymal stem cells available in the bone marrow aspirate to determine the concentration and volume of bone marrow aspirate needed for the defect to heal
 - none of the options listed above reliably increased the volume of bone formation, and more research is necessary to determine the ideal microenvironment to support mesenchymal stem cell therapy
- 41. You performed a nonaugmented repair of an acute rupture of the right Achilles tendon in a forty-year-old woman three months ago. She is now concerned that her plantar flexion strength is less than that on the contralateral side. You perform isometric strength measurements on both sides and tell the patient that she is progressing normally. At three months postoperatively, the operatively treated side should be approximately how much weaker than the normal side?**
- 5%
 - 15%
 - 30%
 - 45%
 - 60%

- 42. A thirty-nine-year-old man is referred to you with a history of shoulder pain of six weeks' duration. The pain is in the lateral aspect of the shoulder and is exacerbated with overhead activities. It prevents the patient from sleeping comfortably most nights. Magnetic resonance imaging reveals a small (5-mm) full-thickness tear in the anterior aspect of the supraspinatus muscle. The patient states that his father and a cousin have had rotator cuff tears and wonders whether his problem might have a genetic component. You can tell him that, in a recent study, the authors found a significant excess genetic relatedness in family members as distant as:**
- parent
 - grandparent
 - sibling
 - first cousin
 - third cousin
- 43. A twenty-eight-year-old man fell from a ladder onto the outstretched hand one hour ago and presents to the emergency room with severe wrist and hand pain. He has a very swollen wrist and hand, but the skin is intact. On examination, he has patchy numbness and tingling in the hand, particularly at the tips of the thumb and index and long fingers. Radiographs show a midwaist scaphoid fracture and a capitulate dislocation with volar tilting of the lunate. What is the first operative priority in this patient?**
- reduction of the capitulate joint
 - decompression of the carpal tunnel
 - screw fixation of the scaphoid
 - volar ligament reconstruction of the wrist
 - dorsal ligament reconstruction of the wrist
- 44. A sixty-six-year-old woman presents with a history of claudication of both calves of six months' duration. She is found to have no neurological deficit on physical examination. After a clinical and imaging workup, a diagnosis of neurogenic claudication secondary to degenerative spondylolisthesis and severe spinal stenosis at L4-L5 is made. She agrees to undergo two serial lumbar epidural steroid injections and eight weeks of physical therapy. At the end of this regimen, the symptoms have not decreased. Which treatment approach would be expected to yield the best outcome at four years?**
- continued nonoperative treatment
 - surgical decompression with or without fusion
 - surgery if the patient had radicular pain; however, surgery and nonoperative care produce similar outcomes for patients with neurogenic claudication
 - surgery if the patient had a neurological deficit on examination; however, surgery and nonoperative care produce similar outcomes for patients with no neurological deficit
- 45. A sixty-one-year-old woman presents with a two-year history of pain at the metatarsophalangeal joint of the right great toe. Physical examination shows a valgus deformity of the great toe, and a standing radiograph of the foot shows severe hallux valgus and metatarsus primus varus. The woman agrees to undergo a proximal crescentic osteotomy. Which of the following was found to be the most reliable method for determining the hallux valgus and intermetatarsal angles for assessment of the postoperative correction?**
- bisecting the shaft of the first metatarsal at two levels
 - connecting the center of the articular surface of the first metatarsal head and the center of the proximal articular surface
 - connecting the centers of the first metatarsal head and base
 - connecting the centers of the first metatarsal head and the proximal part of the metatarsal shaft
 - connecting the centers of the first metatarsal head and the proximal articular surface
- 46. A forty-three-year-old woman with multiple joint involvement secondary to rheumatoid arthritis presents to the emergency room with a two-day history of increasing pain in the right wrist and fever. On examination, her temperature is 101.9°F (38.8°C) and her wrist is erythematous, swollen, and tender to palpation, any motion, and axial load. Her peripheral white blood-cell count is $12 \times 10^9/L$. Arthrocentesis shows no crystals and a nucleated cell count of $100.0 \times 10^6/L$. Cultures are pending. No other joints are symptomatic. Your preliminary diagnosis is infection of the right wrist. According to a recent study, the preferred method of treatment is:**
- elevation, intravenous antibiotics, and observation
 - bone scan to rule out other sites of infection
 - arthroscopic irrigation and débridement
 - open irrigation and débridement
- 47. An obese sixty-five-year-old woman fell on the ice and sustained a bimalleolar fracture of the left ankle. Operative repair included open reduction and internal fixation of the lateral malleolus with a metal plate and screws as well as reduction and screw fixation of the medial malleolus. Because of her obesity, the patient could not maintain a gait with non-weight-bearing on the affected lower limb. At the eight-week follow-up visit, there is a 3-mm gap and bone resorption at the medial malleolar fracture site. You plan to revise the fixation of the medial malleolus and use demineralized bone matrix as an osteoconductive/osteoinductive augmentation agent. On the basis of an in vitro study, the preferred agent to use to rehydrate the demineralized bone matrix is:**
- thrombin in a calcium chloride solution
 - platelet-rich plasma
 - platelet-rich plasma with thrombin
 - normal saline solution
- 48. Despite advances in surgical treatment options, rates of failure of rotator cuff repair have continued to range from 20% to 90%. In an attempt to improve these results, the authors of a recent study used a newly designed poly-L-lactide repair device to augment repair of a tendon release performed in the shoulders of eight adult dogs. The authors found that use of the poly-L-lactide scaffold device in the animals:**
- increased time-zero repair stiffness
 - had no effect on the ultimate load of the healed repair
 - reduced tendon-retraction (gap-formation) distance during healing
 - induced an inflammatory host tissue response
 - produced impingement of the device against the acromial arch
- 49. A twenty-two-year-old man presents with right knee pain and swelling with any impact activities. Two years ago, he underwent removal of a 2.5-cm² loose osteochondritis dissecans lesion from the lateral aspect of the medial femoral condyle. One year ago, he underwent a microfracture procedure of the subchondral bone, but the symptoms did not decrease. On physical examination, he is found to lack 5° of extension compared with the motion of the contralateral knee and to have a moderate effusion as well as medial joint-line pain. Plain radiographs show a large osteochondral defect of the lateral aspect of the medial femoral condyle. A long leg standing anteroposterior radiograph reveals 3° of varus alignment of the knee. Because of the failure of previous procedures, you are considering the use of a refrigerated osteoarticular allograft to treat the condylar defect. This is an attractive option because:**
- it avoids donor site morbidity
 - it uses metabolically active chondrocytes
 - it is an immunoprivileged graft
 - it restores the natural contours of large defects
 - all of the above
- 50. A sixty-seven-year-old woman trips while walking on an icy street and falls on her left shoulder. When seen in an emergency room one hour later, she complains of shoulder pain and an inability to abduct the left arm. Plain radiographs reveal a displaced four-part fracture of the proximal part of the humerus. You recommend that she undergo open reduction and internal fixation with use of a locking proximal humeral plate. When the patient asks you about the advantages of this technique, you tell her that, on the basis of a prospective observational study, you believe that, when the procedure is performed by an experienced surgeon, the advantages include:**
- gentle fracture reduction with use of indirect maneuvers
 - resistance to avulsion even in patients with osteoporotic bone
 - resumption of exercise in the early postoperative period
 - a short period of immobilization
 - all of the above

RESPONSE FORM

ACCREDITATION STATEMENT

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 October 15, 2009.

EXAMINATION EVALUATION (MANDATORY)

Did the April through June 2009 CME Review Questions meet these educational objectives*:

1. Provide a broad-based review and update specifically in the areas of foot and ankle and shoulder and elbow surgery and musculoskeletal oncology? Yes No
2. Strengthen your problem-solving abilities related to patient care particularly in the areas of foot and ankle and shoulder and elbow surgery and musculoskeletal oncology? 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.

ANSWER KEY

Black out the correct answers

- | | | |
|---------------|---------------|-----------------------------------|
| 1. A B C D E | 18. A B C D E | 35. A B C D E |
| 2. A B C D E | 19. A B C D E | 36. A B C D |
| 3. A B C D E | 20. A B C D | 37. A B C D E |
| 4. A B C D | 21. A B C D E | 38. A B C D E |
| 5. A B C D | 22. A B C D | 39. A B C D E |
| 6. A B C D | 23. A B C D E | 40. A B C D |
| 7. A B C D E | 24. A B C D E | 41. A B C D E |
| 8. A B C D E | 25. A B C D E | 42. A B C D E |
| 9. A B C D | 26. A B C D E | 43. A B C D E |
| 10. A B C D E | 27. A B C D E | 44. A B C D |
| 11. A B C D E | 28. A B C D E | 45. A B C D E |
| 12. A B C D E | 29. A B C D E | 46. A B C D |
| 13. A B C D E | 30. A B C D E | 47. A B C D |
| 14. A B C D E | 31. A B C D E | 48. A B C D E |
| 15. A B C D | 32. A B C D E | 49. A B C D E |
| 16. A B C D E | 33. A B C D | 50. A B C D E |
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