

# PATHOLOGY OF SCALENE LYMPH NODES

## *An Analysis of 373 Biopsies*

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AS EARLY AS 1889, TROISIER<sup>18</sup> DESCRIBED "l'adénopathie" of the neck in diagnosing metastatic cancer. He reported 27 cases of intra-abdominal carcinoma detected by supraclavicular node extension. At the same time, reference was made to Virchow's earlier similar findings, which have been perpetuated by the term, "Virchow's node." Rouvière's<sup>15</sup> classical treatise of the anatomy of the lymphatic system in 1938 served to elucidate the pathways of lymphatic dissemination of malignant tumors and particularly to indicate the drainage of pulmonary lymphatics into scalene lymph nodes. It remained for Daniels<sup>3</sup> in 1949 to emphasize the usefulness of scalene lymph node biopsy as a diagnostic tool. Harken et al.<sup>5</sup> subsequently discussed the prognostic implications of this procedure in cases of pulmonary carcinoma. Numerous reports have since appeared relating positive scalene biopsies in cases of extrapulmonary carcinoma,<sup>1, 16</sup> lymphoma,<sup>1, 2, 7</sup> tuberculosis,<sup>7, 19</sup> sarcoidosis,<sup>1, 7, 14, 19</sup> and other conditions.

### MATERIALS AND METHODS

A review of the Pathology Service of Long Beach Veterans Administration Hospital for a ten year period, 1954 to 1963, revealed a total of 373 scalene lymph node biopsies. Clinical records as well as autopsy and surgical pathology material were reviewed on all of these cases.

The scalene tissue received in our laboratory generally consisted of a mass of fat, measuring on the average approximately 4×3×2 cm., within which lymph nodes were embedded. All lymph nodes were isolated and completely sectioned. In most instances, 2 to 8 lymph nodes were found in each specimen and they usually measured up to 1.5 cm. The greatest number of nodes found in a single case was 15, and the largest node measured

2.5 cm. In our series 343 of 373 biopsies had grossly detectable lymph nodes.

In 30 cases (8%), no lymph nodes were found on gross examination. These specimens were then serially sectioned and entirely blocked. Small nodes frequently were so well embedded in the fat tissue that they defied detection. Microscopic examination identified nodes in 28 of these 30 cases. Only 2 cases, less than 1% of the series, were unsatisfactory because of the absence of lymph nodes.

No attempt was made to determine the adequacy of the surgery, since several groups of surgeons over the 10-year period were involved in removing the lymph nodes. The experience of the surgeon and the scope of the dissection undoubtedly affect the yield of positive nodes.

### RESULTS

Table 1 indicates the numbers and percentages of positive diagnoses. Of the 373 biopsies, 113 (30.3%) received a specific diagnosis. This figure is comparable to other extended series.<sup>1, 2, 7, 9-11, 17</sup> Variations in results of scalene node biopsy studies appear to be related to number of cases included, nature of hospital population,<sup>7</sup> surgical technique<sup>5, 8, 12</sup> and technique of study.

*Pulmonary carcinoma.* Considering the entire group of patients with proven pulmonary carcinoma at surgery and/or autopsy, 40.0% (70 of 175) of scalene biopsies were positive. If the 48 additional cases of probable bronchogenic carcinoma (tissue diagnosis unavailable)

TABLE 1  
RESULTS OF SCALENE LYMPH  
NODE BIOPSY

|                          | Number    |
|--------------------------|-----------|
| Diagnostic               | 113 (30%) |
| Bronchogenic carcinoma   | 70        |
| Extrapulmonary carcinoma | 17        |
| Neuroblastoma            | 1         |
| Lymphoma                 | 6         |
| Tuberculosis             | 3         |
| Coccidioidomycosis       | 1         |
| Sarcoid                  | 15        |
| Non-Diagnostic           | 260 (70%) |
| TOTAL                    | 373       |

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are included, the above figure becomes 31.4%. In 46 patients, initial tissue diagnosis was made on the basis of scalene node biopsy.

As shown in Table 2, undifferentiated carcinomas of the lung metastasized most often to the scalene nodes, 38 of 71 (53.5%), and adenocarcinomas were next, 7 of 14 (50%). Squamous-cell carcinomas of the lung metastasized to scalene nodes in only 24 of 83 cases (28.9%). Of 5 cases of bronchiolar carcinoma in which scalene fat pad was biopsied, 1 had spread to the nodes.

*Extrapulmonary carcinoma.* Malignant tumor of primary extrapulmonary origin was found in 24 cases (6.4%) of this series. (Table 3). In cases of extrapulmonary carcinoma scalene biopsy was performed for one of several reasons: undiagnosed lymphadenopathy, suspected bronchogenic carcinoma, follow-up on previously diagnosed tumors. 17 of 30 (57%) were positive, including 7 from the gastrointestinal tract and 5 from the genitourinary system. In most instances a diagnosis of "mucus-secreting adenocarcinoma" (Fig. 1), "transitional-cell carcinoma," etc. was made and primary site was determined by appropriate studies.

In one case, a definitive diagnosis of follicular carcinoma of the thyroid gland could be made (Fig. 2); the clinical diagnosis had been bronchogenic carcinoma on the basis of a left hilar mass. A thyroidectomy was there-upon performed, confirming the diagnosis; the patient expired 2 years later without necropsy being done.

Two cases of squamous cell carcinoma of the esophagus had both been incorrectly diagnosed as bronchogenic carcinoma, one presenting with hemoptysis and the other with a

TABLE 3  
EXTRAPULMONARY TUMORS IN  
SCALENE LYMPH NODES

|                                  | Total | Previously diagnosed | Initial Dx. by scalene Bx. | Diagnosed following scalene Bx. |
|----------------------------------|-------|----------------------|----------------------------|---------------------------------|
| Gastrointestinal                 | 7     |                      |                            |                                 |
| Esophagus                        | 2     |                      |                            | 2                               |
| Stomach                          | 2     |                      |                            | 2                               |
| Pancreas                         | 2     |                      |                            | 2                               |
| Colon                            | 1     |                      |                            | 1                               |
| Genitourinary                    | 5     |                      |                            |                                 |
| Bladder                          | 2     | 1                    |                            | 1                               |
| Prostate                         | 2     |                      |                            | 2                               |
| Testis                           | 1     | 1                    |                            |                                 |
| Lymphoma                         | 6     |                      | 6                          |                                 |
| Other                            | 6     |                      |                            |                                 |
| Thyroid                          | 1     |                      | 1                          |                                 |
| Mediastinal ganglioneuroblastoma | 1     |                      | 1                          |                                 |
| Breast                           | 1     | 1                    |                            |                                 |
| Primary unknown                  | 3     |                      |                            |                                 |
| TOTAL                            | 24    | 3                    | 8                          | 10                              |

hilar mass. Autopsies performed one week and three weeks following respective biopsies established the correct diagnoses. Of the other gastrointestinal tumors, all adenocarcinomas, two arising in the pancreas each produced death within six weeks, and two originating in the stomach terminated respectively in one and 10 months, the latter following total gastrectomy. A case of metastatic carcinoma of the descending colon was lost to follow-up.

Two patients with metastatic transitional cell carcinoma of the urinary bladder expired 3 weeks and 3 months, respectively, fol-

TABLE 2  
HISTOLOGIC CLASSIFICATION OF  
METASTATIC PULMONARY CANCER IN  
SCALENE LYMPH NODES

|                            | Positive node | Negative node | Percent diagnostic |
|----------------------------|---------------|---------------|--------------------|
| Squamous cell carcinoma    | 24            | 59            | 28.9               |
| Adenocarcinoma             | 7             | 7             | 50.0               |
| Undifferentiated carcinoma | 38            | 33            | 53.5               |
| Bronchiolar carcinoma      | 1             | 4             | 20.0               |
| Mesothelioma (Pleura)      | —             | 2             | —                  |
| TOTAL                      | 70            | 105           | 40.0               |

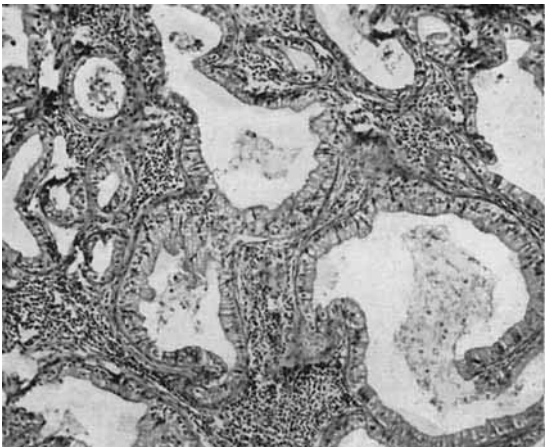


FIG. 1. Mucus secreting adenocarcinoma in left scalene lymph node metastatic from pancreas. (H. & E.  $\times 200$ .)

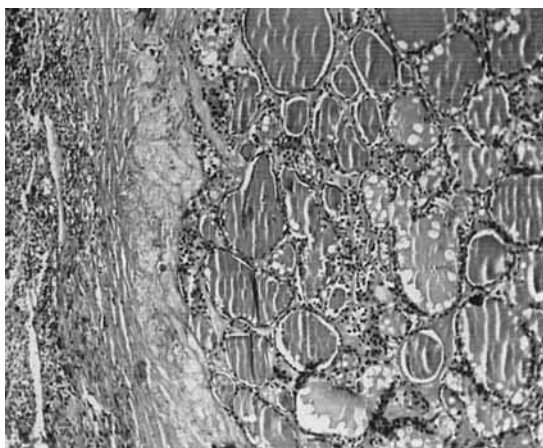


FIG. 2. Follicular adenocarcinoma of thyroid, metastatic to scalene lymph node. (H. & E.  $\times 100$ )

lowing positive scalene node biopsy. A 77-year-old male patient with a 6-month history of epigastric discomfort and a hard nodule in the left scalene area containing metastatic adenocarcinoma had a needle biopsy of the prostate gland showing similar tumor. Subsequent laparotomy revealed extensive pelvic lymph node metastases. The patient expired 15 months later with carcinomatosis. Scalene node biopsy of a 51-year-old male who had had previous orchiectomy indicated an embryonal carcinoma. He expired 6 months later and no autopsy was obtained.

The scalene lymph nodes of the left side were the ones involved with extrapulmonary carcinomas, except in the case of sigmoid colon carcinoma and of the testis, both of which had palpable, enlarged right sided scalene lymph nodes.

**Lymphoma.** Only 1 of 7 patients with a final diagnosis of lymphoma or leukemia had a negative node biopsy. However, in most cases, nodes were palpable and the disease was already fairly widespread; 3 patients with Hodgkin's disease survived 5, 6 and 18 months respectively following positive scalene biopsy, indicating the relatively poor prognosis in these circumstances. A patient with multiple

myeloma involving scalene nodes expired one month after biopsy with generalized myelomatosis. A patient with chronic lymphatic leukemia and another with lymphosarcoma died within a few months after positive scalene nodes were identified.

**Granuloma.** Scalene lymph node biopsy in non-neoplastic pulmonary diseases is of greatest value in cases of sarcoidosis, and is much less profitable in those of tuberculosis, the mycoses and pneumoconiosis<sup>18, 19</sup> (Table 4). In the present series 15 of 18 (83%) cases of sarcoidosis were correctly diagnosed by scalene node biopsy. All 15 were clinically and histologically confirmed. 3 of 12 cases of pulmonary tuberculosis were detected, only 2 in non-palpable nodes. One of 3 cases of coccidioidomycosis was positive (Fig. 3). Two cases of silicosis had negative scalene lymph node biopsies.

**Unusual Cases.** Two cases of particularly unusual interest merit brief reports.

The first was a 60-year-old white male who had tarry stools, anemia and albuminuria. Two lymph nodes, measuring 1.5 cm. and 0.5 cm., respectively were felt in the left supraclavicular area. Biopsy showed replacement of the nodal architecture by varying sheets of plasma cells in a manner consistent with plasma cell myeloma. Bone marrow and electrophoretic studies confirmed this diagnosis, which was further substantiated at autopsy.

The second case was that of a 66-year-old Negro male who had an enlarging posterior mediastinal mass and symptoms of back pain and weight loss. A left scalene node biopsy showed infiltration by large nests and sheets of small round cells embedded in a loose fibrillar matrix of neurogenic appearance. This was diagnosed as "metastatic malignant tumor of neural origin." At autopsy, a mediastinal ganglioneuroblastoma was found with metastases to the brain, liver, left kidney, para-

TABLE 4  
RESULTS OF SCALENE NODE BIOPSIES  
IN GRANULOMAS

|                    | Total | Positive | Per cent |
|--------------------|-------|----------|----------|
| Sarcoidosis        | 18    | 15       | 83       |
| Tuberculosis       | 12    | 3        | 25       |
| Coccidioidomycosis | 3     | 1        | 33       |
|                    | 33    | 19       | 58       |

TABLE 5  
PALPABILITY OF SCALENE LYMPH NODES  
IN BRONCHOGENIC CARCINOMA

|                      |      | Nodes palpable |      | Nodes non-palpable |      |
|----------------------|------|----------------|------|--------------------|------|
|                      |      |                | %    |                    | %    |
| Total cases          | 175  | 44             | 25.1 | 131                | 74.9 |
| Positive nodes       | 70   | 37             | 52.9 | 33                 | 47.1 |
| Non-diagnostic nodes | 105  | 7              | 6.6  | 98                 | 93.4 |
| Percent positive     | 40.0 | 84.1           |      | 25.2               |      |

aortic, supraclavicular and pelvic lymph nodes.<sup>4</sup>

Each of these cases concerns a tumor in which lymph node involvement is not generally well known.

*Node Palpability and Nonpalpability.* The advisability of performing routine diagnostic scalene biopsies on patients without palpable nodes had been disputed by several authors.<sup>6, 13, 16</sup> In order to determine the value of random sampling of non-palpable scalene nodes when clinically indicated, we divided all of our cases into 2 groups, those with palpable lymph nodes, and those without palpable nodes, depending on the clinical examiner's description. In general, palpable lymph nodes were usually greater than 1.5 cm. in size.

As can be seen in Table 5, in 33 of the 70 cases (47.1%), nodes containing metastatic bronchogenic carcinoma were not clinically palpable. This represented 25% of the total of cases with non-palpable nodes in this series, figures considerably higher than those of Hellwig et al.<sup>6</sup> who reported 3 of 20 positive non-palpable nodes. Thus, in almost half of the cases of bronchogenic carcinoma involving scalene lymph nodes, the nodes were not clinically palpable.

Three cases of extrapulmonary carcinoma were discovered by biopsy of the scalene fat pad in the absence of clinical lymphadenopathy (Table 6.) In one, previously referred to above, a 46-year-old Negro male presented with a Horner's syndrome and left hilar mass, and was thought to have a bronchogenic carci-

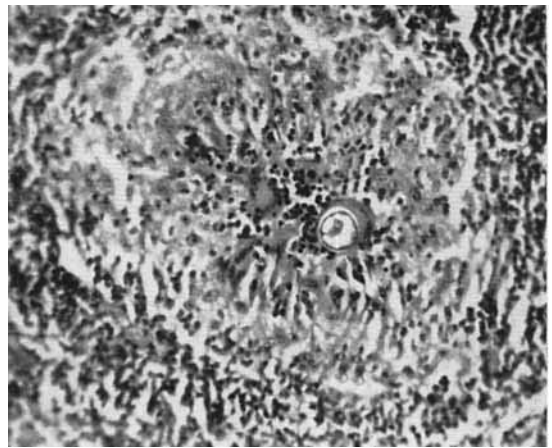


Fig. 3. Coccidioidomycosis involving scalene lymph node. (H. & E.  $\times 300$ .)

noma. Biopsy showed follicular adenocarcinoma metastatic from the thyroid gland. Another, a 75-year-old white male with hemoptysis and dysphagia, proved at autopsy to have a squamous cell carcinoma of the esophagus. 2 of the 3 cases of tuberculosis, 8 of the 15 cases of Boeck's sarcoid and the case of coccidioidomycosis did not have palpable nodes.

## SUMMARY

The present report analyzes 373 patients who had scalene lymph node biopsies, collected and studied over a 10-year period. Consideration was given to biopsy examination, analysis of surgical and autopsy controlled data, unusual diagnosis, and relationship of node palpability to pathologic findings.

Scalene lymph nodes were positive in 70 of 175 patients who had bronchogenic carcinoma, in 19 of 33 patients who had pulmonary granulomatous diseases, and in 24 patients who had extrapulmonary malignancies.

The scalene lymph node biopsy is important as a method of avoiding needless thoracotomy in bronchogenic carcinoma, since a positive scalene node indicates non-resectability of the tumor. It is a method of diagnosing many pulmonary granulomatous diseases, especially sarcoidosis, and many unsuspected extrapulmonary malignancies, including lymphomas, gastro-intestinal carcinomas, and genitourinary carcinomas.

TABLE 6  
PALPABILITY OF SCALENE LYMPH NODES  
IN OTHER CONDITIONS

|                          | Total | Nodes palpable | Nodes non-palpable |
|--------------------------|-------|----------------|--------------------|
| Extrapulmonary carcinoma | 30    | 17             | 13                 |
| Pos. Scalene node        | 17    | 14             | 3                  |
| Non-diagnostic node      | 13    | 3              | 10                 |
| Lymphoma                 | 7     | 4              | 3                  |
| Pos. scalene node        | 6     | 4              | 2                  |
| Non-diagnostic node      | 1     | 0              | 1                  |
| Tuberculosis             | 12    | 1              | 11                 |
| Pos. scalene node        | 3     | 1              | 2                  |
| Non-diagnostic node      | 9     | 0              | 9                  |
| Sarcoid                  | 18    | 7              | 11                 |
| Pos. scalene node        | 15    | 7              | 8                  |
| Non-diagnostic node      | 3     | 0              | 3                  |
| Coccidioidomycosis       | 3     | 0              | 3                  |
| Pos. scalene node        | 1     | 0              | 1                  |
| Non-diagnostic node      | 2     | 0              | 2                  |

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