A Study of Rib Biopsy*
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A retrospective study of one decade of rib biopsy in four hospitals in Nashville, Tenn, showed 61 biopsies were done in 60 patients. The typical patient was a male in his seventh decade. Preferred operative technique was open biopsy with general anesthesia. One half of the patients had metastatic malignancy; most of the known primary tumors were lung cancer. About one fifth of specimens were normal ribs. Biopsy was done in nine of these because of false-positive scintigraphy. Accurate preoperative chest wall localization is critical in order to minimize intraoperative decision-making problems. Yield of rib biopsy should be increased by more careful clinical observation, including critical evaluation of bone scans, avoiding overinterpretation of physical findings and observing for healing of possible rib fractures. (Chest 1992; 102:1134-36)

Reviews of chest wall tumors rarely focus on rib disease, and there has been no study of rib biopsy per se. This report presents a clinical series demonstrating current use of the diagnostic operation, including a discussion of proper application, technical methods and pitfalls, as well as anticipated results.

TECHNIQUE

Medical records with code 77.41 ("chest cage bone biopsy") were retrieved for the years 1981 through 1990 from four tertiary Nashville hospitals: Baptist, Park View, St. Thomas and Vanderbilt University. (At Park View, charts were available only from 1987.) Cases of patients having rib biopsy were extracted. An analysis of patient characteristics, preoperative diagnostic and operative techniques, and diagnostic yield was performed.

RESULTS

Sixty-one operations were performed on 60 patients. There were almost three times as many males (n = 44) as females (n = 16). Ages of the two sexes were similar. For females, the median age was 59 years (r = 15 to 73 years); mean age was 52 years. Males had a median age of 64 years (r = 32 to 82 years); mean age was 63 years.

Right ribs were sampled in 39 cases and left ribs in 22. Of biopsy sites localized by the surgeon, most were from the middle of the chest, ribs 4 to 8 (Fig 1). The preferred technique was an open procedure with the use of general anesthesia; 41 were done this way. With the use of local anesthesia, there were 15 closed (needle) and five open biopsies. No mortality or significant morbidity attributable to the procedure was identified.

Half the patients were found to have metastatic malignancy. Origins of malignancy were lung (n = 14), prostate (n = 4), breast (n = 2), urinary bladder (n = 2), throat (n = 1) and liver (n = 1). Original site of malignancy could not be determined in six cases. The next most frequent diagnosis was rib fracture (n = 7). There were three lymphomas, two each of myeloma and Ewing's sarcoma and one each of chondroma, mesothelioma, Paget's disease, as well as eosinophilic granuloma.

Thirteen specimens (21.3 percent of biopsies) showed no abnormalities. Nine (14.8 percent) normal ribs were obtained because of false-positive scintigrams. Three patients thought to have masses on physical examination had normal costochondral junctions excised. A patient required two biopsies when a normal rib was removed due to incorrect preoperative scintigraphic localization. Diagnosis from that patient's subsequent rib biopsy was old fracture (Fig 2).

COMMENT

In the many studies of primary chest wall tumors, lesions are placed into various categories: bone and cartilage, malignant and benign, epidermal and mesodermal, etc. Some general conclusions are that these tumors are rare, more occur in males than females, distribution between benign and malignant is about equal, and wide excision is the best therapy.

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FIGURE 1. Rib Biopsy location.
No report has focused on ribs, the bony structure most likely to be addressed by a thoracic surgeon. Previous summaries were written when the usual clinical presentation was mass, with or without pain, or an incidental finding on chest radiograph. Small, asymptomatic rib tumors are more likely to be discovered now, especially by scintigraphy. This study retrospectively assessed rib biopsy from the perspective of a consulting surgeon. It addressed current use and likely results.

Rib lesions were more common in males. The tabulation is skewed by the large number of metastatic lung cancers. In the entire group, the male-female ratio was 2.5:1. In the three largest categories (Fig 2), the ratio was 3:2:1. In addition to lung cancer, rib fractures also are more likely to occur in males.

The preponderance of mid-thoracic biopsies is probably due to convenience and the greater tissue area at risk for metastatic disease and trauma. The only inconvenient sites for sampling are the first rib and the subscapular and paravertebral areas.

Metastatic bone tumors have been noted to be the most common chest wall tumor. Most biopsies resulted in a diagnosis of metastatic disease or of systemic malignancies (Fig 2). The one primary malignancy, a mesothelioma, was detected by contiguity. There were only three benign tumors, one each of chondroma, Paget's disease, and eosinophilic granuloma. There were more lung and fewer breast cancer metastases than in other series.

One third (20 of 61) of ribs showed no abnormalities or fractures of varying age. This was an unexpectedly large group. A recurring physical examination problem is “misinterpreted normal anatomic relationships.” Three biopsies were done because of thoracic asymmetry (Fig 2).

Biopsy rate might have been lower with more critical evaluation of rib scan “hot-spots.” Bone scintigraphy has high sensitivity and low specificity. It is an evolving science, and specificity is improving. Even in patients with extraosseous malignancy, though, there is a significant incidence of false-positive scans in ribs. A period of clinical observation might show resolution of an abnormality, thereby avoiding biopsy. The presence of pain or a radiographic change correlating with the scan, or both, would be more suggestive of malignancy and indicate the need for biopsy.

There was no record of rib lesion evaluation by CT or MRI. No definite conclusions can be drawn from the few reports of such application, but potential value seems improbable. In general, CT is more useful for flat bones and MRI for staging of soft tissue tumors. Neither is very accurate in assessing chest wall infection; MRI is unlikely to be helpful in cases of small rib lesions because of chest wall motion and scant marrow.

Technique versatility is necessary because of the physical variety of rib abnormalities. For a palpable mass with radiographic bone destruction and obvious soft tissue component, needle biopsy, perhaps with fluoroscopic guidance, would probably be used. The opposite circumstance and one often encountered in an era of aggressive diagnosis is a subtle scintigraphic change without chest film abnormality. For this lesion, a wide extraperiosteal (to minimize potential tumor spillage) excision would likely be appropriate. Anesthetic choice is based on patient risk and procedure tolerance. Local anesthesia probably is inadequate for excision of any significant length.

Figure 2. Results of rib biopsy.
Preoperative localization is critical for accurate biopsy. If the abnormality is visible on a chest radiograph, the classic method of counting upward from the lowest rib\(^6\) will lead to an accurate incision. Scintigraphy of subtle lesions may be less precise. A second biopsy was necessary on one patient because of incorrect localization. Careful preoperative marking of the skin\(^\circ\) or bone\(^9\) may be helpful. Ideally, the surgeon should be in attendance and the patient in the planned operative position when scan-guided marking is done.\(^8\)

Accurate localization is critical because the surgeon may face the operative quandary of a normal-appearing rib. False-positive scans are a problem. The 14.8 percent rate in this series was sobering and dramatized current diagnostic inaccuracy. Pathologic findings may lurk subperiosteally. Two patients had metastatic carcinoma in normal-appearing ribs. In the absence of a visible abnormality, the operator may be uncertain whether diagnostic tissue has been obtained, and without soft tissue for frozen section analysis, final diagnosis must await bone decalcification.

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