Pleural Biopsy and Thoracentesis
by a New Instrument*

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Since DeFrancis et al.1 first described needle biopsy of the parietal
pleura in 1855, this aid to diagnosis of causes of pleural effusion has
received much interest. According to previous reports, needle biopsy has
been diagnostic in about one-half of the cases in which it has been used.
However, it should be realized that some of these cases were selected and
that needle biopsy of the parietal pleura may not be this efficacious if
used in all cases. If the diagnosis appears obvious on the basis of other
clinical evidence, then pleural biopsy is not recommended. If there is
some question as to the cause of the pleural effusion, then Donohoe's3
approach is advisable: "At the time of the initial thoracentesis, aspira-
tion biopsy should be performed. If a specific cause is determined, no
further diagnostic studies would be needed and appropriate treatment
may be instituted. If such a specimen is either inadequate or inconclu-
sive, either a repeat aspiration biopsy is in order or surgical biopsy
through a small intercostal approach should be undertaken. A frozen
section should be obtained and if a specific cause is demonstrable, the
incision may be closed. If the result is not diagnostic, then the surgeon
should extend the incision and full exploration with appropriate biopsy
and/or resection can be carried out, followed subsequently with appropri-
ate treatment."

The Vim-Silverman needle has generally been used as originally de-
scribed by DeFrancis.1 Following this procedure, thoracentesis must be
done next. Either procedure, particularly the latter, may be complicated
by pneumothorax due to puncturing or lacerating the lung. In order to
combine pleural biopsy and thoracentesis and also to lessen the risk of
pneumothorax, we have devised a new instrument. It has features some-
what similar to those previously described by Cope,3 but it is more similar
to that reported by Abrams.4 The purpose of this article is to describe this
instrument and its use, report our results in using it and compare the
apparent efficacy of this instrument to others. We are not attempting to
prove the merits of pleural needle biopsy, for we feel this has been done.

Description of Instrument

The instrument consists of two parts—the "sheath" and the "needle"
and is shown in Fig. 1. The outer "sheath," A, has a hook-like cutting
notch on one end and a collar with three grooves on the other end. The
needle, B, has a boss protruding from its hub which fits in the grooves of
the collar of the sheath. The sheath has a diameter of a size 13 needle
and the needle, B, fits within this snugly enough to be airtight.

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After adequate anesthetization of the chest wall, a 4 or 5 mm. superficial incision is made in the skin to allow easy introduction of the instrument. A syringe (and intervening three-way stop cock, if desired) is fitted into the hub and the needle is inserted into the sheath. The boss is slipped into the deepest groove of the collar and rotated so as to "lock." This allows the point of the needle to extend beyond the sheath, as in C. The instrument is then inserted in the manner customary in performing thoracentesis. When fluid is aspirated into the syringe, the needle, only, is withdrawn, slightly, and rotated so that the boss is locked in the second groove and then the point of the needle no longer extends past the end of the sheath—as shown in D. In this position fluid may be aspirated without danger of puncturing the expanding lung and causing pneumothorax.

To biopsy the parietal pleura the boss is unlocked and the needle pulled back only far enough within the sheath so that the cutting notch is fully opened. Slight lateral pressure of the entire instrument in the direction of the cutting notch (indicated by an arrow engraved in the collar) is made and it is withdrawn until resistance is met due to the hook-like edge of the cutting notch engaging the parietal pleura. With the sheath portion of the instrument being held carefully in place the needle is again rotated so that the boss engages in the third groove, shown in E. As the needle is then slipped forward that portion of the parietal pleura which has been caught within the cutting notch will be sheared off, as shown in F. The instrument is then withdrawn and the biopsied pleura will be found within the distal end of the sheath from which it may be obtained by pushing a small wire through from the other end.

Present Study

In the present study, 47 patients with pleural effusion of previously undiagnosed cause had thoracentesis and pleural biopsy with the above-described instrument. In this study, the cases were unselected in that we

![Diagram](http://journal.publications.chestnet.org/pdfaccess.ashx?url=/data/journals/chest/21358/)

**FIGURE 1**: Instrument described in present report. Single arrows indicate positions of needle boss in various grooves of the collar of the sheath. Double arrow indicates how point of needle is pushed forward to biopsy the parietal pleura.
did not exclude cases because the underlying condition appeared to be one which might not be diagnosable by pleural biopsy. In the majority of cases, two pleural specimens were obtained at one sitting and when this was done the two were processed together and considered as one for purposes of tabulation. Two of the patients had biopsies at two different times. The "final diagnoses" were those made at times of discharge of the patient or after follow-up in the outpatient clinics. Diagnosis was confirmed by necropsy in nine cases and thoracotomy in seven cases. The "biopsy diagnoses" used were the original pathologist's reports placed in the chart, except one which was originally reported as negative but when later reviewed showed very obvious malignancy. A specimen was considered adequate if the biopsy contained sufficient material for a diagnosis of malignancy, granuloma or inflammatory reaction or if it showed mesothelial cells.

Results

The histologic diagnoses related to the final diagnoses in this series is indicated in Table 1. In this study, only cases of carcinoma were diagnosed by pleural biopsy. Thirteen of all 47 cases (28 per cent) or 59 per cent of the 22 carcinoma cases were thus diagnosed. The one granuloma found was from a patient with a subphrenic abscess and did not aid in the diagnosis in that case. In 26 cases, nonspecific pleuritis was found. Although this histologic picture is not absolutely diagnostic, it is often helpful clinically and in most of these instances is fully compatible with the final diagnosis.

The finding of normal pleura in three of the cases is not surprising in that in cases of carcinoma, the pleura is frequently found to be normal except in areas of invasion or metastatic implantation. Also, there may be no significant pleural reaction in cases of congestive heart failure, in that the pleural fluid in these cases may be only an increased amount of the normal pleural fluid which is a transudate.

Four of the 47 specimens (8.5 per cent) failed to show evidence of parietal pleura. Such specimens showed only connective tissue and muscle. However, one may speculate that pleura may have been obtained on the biopsy but because of its thin structure may be missed by the microtome if not in the plane of section. This is, no doubt, a situation which might take place in needle biopsy of the pleura with any instrument. Table 2 shows how our results compare with other workers' series.

Incidentally, this instrument was also used successfully in one pericardial, one synovial, and one of two peritoneal biopsies. Carcinoma was diagnosed in the pericardial biopsy.

<table>
<thead>
<tr>
<th>Final Diagnosis</th>
<th>Histologic Diagnosis</th>
<th>Malignancy</th>
<th>Granuloma</th>
<th>Non-specific Pleuritis</th>
<th>Inadequate Specimen</th>
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<td></td>
<td>13</td>
<td>1</td>
<td>3</td>
<td>26</td>
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</table>
Discussion

This instrument seems to have satisfactorily fulfilled its purpose in simultaneous performance of thoracentesis and pleural biopsy. The only complication sustained was pneumothorax and subcutaneous emphysema in one patient. However, it must be pointed out that free pleural fluid was not present in this case and we now agree with Heller et al. that the lung must be clear of the chest wall as a definite prerequisite to pleural biopsy. That this instrument is not difficult to use is illustrated by the fact that in the collection of the present series many house staff physicians used it for the first time without difficulty.

Table 2 shows the results obtained by performers of nonsurgical pleural biopsy. For the most part, they have used the Vim-Silverman needle, except Mestitz et al. who used Abrams' needle in all cases and Leggat used both types but found the latter to be preferred. It is not possible to compare accurately the efficacy of methods in two series of cases since the etiologies of the effusions may be quite different. From studying the literature, it becomes obvious that cases of pleural effusion due to carcinomas are most readily diagnosed by this means, as is shown in Table 2. Therefore, to evaluate the efficacy of this instrument, we should confine the comparison to the percentage of cases of carcinomatous pleural effusions diagnosed.

It is unlikely that any instrument can improve upon the diagnostic efficacy of pleural biopsy as shown in Table 2. Even though the parietal pleura might be thickly studded with malignant implants or other lesions, a diagnosis cannot be made unless the few square millimeters of pleura obtained is involved. Whether or not diagnostic material is obtained is largely a matter of chance. At any rate, the statistical chance of making the diagnosis by biopsy at the time of thoracentesis is so good, and the risk of complications so slight, that we believe it should be done in every case where the diagnosis is even remotely in doubt.

SUMMARY

A new instrument for simultaneous performance of thoracentesis and pleural biopsy is described. This instrument is considered safer than previous thoracentesis or biopsy needles in that, after initially entering the pleural space, a sharp point does not project towards the lung.

Twenty-eight per cent of all 47 cases, or 59 per cent of 22 carcinoma cases on which this instrument has been used, were diagnosed by the pleural biopsy. Only four biopsies failed to yield a satisfactory specimen.

RESUMEN

Se describe un instrumento nuevo para llevar a cabo al mismo tiempo la toracentesis y biopsia pleural. Este instrumento se considera mas seguro que las agujas de toracentesis o biopsia antes usadas porque después de haber entrado a la pleura no se proyecta una punta aguda dentro del espacio pleural hacia el pulmón.

En vientocho por ciento de todos los 47 casos de carcinoma se usó este método.

En 59 por ciento o sean 22 enfermos de carcinoma en los que este instrumento se ha usado se hizo diagnóstico por la biopsia pleural.

Solo 4 biopsias dejaron de dar un espécimen satisfactorio.
RESUME

L'auteur décrit un nouvel instrument pour la pratique simultanée de thoracentèse et de biopsie pleurale. Cet instrument est considéré comme donnant plus de sécurité que les aiguilles pour thoracentèse ou pour biopsie connues antérieurement, par le fait que, après la penetration initiale dans l'espace pleural, il n'y a pas de risque de projection d'une pointe aiguisée contre le poumon.

28% de 47 cas de différentes natures, ou 59% de 22 cas pour lesquels l'instrument a été utilisé furent diagnostiqués par biopsie pleurale. Il n'y eut que quatre biopsies qui ne fournirent pas d'échantillon satisfaisant.

ZUSAMMENFASSUNG

Es wird ein neues Instrument zur gleichzeitigen Vornahme einer Thorakocentese und pleuralem Biopsie beschrieben. Dieses Gerät wird für sicherer gehalten, als die bisherigen Nadeln zur Thorakocentese zur Biopsie in der Hinsicht, daß nach dem anfänglichen Durchtritt durch den Pleuralspalt keine scharfe Spitze gegen die Lunge gerichtet ist.


REFERENCES


DIAPHRAGM GRAFTS

Animal experiments demonstrated extremely valuable qualities of the diaphragm for use in plastic surgery. Grafts of the diaphragm affixed to a pedicle and cut out with due consideration for their innervation and blood supply grew very well into the pericardium, cardiac muscle, aorta, lung, esophagus and liver. The clinical application of this method, begun in 1948, yielded good results in operations on the esophagus for tumors, cysts and diverticula. Here we noted the possibility of substituting the vascular wall of the esophagus with the diaphragmatic muscle. Good results were obtained in the application of diaphragmatic grafts affixed to a pedicle for closing the bronchial stump. In aneurysm of the heart, this method enabled us to improve the vascularization of the myocardium and to strengthen the scarred wall of the heart with diaphragmatic muscle. This method also is used in the following situations: closing defects of the wall or strengthening the line of anastomosis in operations on the esophagus; plastic operations on the cardio-esophagus: creating artificial cardiac sphincter in gastroesophageal regurgitation; and for closure of wounds of the lung, liver, heart and aorta incurred during operations on these organs.