

Neoplasm as a Cause of Shoulder Pain

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For most patients with shoulder pain, complaints are related to impingement syndrome, degenerative or inflammatory joint disease, instability, or trauma. Neoplasm is a rare cause of shoulder pain, but should be considered, especially when patient presentation is un-

usual. This review includes a series of cases in which tumor was found to be the cause of pain.

Key words. Shoulder; pain; neoplasm. (*J Fam Pract* 1995; 40:480-485)

A detailed history and physical examination will lead to a diagnosis in the vast majority of patients presenting for evaluation of shoulder pain. Most often, complaints are related to impingement syndrome (bursitis or tendinitis), degenerative or inflammatory joint disease, instability, or trauma. Sepsis and neoplasm are less common causes of pain, but always must be considered in the differential diagnosis.

Over an 18-month period, the following five cases were seen in the author's rural orthopedic practice. All were referred for evaluation of shoulder pain. The pain was due to neoplasm in all cases. At the time of referral, the pain was thought to be secondary to tumor in only one case.

Case Reports

Case 1

A 14-year-old boy reported a 14-month history of vague right-sided shoulder pain.* He attributed its onset to a fall off a skateboard, which caused him to land on the posterior aspect of his shoulder. He developed diffuse shoulder

pain with occasional radiations to the lateral arm. In the 3 or 4 months before orthopedic evaluation, the pain became progressively worse, frequently awakening him from sleep at night. The patient had no other musculoskeletal complaints, and there was no history of fever, chills, or weight loss.

Physical examination showed no swelling or point tenderness in the region of his right shoulder. He demonstrated full forward elevation and abduction but lacked 10° of external rotation. He was able to rotate his right arm internally with his hand only to the midlumbar region, compared with the midscapular level on the unaffected side.

Plain radiographs of the shoulder showed increased bony density in the region of the neck of the scapula on the anteroposterior view (Figure 1, *left*). The axillary view was normal. A complete blood count, erythrocyte sedimentation rate, and serum chemistry studies were within normal limits, except for an alkaline phosphatase level of 328 U/L (normal, 50 to 136 U/L).

A technetium-99 bone scan showed focal increased uptake in the region of the neck of the scapula and coracoid base (Figure 1, *center*). A computed tomographic (CT) scan showed a sharply demarcated lesion in the base of the coracoid process with a high-density nidus (Figure 1, *right*). This lesion corresponded to the location of the previously demonstrated high-signal area on bone scan. A presumptive diagnosis of osteoid osteoma was made.

The patient subsequently had surgical excision of the nidus. Histologically, the specimen consisted of immature woven bone with fibrovascular stroma, compatible with the nidus of osteoid osteoma.

*Based on case described in Kaempffe FA. Osteoid osteoma of the coracoid process: resection using the posterior approach. *Clin Orthop* 1994; 301:260-2.

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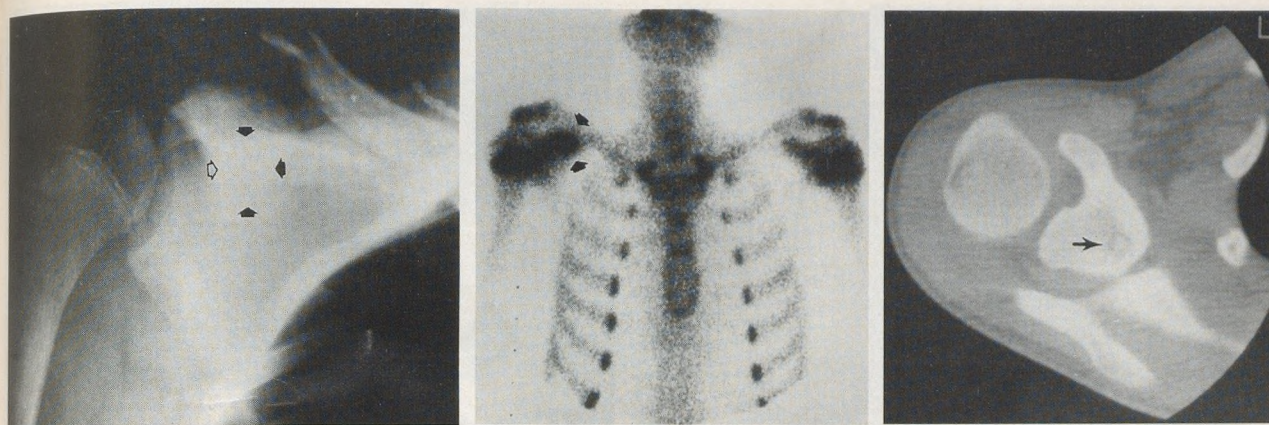


Figure 1. *Left*: Increased bone density is seen in the region of the neck of the scapula and coracoid base on the standard anteroposterior radiograph. *Center*: The bone scan shows focally increased activity in the region of the coracoid base. *Right*: A high-density nidus in a sharply demarcated lesion in the base of the coracoid process is seen on computed tomography scan. Histologic sections confirmed a diagnosis of osteoid osteoma. From Kaempffe FA. Osteoid osteoma of the coracoid process: resection using the posterior approach. *Clin Orthop* 1994; 301:260-2. Reproduced with permission of the publisher.

Within the first 24 hours after surgery, the patient had complete relief of his nighttime pain. One year after surgery, the patient remained pain-free and had full shoulder motion.

Case 2

A 44-year-old, right-hand dominant man had a history of recurrent dislocations of the left shoulder. Five months before evaluation, his shoulder dislocated, after which he noticed a "lump" in his left axilla. It was the size of the tip of his thumb, and for 2 months, there was no change in size. During the month before initial orthopedic evaluation, the mass increased in size and the patient experienced numbness in the second, third, and fourth fingers of his left hand as well as subjective weakness in the entire left upper extremity. The patient denied any history of fever, chills, or weight loss.

There was a mass along the anterior aspect of the left axilla. The mass was firm, nontender, and nonpulsatile, and no bruit was heard. Percussion of the mass did not elicit any radiating paresthesia. The mass was not movable and measured 8 cm in diameter. The patient had nearly full shoulder motion, but full adduction was limited because of the mass. There were motor, sensory, and reflex losses in the left upper extremity.

Plain radiographs of the shoulder showed a large soft tissue shadow in the axilla. A CT scan showed a large, well-circumscribed mass adjacent to the glenohumeral joint (Figure 2). The mass was of uniform consistency, without calcification or ossification.

With a presumptive diagnosis of soft tissue sarcoma, the patient was referred to an orthopedic oncologist at a

tertiary care center. The oncologist further staged the mass, and the patient underwent needle biopsy. Histologic sections were consistent with high-grade, undifferentiated synovial sarcoma. The patient had radiation therapy and then a shoulder disarticulation. His postoperative course was complicated by infection and a persistent draining wound, but this problem eventually resolved. To date, there has been no recurrence.

Case 3

A 45-year-old, right-hand dominant corrections officer presented with complaints of left shoulder and periscapular pain. He attributed its onset to forcefully opening a stuck jail-cell door 4 months previously. He denied neck pain or paresthesia. His pain was constant, even at rest, and was not related to activity. The pain decreased when he shrugged his shoulders posteriorly.

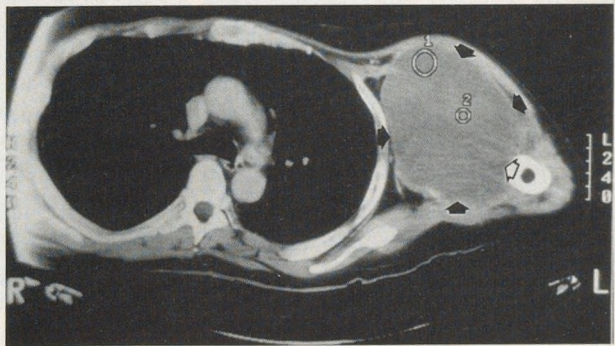


Figure 2. Computed tomography of the shoulder shows a large, well-circumscribed soft tissue mass. Histologic sections were consistent with high-grade synovial sarcoma.

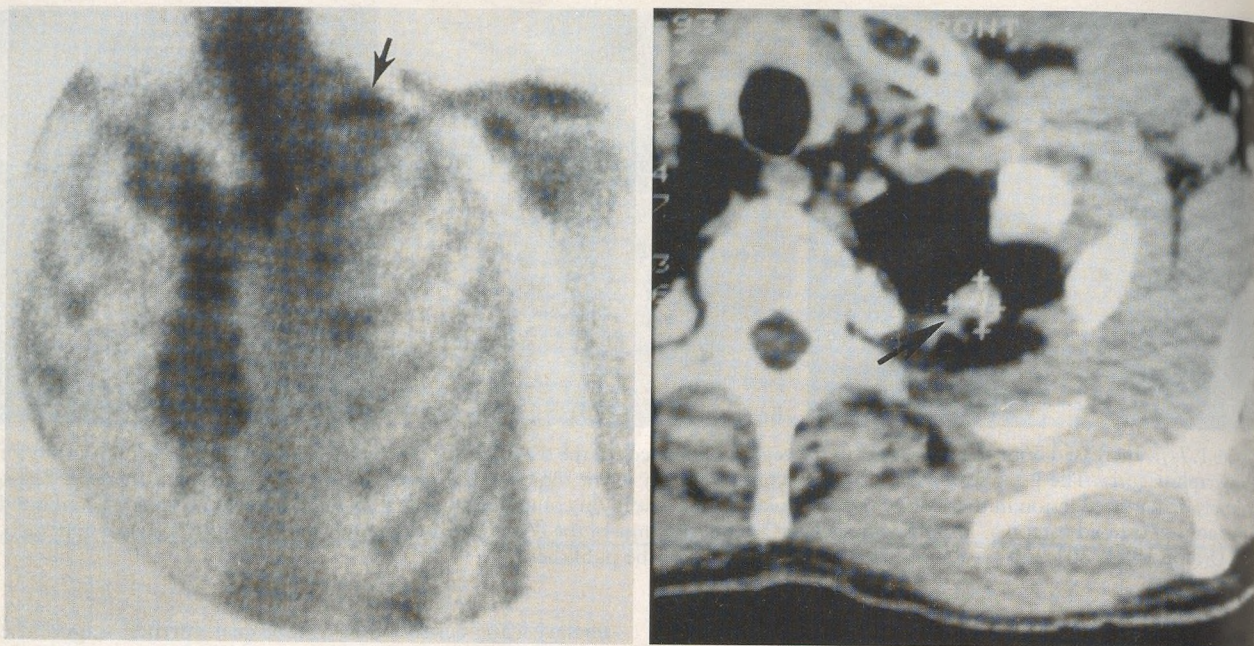


Figure 3. *Left*: A bone scan shows increased activity in the posterior portion of the second rib. *Right*: Computed tomography shows an apical left-sided lung mass. Histologic sections showed a moderately differentiated squamous cell (Pancoast) tumor.

The patient's history was remarkable for a fracture of his left scapula 20 years earlier while fighting a fire. At that time, he also had a left-sided pneumothorax that required a chest-tube thoracotomy. A review of his systems was otherwise unremarkable. Although he currently did not smoke, he had been a heavy smoker previously.

His cervical spine motion was full. There was no localized tenderness of the left shoulder girdle. There was no scapular winging or muscular wasting. Shoulder motion was full, and the impingement and drop tests were negative. There was no subacromial or scapulothoracic crepitus. Radiographs were unremarkable except for a healed scapular fracture.

A diagnosis of periscapular chronic muscle strain was initially made, and anti-inflammatory treatment begun. The patient was reevaluated 2 months later, 6 months after his injury. There was no change in his complaints: he continued to experience pain at rest and at night. A bone scan using technetium-99 showed increased activity in the posterior portion of the left second rib (Figure 3, *left*). A subsequent CT scan of the chest revealed a 1.4-cm mass abutting the posterior aspect of the left second rib (Figure 3, *right*). An enlarged right supraclavicular lymph node was also noted. The patient was referred to a thoracic surgeon and underwent a limited thoracotomy for biopsy. Histologic sections showed a moderately differentiated squamous cell carcinoma of the apex of the lung (Pancoast type). The patient subsequently underwent chemo-

therapy and radiation therapy, then thoracotomy for lobectomy and rib resection. The patient is currently involved in physical therapy to assist in shoulder motion recovery. A recent bone scan showed no evidence of bony metastasis.

Case 4

A 47-year-old, right-hand dominant woman was referred for evaluation of right-sided shoulder pain. Twelve years earlier, she had sustained a right proximal humerus fracture in a fall. The fracture healed, but she reported that her shoulder was "never right." She had a vague aching in the shoulder but had no difficulties performing her daily activities, except for those that required lifting her arm above shoulder level. Physical therapy failed to improve shoulder motion. The patient denied any nighttime pain, fever, chills, or weight loss.

Her cervical spine examination was normal. She had limited forward elevation and external rotation of the right shoulder. There were no areas of localized tenderness. The impingement sign was negative.

Radiographs showed an intramedullary lesion of the proximal humeral metaphysis with areas of speckled calcification (Figure 4, *left*), extension into the diaphysis, and evidence of the previously healed fracture. A bone scan using technetium-99 did not show other areas of



Figure 4. *Left:* Radiograph of the shoulder show an intramedullary lesion of the proximal humerus with areas of calcification. *Center:* A bone scan shows isolated increased activity in the proximal humerus. *Right:* Computed tomography shows a calcified lesion in the proximal humerus without cortical disruption. Final diagnosis was an enchondroma.

involvement (Figure 4, *center*). A CT scan showed a calcified lesion in the proximal humerus (Figure 4, *right*).

The patient was referred to a tertiary center for an orthopedic oncologic consultation. A subsequent biopsy produced neoplastic tissue consistent with an enchondroma.

Case 5

A 71-year-old man had a 6-month history of progressive left-sided shoulder pain. The pain was of insidious onset and without previous trauma. The pain radiated along the posterior aspect of the arm to the elbow, and was aggravated by internal rotation of the shoulder. He noted significant nighttime discomfort, as well as pain after activity. His symptoms were unresponsive to topical analgesics

and anti-inflammatory agents. There was no history of fever, chills, or weight loss.

There was a tender mass along the inferolateral border of the left scapula. Forward elevation and internal rotation of the shoulder were restricted when compared with the unaffected side; forced internal rotation reproduced the discomfort. There were no neurovascular deficits.

Radiographs of the shoulder and left scapula showed an osteolytic lesion along the inferomedial angle of the scapula with posterior cortical destruction (Figure 5, *left*). There was a second osteolytic lesion of the superior glenoid.

A technetium-99 bone scan showed increased uptake in the previously described regions as well as in the right 9th rib posteriorly (Figure 5, *center*). A CT scan of the

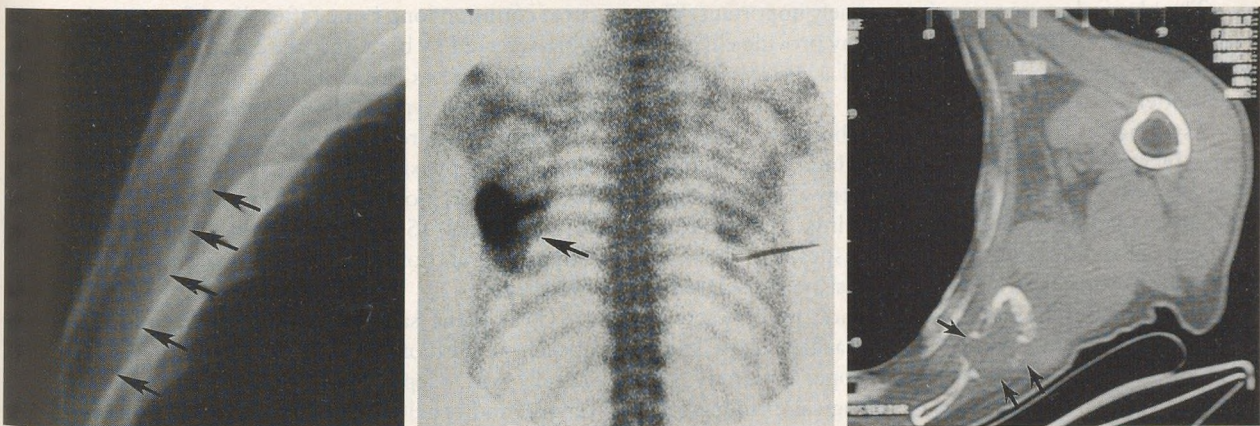


Figure 5. *Left:* Scapular radiographs of a male patient with a palpable mass show a bony lesion producing cortical destruction. *Center:* A bone scan shows increased activity in the scapula, superior glenoid, and in the 9th rib posteriorly. *Right:* Computed tomography of the scapula shows a large mass with cortical destruction. Histologic sections were consistent with metastatic mucin-producing adenocarcinoma. The primary site was unknown.

chest and scapula showed a large osteolytic area involving the inferior scapula (Figure 5, *right*). There were no lung masses. While there was a high probability that the lesion was metastatic, further extensive multisystem evaluation failed to reveal a primary site. The patient, therefore, had an open biopsy, which showed a metastatic mucin-producing adenocarcinoma.

The patient underwent a course of palliative radiation therapy. A primary site was not identified, although the lung was highly suspect.

Discussion

Pain is the most common presenting symptom of tumor of the shoulder.¹⁻⁴ Pain associated with tumor usually occurs at night and often at rest.⁵ Patients and physicians often try to associate onset of pain with a specific event, even though it may not be the cause. For example, in case 3, the pain resulting from a Pancoast tumor was attributed to forcefully opening a jail-cell door. This clearly was not the cause and was, in fact, coincidental.

Pain with shoulder movement can significantly interfere with the ability of the patient to perform routine daily activities, despite functional shoulder motion. The patient may "guard" and resist movement because of pain, and this can make diagnosis of the underlying problem difficult.¹ Pain can also result in subjective weakness. However, when neoplasm is present, specific muscle testing will most likely fail to reveal any focal deficits. This is in contrast to impingement syndrome (with or without a rotator cuff tear), in which specific testing of supraspinatus function, for example, will elicit weakness and reproduce pain.

The physical examination is extremely important. Visual inspection of the entire patient may provide clues to systemic illness and body habits, as well as distress related to shoulder.

Asymmetry between the two shoulders may be caused by muscle wasting or scapular winging or, alternatively, a mass. Palpation can help confirm visual findings. During palpation, tenderness, swelling, temperature changes, deformities, muscle characteristics, and their relationship to various structures, all must be considered.¹ Assessment of joint motion should include not only actual range of motion, but *how* the motion is achieved (eg, with effort or with ease, using the other upper extremity for assistance, or with pain). The neurological examination should include a complete cervical spine examination, as well as strength, sensibility, and reflex testing. The presence or absence of Horner's syndrome (miosis, ptosis, anhidrosis) should be documented, as it could indicate

injury or disease at the base of the neck, and sometimes is a sign of Pancoast tumors.^{1,7,8}

Radiographs should always be obtained, and should include at least an anteroposterior view and an axillary lateral view of the shoulder. Additionally, scapular films should be obtained if the scapula is the site of suspected disease. In the absence of radiographic findings and with a strong suggestive history and physical examination, a three-phase technetium-99 bone scan can identify occult bony abnormalities, which can subsequently be confirmed on CT scanning or magnetic resonance imaging (MRI). CT scanning usually provides better "bone windows"; MRI can help characterize soft tissue masses or extraosseous extension of interosseous lesions. Routine serum chemistries, including calcium, phosphorus, and alkaline phosphatase, a complete blood count, including differential, and an erythrocyte sedimentation rate can provide additional clues to diagnosis. A chest radiograph is also indicated for staging if a neoplasm is identified.

Eighteen percent to 24% of tumors of the shoulder are in the scapula.^{3,5} The scapula is more often involved with marrow cell lesions and metastatic carcinoma than with primary sarcoma. Osteoid osteoma are usually found in the neck of the scapula just behind the glenoid.³ Osteoid osteoma at the base of the coracoid process is very rare.⁹

Clinically, a palpable mass is usually felt when a scapular lesion is superficial; the asymmetrical appearance of one scapula because of a posterior scapular protuberance is usually the first sign of a deep scapular lesion.³ Scapulothoracic crepitus during shoulder motion could be the first presenting symptom.³

The proximal humerus and adjacent soft tissues are the second most likely region in the extremities to contain a neoplastic lesion; the proximal humerus is the third most common long bone (after distal femur and proximal tibia) affected by bone tumor.³ Sixty percent to 70% of all shoulder tumors occur in the humerus.⁵ Cartilaginous lesions of all types (chondroblastoma, enchondroma, periosteal chondroma, chondrosarcoma) have a predilection for the proximal humerus; marrow cell lesions and metastatic carcinoma are the common malignant lesions.¹ Ten percent to 15% of osseous metastases are in the upper extremity,⁴ and of these, 50% will occur in the proximal humerus.²

Soft tissue sarcomas occur in the upper extremity about one third of the time.⁵ These tumors are characteristically firm, deep to the superficial muscular fascia, nontender, and usually larger than 5 cm in diameter.^{5,6} The most common soft tissue sarcoma in adults (50 to 70 years of age) is malignant fibrous histiocytoma.⁵ Synovial sarcomas occur in a younger population, are juxta-articular in location, and have a high rate of metastases.⁵

Two types of tumor deserve special mention. Pancoast tumors involve apical lung parenchyma and are usually adenocarcinoma.⁸ These tumors can be the cause of shoulder pain, but can also cause Horner's syndrome, destruction of underlying bone (eg, posterior portions of the first three ribs), and atrophy of hand muscles.^{7,8} This last finding, often combined with radicular pain, paresthesia, and dermatomal sensory loss, is caused by a mass effect and compressive brachial plexopathy.^{7,8} In case 3, the patient presented with atypical shoulder pain, and a positive bone scan ultimately led to the correct diagnosis.

Osteoid osteoma is a benign bone lesion, occurring predominantly in adolescents and young adults. Pain is usually associated with the lesion, classically occurring at night and often relieved by salicylates. The pain is thought to originate in the nidus, which is histologically composed of vascular mesenchymal tissue. The recommended surgical treatment is excision of the nidus, which results in dramatic, and often immediate, relief of pain.⁹

Summary

Neoplasm causing shoulder pain was demonstrated by a series of case studies. The purpose was not to provide an in-depth discussion but rather to remind physicians that neoplasm can be the cause of shoulder complaints. Although rare, tumor should be suspected when clinical

presentations are unusual. These cases emphasize the importance of a careful history and physical examination.

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