
The Journal of Bone & Joint Surgery
Continuing Medical Education

CME

Review Questions

April, May, June
2002

PURPOSE

The purposes 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 April, May, and June issues of the American volume of *The Journal of Bone and Joint Surgery* (Volume 84-A, Numbers 4, 5, and 6). A careful study of each article should yield the best response to each question.
3. Read each question carefully, identify the best answer, and record that answer on the CME Response Form in the back of this document.
4. To receive CME credit, it is absolutely essential that you complete all portions of the attached Response Form and answer each question.
5. 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.
6. 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.
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. A charge of \$25 per quarter, or \$95 per year, must be paid at the time that the answer sheet is submitted. **The deadline to submit your answers for grading this set of questions will be October 15, 2002.**

1. **It may be possible to use transforming growth factor beta-1 (TGF- β 1) clinically to enhance chondrogenesis for the repair of articular cartilage. This cytokine may enhance cartilage formation through one of several mechanisms. It has been shown that one of the most likely mechanisms is:**
 - A. induction of chondrogenesis in chondrocytes
 - B. induction of chondrogenesis in prechondrocytes
 - C. inhibition of osteogenesis in osteoblasts
 - D. inhibition of osteogenesis in preosteoblasts
 - E. inhibition of cell proliferation in periosteal explants
2. **Athletes who throw, such as baseball players, have a high prevalence of medial elbow instability. Which of the following factors is the most significantly associated with medial elbow pain in college baseball players?**
 - A. medial shift of the proximal part of the ulna
 - B. lateral shift of the proximal part of the ulna
 - C. angular deformity of the ulnar collateral ligament
 - D. osteophyte formation medially
 - E. stretching of the lateral collateral ligament
3. **In in vitro biomechanical testing of internal fixation of proximal humeral fractures, the addition of an injectable calcium triphosphate cement is associated with:**
 - A. improved stability at the interface between the implant and cancellous bone
 - B. necrosis of adjacent cancellous bone due to the exothermic nature of the curing reaction
 - C. frequent fracture of the cement due to its brittleness
 - D. elimination of the influence of bone density on specimen stiffness
 - E. no change in interfragmentary motion during nondestructive testing
4. **Which of the following is an example of indirect gene therapy?**
 - A. harvesting muscle-derived cells from a patient, introducing a retrovirus to express BMP-4 cells, and injecting the cells into the site of an osseous nonunion
 - B. injecting a retrovirus containing the BMP-4 gene into the site of a nonunion
 - C. placing a BMP-4-impregnated collagen sponge into the intervertebral disc space
 - D. injecting an adenovirus containing the BMP-2 gene into the knee joint
 - E. injecting an adenovirus containing BMP-2 intravenously
5. **When treating a patient who has osteonecrosis of the knee with severe bone loss on the femoral side, the best result will most likely be achieved with:**
 - A. a cementless component on the femoral side
 - B. a cemented component on the femoral side

- C. a fully constrained component
 D. cemented standard components on both sides of the knee
 E. a cemented component with a stem on the femoral side
- 6. The most common complication after intramedullary nailing of a fracture of the tibial shaft is:**
- A. pseudarthrosis
 B. malunion
 C. anterior knee pain
 D. deep infection
 E. superficial infection
- 7. After injury, muscle-healing proceeds according to the following timetable:**
- A. degeneration and inflammation at one to two weeks, regeneration at one to two weeks, and fibrosis at two to four weeks
 B. degeneration and inflammation at one to two months, regeneration at one to two months, and fibrosis at two to four months
 C. degeneration at one week, inflammation at two weeks, regeneration at two weeks, and fibrosis at four weeks
 D. degeneration at two weeks, regeneration at two weeks, and hypertrophy at six weeks
 E. degeneration at two weeks, regeneration at two weeks, and hyperplasia at six weeks
- 8. A twenty-five-year-old man had a fracture of the midpart of the tibial shaft that united after sixteen weeks in a cast. Which of the following factors is most likely to be associated with medial compartment osteoarthritis of the knee thirty-five years later?**
- A. coronal plane malunion in 7° of varus
 B. lower-limb alignment (hip-knee-ankle angle) in 7° of varus
 C. sagittal plane malunion in 7° of recurvatum
 D. rotational malunion in 14° of external rotation
 E. fracture shortening of 1.5 cm
- 9. Which of the following factors makes the most significant contribution to increased angular deformity of the ulnar collateral ligament?**
- A. medial shift of the proximal part of the ulna
 B. lateral shift of the ulna
 C. widening of the medial joint space
 D. osteophyte formation medially
 E. joint-space narrowing in the radiocapitellar joint
- 10. Activity-related pain and a joint effusion are clinical findings associated with accelerated polyethylene wear of implants sterilized by gamma irradiation in air. Which practice best alerts the surgeon to the likelihood of accelerated polyethylene wear?**
- A. comparison of serial plain radiographs
 B. serial fluoroscopically controlled radiographs
 C. determination, by contacting the implant manufacturer, of the duration of shelf storage prior to the arthroplasty
 D. joint aspiration and analysis of the joint fluid
 E. arthroscopy
- 11. When harvesting anterior iliac-crest bone grafts, the most important contributing factor associated with injury of the lateral femoral cutaneous nerve is:**
- A. patient obesity
 B. subperiosteal dissection of the iliac crest
 C. postoperative hematoma
 D. anatomic variation in the position of the lateral femoral cutaneous nerve
 E. constricting postoperative dressing
- 12. Removal at home of a plaster splint three weeks after a buckle fracture of the radius in children**
- A. increases parental anxiety
 B. results in a 20% rate of wrist deformity
 C. causes increased swelling at six weeks postfracture
 D. leads to improved hand function at six weeks postfracture
 E. is as safe and effective as removal at a fracture clinic
- 13. The cement strains in a cemented femoral component of a total hip replacement during simulated stair-climbing are higher for smaller stems assuming that all other conditions are the same. What factor is more important in generating the highest peak strains in the cement?**
- A. the length of the neck of the femoral component
 B. the amount of offset of the neck of the femoral component
 C. the amount of contact of the collar of the prosthesis with the calcar of the femur
 D. the degree of valgus or varus in which the femoral prosthesis is set
 E. the patient's weight
- 14. Concerning the surgical treatment of unicameral bone cysts, which statement is true?**
- A. percutaneous corticosteroid injection is associated with the lowest risk of cyst recurrence
 B. percutaneous injection of demineralized bone matrix and autogenous bone marrow is associated with the fastest rate of cyst healing
 C. percutaneous injection of demineralized bone matrix and autogenous bone marrow is associated with a high risk of cyst recurrence
 D. open curettage with placement of autogenous iliac-crest bone graft is associated with the lowest risk of cyst recurrence
 E. open curettage with placement of bone-graft substitute is associated with the lowest risk of additional surgery

- 15. Most pathological insufficiency fractures of the pelvis unite after a few months of non-operative treatment. Which of the following clinical scenarios is least likely to be associated with a risk of a persistent painful nonunion?**
- prior pelvic irradiation therapy
 - prior harvesting of a posterior iliac-crest bone graft
 - a simple fall from a standing height
 - steroid-induced osteoporosis
 - senile osteopenia
- 16. Which critical risk factor for mortality after orthopaedic surgery is associated with the highest mortality rate?**
- chronic renal failure
 - congestive heart failure
 - chronic obstructive pulmonary disease
 - diabetes mellitus
 - age of more than seventy years
- 17. Which form of treatment of patellar fracture after total knee arthroplasty is associated with the highest rate of complications?**
- nonoperative treatment
 - open reduction and internal fixation
 - component resection and patelloplasty
 - partial patellectomy
 - complete patellectomy
- 18. When performing femoral lengthening over an intramedullary humeral nail in preadolescent children, which of the following is true?**
- the anticipated femoral length will be 30% greater than the preoperative femoral length
 - proximal valgus secondary to injury to the greater trochanter physis is common
 - osteonecrosis of the femoral head is common
 - infection and fracture are the most frequent complications
 - hip and knee subluxation are frequently seen postoperatively
- 19. The best indication for proximal segmental resection of the radius for treatment of proximal radioulnar synostosis is:**
- duration of the synostosis exceeding two years
 - synostosis involving the greater tuberosity of the radius
 - complete osseous synostosis
 - anatomic deformity of the proximal radioulnar articulation
 - concomitant distal radioulnar abnormality
- 20. Directors of residency programs in internal medicine were requested to evaluate, establish relevance for, and set a passing score for a written examination of basic competency in musculoskeletal medicine for graduating medical students. Their collective responses suggested that:**
- education in musculoskeletal medicine is not relevant to the practice of the average internist
 - recent medical school graduates are well educated in musculoskeletal medicine
 - the majority of graduating medical school students fail to demonstrate competency in musculoskeletal medicine
 - musculoskeletal medicine occupies the appropriate portion of the average medical school curriculum
 - medical school education in musculoskeletal medicine prepares graduates well for a career in internal medicine but inadequately for a career in orthopaedic surgery
- 21. Transcalcaneal talonavicular dislocation is a severe foot injury that includes dorsal dislocation of the navicular from the talus associated with a comminuted fracture of the calcaneus. After reduction of the talonavicular joint, initial management should include:**
- percutaneous fixation of the unstable joints and careful management of the soft tissues
 - open reduction and internal fixation of the calcaneus
 - open reduction and internal fixation of the calcaneus combined with subtalar fusion
 - open reduction and internal fixation of the calcaneus combined with triple arthrodesis
 - Boyd amputation of the foot
- 22. A forty-year-old man was involved in a motor-vehicle accident in which he sustained a fracture of the posterior wall of the acetabulum and a posterior dislocation of the hip, which was reduced fourteen hours after injury. The most important risk factor associated with an unsatisfactory clinical outcome is:**
- the patient's age
 - a twenty-five-year history of smoking
 - the duration of unreduced hip dislocation
 - the size of the posterior wall fracture fragment
 - an associated head injury
- 23. When treating a periprosthetic femoral fracture around a well-fixed prosthesis:**
- revision of the prosthesis is necessary in order to obtain stable fixation
 - cortical onlay allograft struts alone provide mechanical stability and improve bone stock
 - use of a cortical strut and a plate is superior to use of two cortical allografts alone
 - union of allograft to host bone is usually seen by two years postoperatively
 - late femoral component loosening is a frequent complication
- 24. Growth factors enhance the healing of musculoskeletal tissues by binding to cells and**

- inducing which of the following responses:**
- increased alkaline phosphatase and decreased adenylate cyclase activity
 - expression of new genes or sets of genes
 - acceleration of mitotic activity
 - increased sensitivity to growth hormone
 - enhanced mitochondrial activity
- 25. The addition of epinephrine to irrigation fluid during arthroscopy of the shoulder:**
- increases heart rate
 - increases blood pressure
 - decreases the amount of irrigation fluid required
 - decreases intra-articular bleeding
 - increases operative time
- 26. Glenoid deficiency in osteoarthritis secondary to glenoid dysplasia is typically seen in what portion of the glenoid?**
- superior and medial
 - anterior and inferior
 - posterior and superior
 - inferior and lateral
 - posterior and inferior
- 27. At ten years postoperatively, radiographic evaluation of uncemented acetabular components in patients younger than fifty years old is most likely to demonstrate a high prevalence of:**
- complete radiolucent lines
 - component migration
 - pelvic osteolysis
 - liner dissociation
 - screw breakage
- 28. With a patient in the prone position, to ensure minimal risk to the posteromedial neurovascular bundle the posteromedial arthroscopic portal should be kept:**
- medial to the flexor hallucis longus tendon
 - lateral to the peroneal tendon
 - lateral to the flexor hallucis longus tendon
 - medial to the Achilles tendon
 - lateral to the sural nerve
- 29. Which of the following is most likely to enhance the ability of a growth factor to induce a desired effect?**
- increased production by recombinant gene technology
 - progress in the purification technique
 - sterilization techniques that maintain biologic activity
 - enhancement of the intracellular transduction response
- 30. The presence and extent of periacetabular osseous lysis secondary to polyethylene wear often must be determined in patients with total hip implants. Which method provides the most information on the extent and location of these lesions?**
- four-view plain radiographs
 - magnetic resonance imaging
 - helical computed tomography
 - ultrasound
 - scintigraphy with technetium-methylene diphosphonate
- 31. Aseptic loosening of cemented femoral components and subsequent bone lysis is a major cause of revision of total hip replacements. The surface finish of the femoral stem is thought to be a possible contributing factor. Which of the following statements is true?**
- polished and rough-surfaced stems have a similar incidence of loosening and need for revision
 - stems with polished surfaces loosen and require revision more frequently than do rough-surfaced stems
 - surface finish of cemented stems is not related to the incidence of stem loosening
 - polished stems, when loose, cause less lysis of bone than do rough stems
 - polished stems loosen less often than do rough stems but have a much higher incidence of fracture
- 32. During the rehabilitation of a patient who has just undergone a single-bundle posterior cruciate ligament reconstruction, which of the following activities should be avoided in the early postoperative period?**
- straight-leg quadriceps-strengthening exercises
 - active-assisted extension to terminal extension
 - full weight-bearing with the knee locked in full extension
 - active range-of-motion exercises between 0° and 90° of flexion
 - loading of the knee in flexion greater than 90°
- 33. For cerebral palsy patients with diplegia, spastic contracture of the gastrocnemius-soleus muscle-tendon complex is associated with ankle and knee coupling during walking. This coupled motion is characterized by:**
- progressive crouch with excessive ankle dorsiflexion in stance
 - simultaneous ankle plantar flexion and knee extension during midstance
 - progressive ankle dorsiflexion with knee extension in stance
 - progressive crouch and equinus through midstance
 - ankle plantar flexion during loading
- 34. Which of the following treatment options is most likely to result in an unsatisfactory**

- result in patients with osteoarthritis secondary to glenoid dysplasia?**
- hemiarthroplasty alone
 - hemiarthroplasty with glenoid bone-grafting or osteotomy
 - total shoulder arthroplasty with glenoid bone-grafting
 - total shoulder arthroplasty with an augmented glenoid component
 - fully constrained total shoulder arthroplasty
- 35. Which of the following symptoms or signs is seen most frequently in a patient with a long-standing fracture nonunion of the lateral humeral condyle?**
- elbow pain
 - ulnar nerve dysfunction
 - valgus deformity
 - severe restriction of range of motion
 - loss of grip strength
- 36. A fifty-year-old man presents with right groin pain and is suspected of having early-stage osteonecrosis of the hip. Which entity presents with radiographic and magnetic resonance imaging findings most similar to osteonecrosis:**
- osteoarthritis
 - pigmented villonodular synovitis
 - transient osteoporosis
 - Lyme arthritis
 - sickle cell disease
- 37. Which of the following factors is the most important in determining outcomes of arthroscopic repair of superior labral lesions?**
- age of the patient
 - dominance of the involved arm
 - gender of the patient
 - type of sports activity
 - duration of symptoms
- 38. The most appropriate means of diagnosing isolated gastrocnemius contracture during physical examination of a neutrally aligned foot includes which of the following criteria:**
- maximal ankle dorsiflexion of $\leq 5^\circ$ with the knee fully extended
 - maximal ankle dorsiflexion of $\leq 10^\circ$ with the knee fully extended
 - maximal ankle dorsiflexion of $> 0^\circ$ with the knee in 90° of flexion
 - maximal ankle dorsiflexion of $\leq 10^\circ$ with the knee in 90° of flexion
 - maximal ankle dorsiflexion of $> 5^\circ$ with the knee fully extended
- 39. Which of the following statements is most likely true of abstracts presented at international meetings?**
- more than two-thirds will be subsequently published in peer-reviewed journals
 - the majority are prospective cohort studies
 - almost 20% of the final publications will be inconsistent with the results of the original abstract
 - inconsistencies between abstracts and final full-text publications are most commonly due to a decrease in sample size from the abstract to the final publication
 - key methodological issues are reported in the majority of abstracts
- 40. An improved prognosis following core decompression is most likely to be associated with:**
- steroid use
 - idiopathic osteonecrosis
 - a sclerotic rim around a necrotic lesion
 - a younger patient
 - a female patient
- 41. Which of the following is true concerning the potential change in pelvic dimensions, documented by magnetic resonance pelvimetry, in young women who have had a reconstructive periacetabular osteotomy?**
- the bispinous diameter will be significantly decreased
 - the bispinous diameter will be significantly increased
 - the bispinous diameter will not be significantly altered
 - the anterior-posterior inlet measurement will be significantly decreased
 - both the bispinous diameter and the anterior-posterior inlet measurement will be significantly decreased
- 42. The best outcomes after traumatic posterior dislocation of the elbow associated with fractures of the radial head and coronoid process are associated with which of the following treatments in addition to closed reduction of the elbow:**
- immobilization in a posterior splint with the elbow flexed to 90° and the wrist in neutral supination for ten days followed by early supervised range-of-motion exercises
 - immobilization in a posterior splint with the elbow flexed to 90° and the wrist fully supinated for six weeks
 - repair or replacement of the radial head and repair of the lateral collateral ligament
 - excision of the radial head, repair of the lateral collateral ligament, and internal fixation of the coronoid process fracture
 - application of external fixation across the elbow that incorporates distraction and permits early joint motion
- 43. In an evaluation of the ten-year results of total hip arthroplasty in patients younger than fifty years old, which of the following is least likely to be associated with aseptic loosening:**

- A. a history of osteonecrosis
 B. a 32-mm femoral head
 C. a femoral component with a surface RA of 90
 D. a cementless porous-coated acetabular component
 E. polyethylene gamma irradiation in air
- 44. Which of the following factors is most responsible for a nonunion after reconstruction with an allograft?**
 A. use of chemotherapy
 B. use of fixation that is not sufficiently rigid
 C. not applying autograft at the host bone-allograft junction
 D. use of plate and screw fixation instead of an intramedullary nail
 E. use of unicondylar rather than full articular allografts
- 45. The main beneficial effect of antibiotic-impregnated cement in total knee arthroplasty is:**
 A. faster polymerization of polymethylmethacrylate
 B. improved mechanical strength of cement
 C. local elution of antibiotic into the joint fluid
 D. ability to avoid systemic antibiotic prophylaxis
 E. hemostatic effect
- 46. In revision total hip arthroplasty, segmental bone loss of <5 cm in length on the femoral side is best managed by:**
 A. a proximal femoral allograft
 B. a calcar-replacing implant
 C. a standard-length uncemented implant
 D. a proximally porous-coated implant
- 47. In revision total hip arthroplasty, contained bone loss on the acetabular side can be managed by an uncemented cup:**
 A. if contact of the cup can be made with 50% of the area of the host bone
 B. if a large structural graft involving >50% of the acetabulum is used
 C. if >50% of the acetabulum is filled with morselized allograft bone
 D. if the cup is placed in a protruded position
- 48. Which of the following factors is the most important for improving hand function in Müller type-D symbrachydactyly?**
 A. depth of the web space
 B. length of the fingers
 C. length of the metacarpals
 D. abductor function of the thumb
 E. stability of the wrist
- 49. Which of the following complications is the leading cause of failure of an allograft used for reconstruction after resection of a bone tumor?**
 A. fracture
 B. nonunion
 C. infection
 D. joint collapse
 E. rejection
- 50. The use of scalene regional anesthesia is least likely to be associated with:**
 A. a need for adjunctive general anesthesia
 B. a need for adjunctive intravenous pain medication
 C. a need for respiratory monitoring
 D. neurologic deficits for up to six weeks
 E. decreased cost compared with that of general anesthesia
- Conflict of Interest**
 The author of these CME questions does not have any financial conflict of interest with regard to the subject matter discussed in these review questions.

RESPONSE FORM

EXAMINATION EVALUATION

Did the July 2002 CME Review Questions meet these educational objectives*:

1. Provide a broad-based review and update specifically in the areas of pediatric orthopaedics, sports medicine, and musculoskeletal oncology? Yes No
2. Strengthen your problem-solving abilities related to patient care particularly in the areas of pediatrics, sports, and tumors? 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. Is this your own copy of *The Journal*?
 Yes No
2. Which of the following best describes your practice type?
 General orthopaedics
 General orthopaedics with subspecialty interest
 Exclusively subspecialty
 Resident or student
 Researcher
 Other: _____
3. 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	
4. Which is your number-one priority to read when you receive *The Journal* (American volume only) each month?

<input type="checkbox"/> Commercial advertising	<input type="checkbox"/> Current Concepts
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<input type="checkbox"/> Clinical scientific articles	<input type="checkbox"/> Basic scientific articles
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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.

QUESTIONS?

Please contact the CME Division of *The Journal of Bone and Joint Surgery* at 781 449 9780 x143.

ANSWER KEY

Black out the correct answers

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|---------------|---------------|---------------|
| 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 E |
| 3. A B C D E | 20. A B C D E | 37. A B C D E |
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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 |
| 8. A B C D E | 25. A B C D E | 42. A B C D E |
| 9. A B C D E | 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 E |
| 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 E | 32. A B C D E | 49. A B C D E |
| 16. A B C D E | 33. A B C D E | 50. A B C D E |
| 17. A B C D E | 34. A B C D E | |

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