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The Use of the scalene node biopsy in diseases of the lungs and mediastinum

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THE USE OF THE SCALENE NODE BIOPSY IN DISEASES OF THE LUNGS AND MEDIASTINUM

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INTRODUCTION

In 1949, Daniels (1) advocated biopsy of the supraclavicular lymph nodes overlying the scalenus anticus muscle in patients with pulmonary pathology which had defied diagnosis by other means, and suggested that this simple, safe biopsy be done before resorting to exploratory thoracotomy.

Since 1949, the biopsy has proven itself valuable both diagnostically and as an aid to determining the operability of patients with bronchogenic carcinoma. Yet the procedure is apparently infrequently used, for relatively few reports on it have appeared in the literature.

The purposes of this paper are to study the rationale and indications for the biopsy, to analyze results obtained with it, and to offer practical points for its use. Literature on which the paper is based is the English-language literature on scalene node biopsy and several books on lymphatic anatomy.

ANATOMIC BASIS FOR THE BIOPSY

The usefulness of the scalene node biopsy lies in the fact that the supraclavicular lymph nodes overlying the anterior scalene muscle often receive lymph from the lungs and mediastinal lymph nodes, and therefore may mirror pathology in these areas. This was shown by Rouviere (2), who followed the course of dye centrally from peripheral lymphatics of injected lungs. He found that the lymphatic vessels of the lungs drain into the paratracheal chains of lymph nodes, from which lymph in most cases passes directly into the lymphatic ducts or great veins at the root of the neck. In some cases,

however, a terminal collecting trunk exists thru which lymph may pass from the right or left paratracheal chain into the lowest node of the internal jugular and transverse cervical chain of nodes near the junction of the jugular and subclavian veins on the homolateral side. This node is one of those accessible to the biopsy technique under discussion.

Lateralization of lymph drainage from the lungs to the scalene nodes will be discussed under "Selection of Side for Biopsy."

INDICATIONS

Scalene node biopsy is indicated in a patient who has (1) an undiagnosed lesion in the lung, (2) undiagnosed hilar or anterior mediastinal lymphadenopathy, or (3) proven bronchogenic carcinoma.

1. Undiagnosed lung lesion. Biopsy is sometimes diagnostic in such cases even if there is no associated hilar or mediastinal enlargement on chest X-ray. Shefts and his co-workers (3) diagnosed a case of bronchogenic carcinoma in which X-ray showed only a very small infiltration in the right upper lobe. Carstensen and his group (4) biopsied eleven cases in which there were lung changes without any marked hilar enlargement, and found pathologic tissue in eight cases. Baer (5), however, advises that biopsy be done only if the patient has hilar or mediastinal lymphadenopathy in addition to the lung lesion, feeling that only in such cases is pathologic tissue likely to be obtained. In his series, all 18 patients in whom biopsy established the diagnosis had pre-operative X-ray evidence of hilar or mediastinal lymphadenopathy, whereas of 62 patients in whom biopsy was of no value in establishing the diagnosis, only

six had mediastinal node enlargement; the other 56 showed only parenchymal infiltration or atelectasis.

2. Undiagnosed hilar or anterior mediastinal lymphadenopathy. When this is the principal X-ray finding, biopsy will reveal many cases of sarcoidosis, Hodgkin's disease, lymphosarcoma, and tuberculosis.

3. Proven bronchogenic carcinoma. Harken and his group (6,7) biopsy all such patients to help determine operability. If they find cervicomediastinal metastases, they exclude the patient from radical surgery, feeling that operation holds small hope for cure, and may hasten death and increase suffering. If biopsy fails to show metastases, and if there are no other more commonly accepted evidences of inoperability (such as tracheal invasion, distant metastases, or positive pleural fluid), radical excision with block dissection of the lymphatics is done. Although Storey and Reynolds (8) in 1953 were often performing palliative resections for bronchogenic carcinoma in the presence of metastases to scalene nodes or other sites, they admitted that careful follow-up studies might show the wisdom of Harken's policy.

PRACTICAL CONSIDERATIONS

SELECTION OF SIDE FOR BIOPSY

Given a patient in whom scalene node biopsy is indicated, on which side of the neck should it be done? The work of Rouviere (2), confirmed by Drinker (9), is again pertinent. Rouviere found that the lymph drainage from the lungs is lateralized as follows: (1) Lymph from the whole right lung and from approximately the lower half of the left lung drains to the right paratracheal nodes and thence to the right scalene nodes. (2) Lymph from approximately the

upper half of the left lung drains to the left paratracheal nodes and thence to the left scalene nodes. Cahan (10) states that metastases from a carcinoma in the lower two-thirds of the left lung occasionally travel directly up the left lymphatic pathway instead of by the more usual contralateral spread.

In a patient with a lung lesion, it would seem wise, in view of this work, to determine selection of side for biopsy according to (1) location of the lung lesion as seen by X-ray, and (2) lymph drainage from that area of lung. Harken and his group (7) follow this policy. For a lesion in the right lung, they do a right-sided biopsy; for a lesion in the upper portion of the left lung, a left-sided biopsy; and for a lesion in the lower half of the left lung, a bilateral procedure. Such a plan would be advantageous in a case such as that reported by Shefts (3) in which chest X-ray showed a small area of infiltration in the left lower lobe and some enlargement of the mediastinum. Left scalene node biopsy showed only normal tissue. Three months later, X-ray findings were unchanged, but a right scalene node biopsy showed Boeck's sarcoid.

In a patient with hilar or mediastinal enlargement without evidence of a lung lesion, it seems logical to the writer that biopsy of the nodes on the side of the greater enlargement would be most likely to yield a diagnosis. Where there is no pulmonary lesion and equal bilateral mediastinal enlargement, Shefts (3) states that it is probable that the highest percentage of positive nodes would be found on the left, but gives no evidence to support this statement. Skinner and his co-workers (11), however, would do right-sided biopsy in such cases

because of the lesser chance of damage to the major lymphatic structures on the right.

If only normal nodes are found in a given case where pathologic nodes were expected, biopsy of the remaining side is advisable (3).

SURGICAL TECHNIQUE

The anterior scalene nodes are easily accessible to a simple surgical procedure described by Daniels (1) and others. It is best done in the hospital (often in conjunction with diagnostic bronchoscopy), where it can easily be handled on an outpatient basis. The biopsy procedure takes only ten or fifteen minutes (4). Local infiltration anesthesia is sufficient, and no special pre- or post-operative care or medication is necessary. Operative and post-operative discomfort is minimal.

The patient is placed in the supine position with the head slightly lower than the thorax to lessen the possibility of air embolism (12). The face is turned away from the side to be biopsied.

The approach used by most workers is similar to that used for phrenic nerve crush. After local infiltration anesthesia has become effective, a three to four cm incision is made two cm above the clavicle, with the center of the incision lying over the lateral border of the clavicular head of the sternocleidomastoid muscle. The incision passes thru the skin, subcutaneous tissue, platysma muscle, and superficial layer of the deep cervical fascia. The sternocleidomastoid is retracted medially. If this does not give enough exposure, the muscle can be split or the lateral border of its clavicular portion can be divided. The external jugular vein can be sacrificed

if it interferes with exposure. The transverse cervical and thyroid vessels can usually be seen coursing thru or superficial to the scalene fat pad, and should be retracted. If necessary, they may be ligated and cut without complication to the patient. Using a slightly different approach, Seghers and his group (12) make their skin incision across the origins of both heads of the sternocleidomastoid muscle, dissect downward between the two heads, free the internal jugular vein, and retract it with a blunt hook.

The scalene nodes are contained in a fat pad which lies on the anterior scalene muscle in a triangle bounded medially by the internal jugular vein, inferiorly by the subclavian vein, and craniolaterally by the omohyoid muscle. The fat pad is covered by a layer of the medial transverse (deep) cervical fascia. Nodes superficial to this fascia have been normal when the desired scalene nodes beneath it were pathologic (3), so one must be careful to secure the proper biopsy tissue. The deep fascia is incised, and the scalene fat pad pops out. As much of it as possible is removed by en bloc dissection carried medially to the inferior jugular vein and inferiorly to the subclavian vein. By cephalad traction on the fat, a great deal of that part of it which lies retrosternally and retroclavicularly can be secured. Nodes are dissected out of the fat post-operatively as they are easier to find at this time than they are at surgery with the fat pad still in place. It is conceivable that nodes may be seen at surgery which are grossly enlarged due simply to past or present non-specific inflammation. If such nodes were removed and a fat pad containing small pathologic nodes was left behind, the

diagnosis could be missed. Therefore, it seems to the writer (who has had no personal experience in the matter) that routine resection of the fat pad is advisable. However, it should be pointed out that Shefts (3) suggests that leaving the fat pad in place may reduce injuries to the major lymphatic ducts (an infrequent occurrence -- see section on "Complications").

After removal of the scalene fat pad, a finger can be carefully passed in front of the great vessels and down into the upper mediastinum in search of nodes. Seghers and co-workers (12) used this finger exploration for a time, but felt that the results obtained did not justify the risk of working blindly in this area, so they largely abandoned the practice. Harken and his group (7), however, advocate a rather extensive exploration of the superior mediastinum in conjunction with scalene node biopsy. They enter the superior mediastinum by blunt dissection thru the cervical fascia, insert the index finger either anteriorly or posteriorly to the subclavian artery, and then continue medially, dorsally, and caudally. The trachea is identified and the mediastinal pleura pushed laterally, exposing the paratracheal lymphatic chain. On the left, the arch of the aorta can be felt; on the right, the right main stem bronchus may be reached. If an enlarged, non-fixed lymph node is felt, it is removed with the finger. If a fixed node or non-pulsating mass is found, a laryngoscope or lighted retractor is introduced and a biopsy obtained under direct vision with a laryngeal biopsy forceps. After the mediastinal exploration, nodes are sought in the carotid sheath and retrosternal areas. In the series reported by Harken (7), dealing chiefly with bronchogenic carcinoma, half the positive biopsies came from

mediastinal tissue and not from the scalene fat pad. The whole procedure is said to produce little discomfort despite the use of only small amounts of procaine anesthesia, and was performed 300 times by thoracic surgeons without mortality or serious complication. Since it affords access to intrathoracic nodes not obtainable by scalene node biopsy alone, it seems to be a valuable extension of the latter procedure for surgeons sufficiently skilled to use it.

WHAT TO DO WITH THE BIOPSY SPECIMEN

(Most of this section is applicable to biopsy done for diagnostic purposes rather than to that which is done to determine presence of metastases from proven bronchogenic carcinoma.)

Having obtained the biopsy specimen, what should be done with it? A fourfold routine for obtaining maximum diagnostic value from the specimen can be assimilated from the important contributions of several workers.

1. The surgeon should dissect out of the excised fat pad those nodes which are visible, and make proper disposition of them to the pathologist and mycobacteriologist. By "proper disposition" is meant that each individual node should be cut in half, one portion of it being sent to the pathologist for section and the other portion to the mycobacteriologist for culture. The mycobacteriologist should be asked to divide the material he receives in similar fashion, so that a part of each node is used for each type of culture. Obviously, a diagnosis is possible from an involved node but not from an uninvolved node. This is illustrated by a case reported by Johnson and MacCurdy (13) and by Johnson (14) in which several one-to-three mm nodes and a one cm node were found. The smaller nodes were sent

only to the pathologist, and were reported as showing a moderately well-developed reticulum cell stroma with no abnormality. The one cm node was sent only to the mycobacteriologist, who cultured out an organism having the morphologic characteristics of Histoplasma capsulatum.

2. Cultures for M. tuberculosis and for fungi should be made in all cases (3).

3. Special tissue stains for M. tuberculosis and for fungi should be requested.

The purpose of these last two points is to aid in differentiating sarcoidosis, tuberculosis, and fungus disease (especially histoplasmosis), all of which may show similar histologic lesions difficult to distinguish by routine H and E stain. Growth of M. tuberculosis or of fungus from culture circumvents this problem, while differential staining attacks it directly. Fungi are brought into sharp contrast with the host tissue thru use of the Hotchkiss-McManus stain, as advocated by Shefts (3) and described by Kligman and associates (15). Tuberculosis organisms can be demonstrated by use of the Ziehl-Neelsen stain.

4. If nodes cannot be found in the scalene fat pad, the latter should itself be subjected to study, for it will often contain pathologic nodes too small to be seen with the naked eye. Seghers and group (12) make tissue sections on the fat routinely instead of searching for nodes in it, and state that since they started this policy, they have had "practically no" biopsies in which no lymphoid tissue was found. Skinner (11) advises that culture of the fat be done in certain cases. It seems to the writer that routine studies on the fat pad might be advisable even in cases where nodes had been obtained,

for the reason given on pages 6 and 7.

COMPLICATIONS

When performed with care by experienced surgeons, scalene node biopsy is safe. No mortalities have been reported, and the overall rate of complications was 1.6% in the total of 974 biopsies reported by five groups of workers (3,4,5,7,12). The complications were as follows:

Complication	Number of cases
Hemorrhage	6
Torn lymphatic ducts of major caliber	4
Pneumothorax	3
Hematoma	2
Temporary Horner's syndrome	1
total	16

Although the phrenic nerve lies upon the anterior scalene muscle directly beneath the scalene fat pad, and must therefore be carefully watched for, injury to it has not been reported. It is of interest to note that Harken and his group (7), who explore the superior mediastinum in addition to doing the scalene node biopsy, report the second lowest complication rate (1.3%).

The several types of complications reported will now be discussed further:

1. Hemorrhage

Harken (7) (combined cervicomediastinal exploration) reported hemorrhage in two of 300 biopsies due to injury to the subclavian or internal jugular vein. Bleeding was readily controlled with Gelfoam.

Seghers (12) performed 329 biopsies and had four instances of "substantial" hemorrhage due to tearing off the transverse cervical vein, but was able to control the bleeding with a short-lasting tamponade.

2. Hematoma

In 84 biopsies Baer (5) had one patient who developed a small hematoma which healed spontaneously.

Carstensen (4) reported development of a slight hematoma once in 56 biopsies.

3. Torn lymphatic ducts

In 56 biopsies Carstensen (4) had one case in which right-sided biopsy was followed by discharge of a chylus-like fluid for a couple of weeks.

In 205 biopsies Shefts (3) had three instances in which the lymphatic ducts were torn. The (left) thoracic duct was torn in one case. This was not evident at the time of surgery, but became evident postoperatively by the drainage of lymph thru the skin incision. The patient had bronchogenic carcinoma without metastases to the biopsied lymph nodes. Lymphatic drainage ceased following a left total pneumonectomy at which time everything possible was ligated in the mediastinum (the thoracic duct was not seen). The right lymphatic duct or branches thereof were torn in two biopsies. Aspiration and pressure dressings sufficed to stop the drainage. Despite visualization of them, lymphatic vessels descending on the left side of the neck were torn near the arch of the thoracic duct and required ligation in an unstated number of cases. The right lymphatic duct was visualized

once, and the arch of the thoracic duct "numerous times." The incidence of torn lymphatic structures is reduced by careful dissection and visualization, and by clamping and ligating tissue before transection.

4. Pneumothorax

In 84 cases Baer (5) had one patient who developed a small pneumothorax which healed spontaneously.

A pneumothorax was produced during two of 300 biopsies done by Harken and associates (7), who explored the superior mediastinum in addition to doing the scalene node biopsy. The lungs were expanded by catheter aspiration thru the operative site as the incision was closed. These authors note that the passage of air into or out of the incision does not always mean that a pneumothorax has been produced, for it may be due to the excursion of the mobilized mediastinal pleura during coughing or deep breathing.

5. Horner's syndrome

Shefts (3) reports one case of a temporary right Horner's syndrome in 205 biopsies.

RESULTS

Scalene node biopsy has established the diagnosis in a number of diseases of the lungs and mediastinum, enabling proper treatment and making unnecessary the performance of a diagnostic thoracotomy. In patients with lung metastases from extra-pulmonary tumors, it has established the previously unknown location of the primary lesion. When used as an indicator of operability, it has spared patients with metastatic bronchogenic carcinoma from useless radical surgery.

Of the diseases diagnosed by scalene node biopsy, sarcoidosis

and bronchogenic carcinoma have been by far the most frequent, followed by tuberculosis, Hodgkin's disease, and metastatic carcinoma from primary sites other than the lung. Several cases each of fungus disease and of lymphosarcoma have been diagnosed, and one or two cases of each of the following: adenomatous colloid goiter, epitheloid cell granulomatosis, lipoma, lymphatic leukemia, mononucleosis, neuroblastoma, neurilemmoma, plasmacytoma, silicosis, and Streptobacillus infection.

A summary of results reported by several groups of workers follows. Note that scalene node biopsy has been especially helpful, and therefore most often used, in patients who on physical examination present no palpably enlarged supraclavicular nodes.

Baer (5) performed scalene biopsy in 84 patients who had no palpably enlarged supraclavicular nodes and in whom the diagnosis of the intrathoracic pathology had not been established by routine examinations which included sputum studies and bronchoscopy. Biopsy established the diagnosis in 18 patients. There were 11 cases of sarcoidosis, four of tuberculosis, and one each of silicosis, Hodgkin's disease, and bronchogenic carcinoma. Baer states that the biopsy report was "misleading" in two patients. In one patient who eventually died of bronchogenic carcinoma, the nodes had been reported as showing nonspecific hyperplasia. In a patient who died of miliary tuberculosis, the pathology report had been sarcoidosis.

Carstensen and co-workers (4) biopsied 56 patients who had lung and mediastinal pathology of uncertain nature and in whom no enlarged supraclavicular nodes could be found by careful palpation. Abnormal lymphoid tissue was obtained in 50 cases, normal tissue in six.

There were 26 cases of sarcoidosis, five of epitheloid cell granulomatosis, one of tuberculosis, one of mononucleosis, and 17 which showed non-specific inflammation. Biopsy was confirmatory in two-thirds of the patients in whom a clinical diagnosis of sarcoidosis had been made.

Cuykendall (16) reported on 41 cases with intrathoracic pathology in whom scalene node biopsy was done after other diagnostic means had been tried without success. In none of these patients were palpable supraclavicular nodes present. Biopsy established the diagnosis in eight cases. Boeck's sarcoid was found in four cases, metastatic carcinoma (origin not stated, but presumably bronchogenic) in three, and lymphosarcoma in one.

Daniels (1), the first advocate of scalene node biopsy, presented case reports on five patients with pulmonary and mediastinal disease in whom there had been no palpable nodes on physical examination. Biopsy showed two cases of Boeck's sarcoid, two of squamous cell carcinoma of the lung, and one of silicosis (silica particles could be seen with Nicol prisms). In one case of carcinoma, biopsy findings resulted in decision against exploratory thoracotomy. In the other case, positive biopsy was obtained after exploratory thoracotomy had shown inoperable carcinoma of the lung with metastases. Had biopsy been done earlier, the useless thoracotomy could have been prevented.

Harken and his group (7) performed scalene node biopsy and superior mediastinal exploration on 142 patients with known or suspected bronchogenic carcinoma. They found 31 cases of bronchogenic carcinoma, seven cases of sarcoidosis, two cases each of Hodgkin's disease, metastatic carcinoma of the esophagus, and granulomatosis

compatible with tuberculosis, and one case of plasmacytoma. Thus, they obtained a positive histologic diagnosis in 32% of their biopsies. Among the 142 cases biopsied, there were 78 in whom a tissue diagnosis of bronchogenic carcinoma was made by one means or another. Thirty-one of these 78 patients (40%) had demonstrable metastases to the scalene or upper mediastinal nodes.

Johnson and MacCurdy (13) presented a report of a case of pulmonary histoplasmosis diagnosed by culture from a node obtained at scalene biopsy. Further material regarding the case was reported by Johnson (14), along with results of biopsy done in a number of patients who had pulmonary calcifications on X-ray.

Seghers and fellow workers (12) did scalene node biopsy in patients with proved or suspected bronchogenic carcinoma without palpable nodes. Biopsy was positive in six of 87 proven cases (7%) and in eight of 37 suspected cases (22%). In 180 cases of undiagnosed diffuse or miliary lung disease, positive biopsy was obtained in 86 cases (48%). There were 75 cases of sarcoidosis, six of tuberculosis, and five of tuberculosis or sarcoidosis. In 17 patients with mediastinal tumor there were nine positive biopsies (53%); all showed Hodgkin's disease. Biopsy was positive in one case of lymphatic leukemia and in 12 cases of metastatic carcinoma from stomach, ovary, jaw, and lip.

Shefts and associates (3) performed 205 biopsies (17 bilateral) in 187 patients with previously undiagnosed lesions of the lungs and mediastinum, and obtained 67 positive biopsies (36%). No statement was made as to whether or not these patients had palpable supraclavic-

ular nodes. Boeck's sarcoid was the most common finding, being present in 38 cases. Bronchogenic carcinoma was found by biopsy in 13 cases, and subsequently by other means in 11 others, so that biopsy was positive in 54% of the 24 proven cases. Tuberculosis was found in eight cases, all of which on X-ray showed mediastinal and/or hilar enlargement without discernible parenchymal involvement and in all of which tubercle bacilli were demonstrated both by tissue section and by culture from the enlarged, grossly necrotic nodes. There were two cases of lymphosarcoma, two of Hodgkin's disease, one of histoplasmosis, and one each of metastases to the lung and scalene nodes from carcinoma of the pancreas, hypernephroma, and carcinoma of the cervix. Not included in this series because diagnosis had been made previously were one case each of actinomycosis, coccidioidomycosis, North American blastomycosis, and South American blastomycosis cultured from scalene nodes.

Skinner and his co-workers (11) obtained positive results in 43 of 100 consecutive scalene node biopsies. In 18 of the 43 cases, no supraclavicular nodes had been palpable; in the other 25, there had been palpable nodes. In two of the 43 cases, diagnosis was known before biopsy, there being primary cancer elsewhere in the body with metastases to the lung. In the other 41 cases, the first positive cellular diagnosis was established by scalene node biopsy after many other diagnostic studies (including, in a few cases, lung biopsy or biopsy of the chest wall and axillary nodes) had been of no help. In this series there were 43 patients who, by examination of tissue obtained by one means or another, were eventually shown to have

bronchogenic carcinoma. In ten other patients a diagnosis of this disease was made clinically in the absence of histologic proof. Of these 53 patients with proven or suspected bronchogenic carcinoma, 24 (45%) had positive scalene node biopsy. Three of these 24 patients also had tuberculosis. The remainder of the positive biopsies in this series showed five cases of Boeck's sarcoid, five of carcinoma metastatic to lung and scalene nodes, three of Hodgkin's disease, two of neuroblastoma, and one each of neurilemmoma, lipoma, adenomatous colloid goiter, and Streptobacillus infection.

Storey and Reynolds (8) presented case reports of five patients in whom scalene node biopsy was diagnostic. Three patients had Hodgkin's disease, one Boeck's sarcoid, and one bronchogenic carcinoma.

Weiss and his associates (17) reported on a patient without palpable lymph nodes in whom scalene biopsy showed pulmonary sarcoidosis.

A positive biopsy may be related only to old or immaterial lesions and not to coexistant, active pathology of a different nature. Seghers (12) presented a case report illustrating this limitation of the biopsy which must be kept in mind when the results of a biopsy are being interpreted. The patient was a 58-year old man with an X-ray density in the left upper lobe, positive tuberculin reaction, and sedimentation rate of 85 mm per hour. Carcinoma and tuberculosis were suspected, but sputum was negative for carcinoma cells and for tuberculosis, and at bronchoscopy no lesions were seen. A lymph node obtained by scalene node biopsy was typical of tuberculosis, and a diagnosis thereof was made. Periodic X-ray examination was scheduled, but the patient stayed away longer than was arranged, and when next seen, he had an inoperable carcinoma of the lung. Obviously, the lesson to be learned here is

that further studies are indicated in cases where the index of suspicion remains high although the suspected lesion was not demonstrated by biopsy.

SUMMARY

Scalene node biopsy, introduced by Daniels in 1949, is based on the fact that the lymph nodes overlying the anterior scalene muscle often receive lymph from the lungs and mediastinum and may therefore mirror pathology in these sites. The biopsy is indicated chiefly in two types of patients: those with an undiagnosed lesion of the lung or mediastinum, and those with proven bronchogenic carcinoma in whom operability is being determined. Selection of the particular side of the body on which biopsy is most likely to be successful is based on a knowledge of the lateralization of lymph drainage from the lungs, which is described herein. The scalene nodes are easily obtained by a simple, safe surgical procedure which may be done under local anesthesia. Proper disposition of the biopsy material to the laboratories is important. Complications have been infrequent, and consist chiefly of damage to blood vessels or large caliber lymph ducts. No mortalities have been reported.

Scalene node biopsy has yielded a tissue diagnosis in as high as one-third of patients with previously undiagnosed lesions of the lungs and mediastinum, even when such patients have no palpably enlarged supraclavicular lymph nodes. Positive biopsy in such cases eliminates the need for a diagnostic thoracotomy. Likewise, demonstration of metastases in the scalene nodes has spared up to

two-fifths of patients with inoperable bronchogenic carcinoma from useless radical surgery. Despite the good results obtained with this procedure, it has been infrequently reported on and apparently is not widely used.

CONCLUSIONS

1. Scalene node biopsy is a valuable procedure for the diagnosis of lesions of the lungs and mediastinum and for the determination of operability in patients with proven bronchogenic carcinoma.

2. It is especially valuable for use in patients who lack enlarged superficial nodes which could be removed by standard biopsy procedures.

3. In view of the good results obtained thus far, scalene node biopsy deserves more frequent use.

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