Subscalene Biopsy in Intrathoracic Diseases*

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Even when all the usual aids to diagnosis of intrathoracic diseases are applied, many patients still lack a histologic diagnosis. This is particularly true with superior sulcus tumors. Biopsy of lymph nodes overlying the surface of the anterior scalene muscle has been employed for several years as an aid in the diagnosis and management of various intrathoracic diseases. It has been particularly valuable in the evaluation of bronchogenic carcinoma and sarcoidosis, but is also useful in other diseases. The purpose of this presentation is to describe a modified approach to lymph node and tissue biopsy as employed in the management of intrathoracic disease.

MATERIAL AND METHODS

A 43-year-old white married woman entered the University of Kansas Medical Center on February 1, 1962 with a complaint of pain in the right scapular area of two months' duration. Positive physical findings included tenderness to palpation over the medial aspect of the right scapula and a moderate decrease in the motor power of the entire right arm. All laboratory studies were within normal limits with the exception of the chest x-ray film which showed erosion of the posterior right second rib and an opacity in the apical area (Fig. 1). Bronchoscopy was normal.

Right anterior scalene lymph node biopsy was performed under local anesthesia and a frozen section examination of the excised nodes did not show tumor. The anterior scalene muscle was then sectioned near its attachment to the first rib and the superior portion reflected superiorly and anteriorly (Fig. 2, 3). Tumor tissue was apparent grossly in the brachial plexus and fatty tissue of the thoracic inlet. Biopsy confirmation was obtained by frozen section examination of tissue in this area. The tumor was separated from the brachial plexus and the wound closed in anatomic layers. Immediately after this procedure, the patient experienced some relief of shoulder pain. Cobalt therapy resulted in satisfactory palliation for approximately six months. The disease then progressed to the cervical cord, necessitating a decompressive laminectomy nine months after the original procedure. She then experienced a rapid downhill course to death.

In two additional patients with similar chest lesions, biopsy of the anterior scalene lymph nodes did not reveal tumor; however, extension of the procedure to include a subscalene tissue biopsy revealed histologic evidence of squamous cell carcinoma and a thoracotomy was thus avoided in each instance. Each patient was treated with x-ray therapy and satisfactory palliation obtained.

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DISCUSSION

One may pose several questions regarding the rationale of subscalene biopsy. Its major advantage is that a diagnosis may be established and an unnecessary thoracotomy prevented in selected patients with superior sulcus lesions in whom the usual procedures do not produce a histologic diagnosis.

Mediastinal exploration through the neck has been previously suggested in diagnosis of pulmonary lesions. A major advantage of this technique over the technique described by Marken and associates' (1954) is that one has more direct control of the mediastinal structures. The technical aspects of the procedure are not difficult although it requires knowledge of the many

Figures 2 and 3: Demonstration of the surgical approach to the subscalene area in which anterior scalene muscle is transected near its attachment to the first rib reflected superiorly and anteriorly exposing the thoracic inlet, brachial plexus and areolar tissue. Tumor tissue frequently presents in this area in Pancoast tumors.

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vital structures in the area. The entire operation may be done under local anesthesia.

A direct biopsy of tumor as suggested in this report involves transection of tumor tissue and lymphatics, which might militate against the possibility of a definitive procedure subsequently. Prior to Shaw and co-workers' (1961) report on a series of patients with Pancoast tumor, malignancies of the superior sulcus were generally considered to be invariably and rapidly fatal. Attempts at radical resection were met with failure. Shaw and colleagues' description of management of superior sulcus lesions included irradiation prior to resection and in some patients, thoracotomy and direct biopsy of the lesion prior to administration of x-ray therapy. It seems doubtful, therefore, that subscalen node biopsy would alter significantly the results of any subsequent therapeutic measures, including resection.

Other applications of this technique may become obvious with increased experience. Inflammatory disease of the upper lobes or lymphatics as well as lymphoma, aneurysms, neurofibromas, and other superior mediastinal lesions may be diagnosed or treated through this approach. Extension of the procedure to patients with bronchogenic carcinoma is not routinely indicated in the scope of a radical pneumonectomy includes the tissues removed by subscalen biopsy. It might be advantageous, however, in the elderly patient in whom a thoracotomy is hazardous and the principal purpose of major surgery is to establish a diagnosis. This procedure would be used only when routine lymph node biopsy is negative on frozen section. The rationale of scalen node biopsy in pulmonary carcinoma has been well presented by Connar.

Another benefit from this direct approach to superior sulcus lesions is that at least partial immediate pain relief may be obtained by separation of the neoplastic tissue from its points of innervation. In addition, the anterior scalenotomy allows expansion of the tumor anteriorly and superiorly, thus avoiding the pain of posterior and superior extension in the closed thoracic inlet. Complete evaluation of the procedure is not possible at this time, but initial results indicate further clinical trial.

**Summary**

Biopsy of lymph nodes overlying the anterior scalene muscle has been used many years as an aid to diagnosis of intrathoracic disease. This paper describes an extension of this procedure to include transection of the anterior scalene muscle and biopsy of subscalen tissues as an aid to diagnosis of intrathoracic disease. This procedure is particularly useful in those patients with superior sulcus tumors and in whom scalene node biopsy is negative.

**Resumen**

La biopsia de los ganglios linfáticos adyacentes al músculo escaleno ha sido practicada desde hace años para el diagnóstico de las afecciones internorácicas. El autor propone incluir en el procedimiento la resección transversa del músculo escaleno y la del tejido subescaléneo, con fines diagnósticos. Este proceder es particularmente útil en sujetos con tumores del surco superior y en los que la biopsia ganglionar ha resultado negativa.

**Zusammenfassung**


**References**

5. Herbet, P. A. and Watron, J. S.: "Tumor of Thoracic Inlet Producing Pancoast Symp-
SUBSCALENE BIOPSY IN INTRATHORACIC DISEASES

RIGHT OBLIQUE TRANSTHORACIC ECG

The value of three transthoracic electrocardiographic leads in the investigation of cardiac pain was adjudged following their recording alongside a conventional 7-lead tracing in 60 patients with cardiac infarction and in 40 supposedly healthy subjects, five of whom were subsequently shown to have coronary arterial disease. In two of the leads, an electrode in the fourth intercostal space at the right border of the sternum was paired with an electrode at station 8 (1¼ in. (3.8 cm.) beyond station 7) in the one, and at the angle of the left scapula in the other; the latter arrangement is the same as that adopted for the Ackerman and Nehrle leads, except that the indifferent electrode in these instances is placed in the second rib space. Since the tracing obtained by these two leads was frequently normal in patients in whom the cardiac infarct was situated, either laterally or posteriorly, they have no claim to be used in routine electrocardiography, nor in the occasional case that presents difficulty.

In the third transthoracic lead submitted to prob- ability, the electrode in the fourth intercostal space at the right border of the sternum was paired with one in station 7 in the left posterior axillary line; this arrangement has been named the right oblique lead.

In the healthy series, the P wave was usually low and sometimes inverted; a Q wave was usually present and it was often deep, the T wave was often low, but was never flat or inverted; the S-T segment was never depressed below the isoelectric line.

In 30 patients with lateral or posterolateral cardiac infarction where the conventional leads demonstrated either a 7, T, or T wave, pattern, the right oblique cardia diagram was abnormal in each, showing significant depression of the S-T segment in 22, and inversion of the T wave without S-T depression in eight patients. In these cases, the changes in the right oblique lead were always obvious and in the majority were more obvious than in the conventional leads. In 15 other patients in whom the infarct was more anteriorly disposed, the lead produced an abnormal tracing in 9, and in 12 among 15 patients, where the infarct was situated posteromedially, there was an abnormal tracing.

In five patients in particular, where consideration of their chest pain alongside their conventional electrocardiograms did not lead to an unequivocal diagnosis of coronary arterial disease, changes showing in the right oblique tracing removed the uncertainty in each. This lead proved superior to any other in uncovering a small lesion in the lateral wall of the left ventricle.

EFFECTS OF INTRAVENOUS PHENTOLAMINE

Observations have been made on six normal subjects and six hypertensive patients before and after the acute intravenous injection of 5 mg. of phentolamine. The drug caused a prompt reduction in systemic vascular resistance which resulted in a rapid fall in systemic blood pressure in spite of an increase in heart rate and cardiac output. Evidence is presented that the predominant vascular activity of the drug is to cause a direct relaxation of vascular smooth muscle, an effect far more potent than its antagonism of circulating catecholamines or its very much weaker sympathetic-blocking action. This direct depressor effect on vascular smooth muscle unaccompanied by any but slight sympathetic-blocking activities endows the drug with theoretically ideal antihypertensive properties.

Phentolamine caused a transient but significant reduction in oxygen uptake in the majority of individuals. It is suggested that this may be due to a direct inhibition of cellular oxidative mechanisms. TAYLOR, S. H.; SUTHERLAND, G. R.; MACKENZIE, G. J.; STAUNTON, H. P.; and DONALD, K. W.: "The Circulatory Effects of Intravenous Phentolamine in Man," Circulation, 31:741, 1965.

CONGESTIVE HEART FAILURE

Studies on sodium excretion and reabsorption in 21 cases with congestive heart failure and 13 cases of normal controls are reported. Seven cases recovered from congestive heart failure. The glomerular filtration rate in the majority of patients with congestive heart failure was markedly lower than normal, while in five of the seven cases during recovery it was not increased to the normal range. In patients with congestive heart failure, the tubular reabsorption of sodium exceeded 99.5 per cent in 11 cases, with the highest value reaching 99.96 per cent. Increased tubular sodium and water reab- sorption is believed to be the main cause of renal retention of sodium and water.