

A 15-year-old boy comes to the physician with left shoulder joint pain and swelling. He has had these symptoms for the past 3 months and they are getting progressively worse. He has no fever, weight loss, or night sweats. The patient lifts weights and plays baseball 5 days a week. He has taken acetaminophen and ibuprofen with little relief. Examination shows a tender mass at the left proximal humerus. Range of motion is normal. Laboratory evaluation shows elevated alkaline phosphatase, erythrocyte sedimentation rate, and lactate dehydrogenase. X-ray of the shoulder is shown in the photograph below.



Which of the following is the most likely diagnosis?

- ☐ A. Ewing sarcoma
- ☐ B. Osteoid osteoma
- ☐ C. Osteomyelitis
- ☐ D. Osteosarcoma
- ☐ E. Stress fracture



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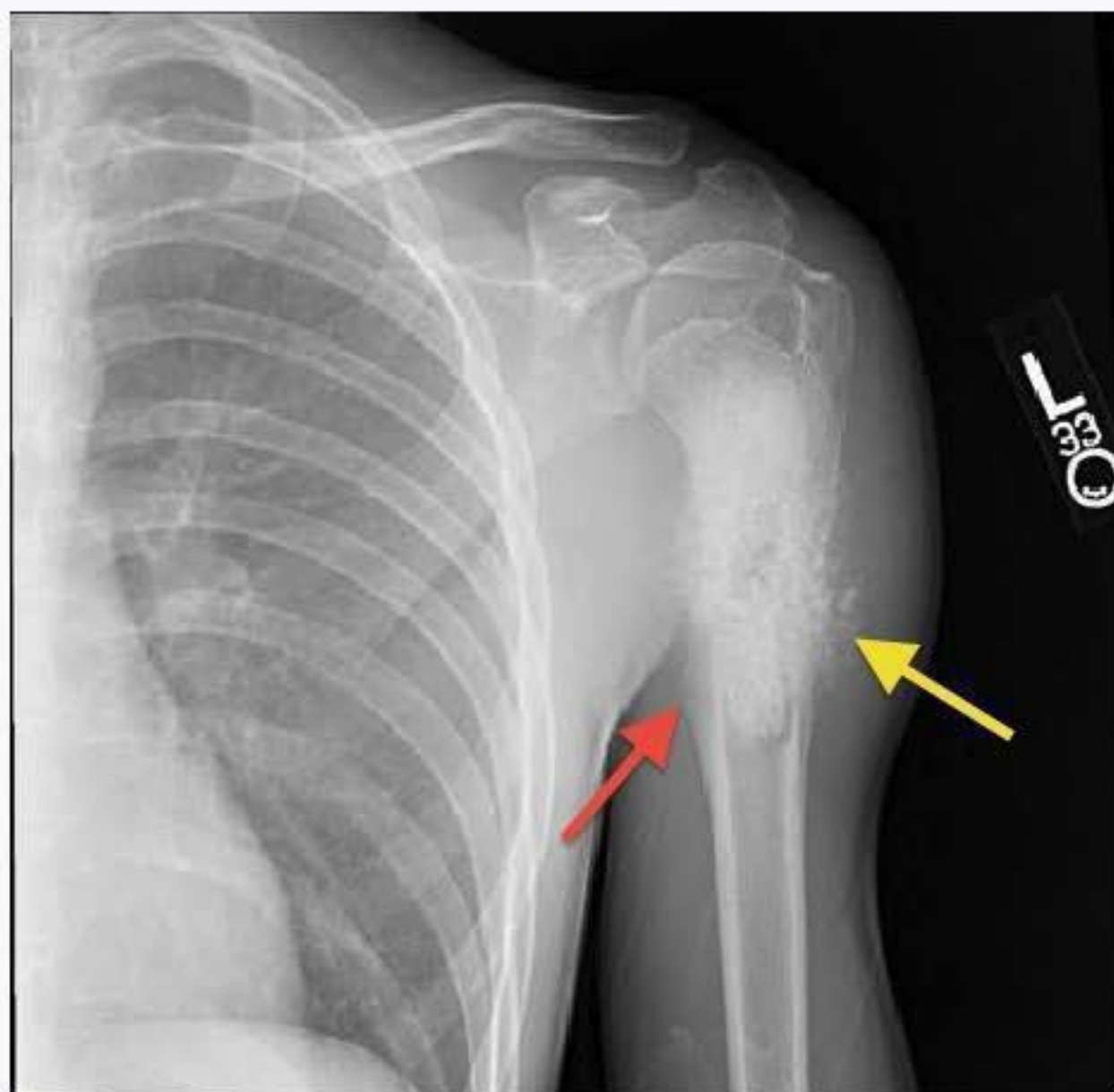
- ☐ A. Ewing sarcoma [21%]
- ☐ B. Osteoid osteoma [8%]
- ☐ C. Osteomyelitis [2%]
- ☒ D. Osteosarcoma [66%]
- ☐ E. Stress fracture [3%]



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Explanation:

User Id: [REDACTED]



The patient most likely has osteosarcoma, the most common primary bone tumor affecting children and young adults. Boys between ages 13 and 16 years are at higher risk. In children, the tumor occurs most frequently at the metaphyses of long bones such as the distal femur, proximal tibia, and proximal humerus. Constitutional symptoms such as fever, weight loss, and malaise are usually absent. On physical examination, the most important finding is a tender soft-tissue mass. Characteristic x-ray findings include a spiculated "sunburst" pattern (yellow arrow) and periosteal elevation known as the Codman triangle (red arrow). Alkaline phosphatase and lactate dehydrogenase are elevated from turnover of damaged osteocytes; high levels may correlate with adverse prognosis. Increased erythrocyte sedimentation rate is a non-specific marker of inflammation. Treatment includes tumor excision and chemotherapy.

**(Choice A)** Although overall rare, Ewing sarcoma is the second most common primary bone malignancy. The incidence is also highest in adolescent males and up to 20% of



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**(Choice A)** Although overall rare, Ewing sarcoma is the second most common primary bone malignancy. The incidence is also highest in adolescent males and up to 20% of patients may have systemic symptoms. X-ray shows an osteolytic lesion with a periosteal reaction that produces layers of reactive bone, giving the classic "onion skin" appearance. This diagnosis is less likely due to its lower prevalence and the lack of characteristic x-ray findings.

**(Choice B)** **Osteoid osteoma** appears as a sclerotic, cortical lesion on imaging with a central nidus of lucency. It typically causes pain that is worse at night and unrelated to activity. However, the pain is quickly relieved by nonsteroidal anti-inflammatory medications.

**(Choice C)** Osteomyelitis can result in elevated erythrocyte sedimentation rate but is not associated with mass on physical examination.

**(Choice E)** A stress fracture can result in periosteal elevation and sclerosis. However, it is not associated with a large mass on physical examination.

#### Educational objective:

Osteosarcoma is the most common primary bone tumor in children and young adults and typically involves the metaphyses of long bones. Physical examination typically shows a large and tender mass. Classic x-ray findings include "sunburst" periosteal reaction and Codman triangle.

#### References:

1. **Osteosarcoma.**
2. **Osteosarcoma incidence and survival rates from 1973 to 2004: data from the Surveillance, Epidemiology, and End Results Program.**



Media Exhibit

osteoma

