Evaluation of Various Types of Needle Biopsies of the Thyroid

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Thyroid needle biopsy has been used at the Cleveland Clinic since 1948 in more than 2,000 instances without serious complications. In the years 1979 and 1980, there were 481 needle biopsies performed, and the patients have been followed from 1 to 3 years. One hundred fourteen needle biopsies were with the 18-gauge needle, 119 were with the fine needle, and 248 were Tru-cut® biopsies. One hundred fourteen of the patients had 2 kinds of biopsies at the same time, usually Tru-cut® and fine needle. The Tru-cut® needle biopsy gave the highest percentage of success in obtaining diagnostic material with only a 4% failure in the hands of the surgeon using it most often. Aspiration with an 18-gauge needle and fixing the aspirate to form a cell block was found to be a safe and satisfactory way of obtaining material from cysts or nodules too small to be safely and easily sampled by a Tru-cut® technique. The fine-needle (ABC) biopsy is safe, simple, and economical and provides material sufficient to diagnose all types of thyroid cancer except the low-grade follicular type. This limits to some extent the usefulness of the ABC biopsy. Even with Tru-cut® core biopsies, it is often impossible to distinguish between cellular adenomas and low-grade adenocarcinomas. Since approximately one-third will prove to be malignant, surgery is advised for these patients.

The most significant accomplishment of the routine use of needle biopsy in the diagnosis of thyroid nodules has been the diagnosis of malignancy in more than 5% of the patients with nodules. This has permitted us to avoid surgery in 87% of all patients with thyroid nodules. As a result, in the time period reviewed, 21 of the 46 patients (47%) who had thyroid surgery had malignant tumors.

Core-needle biopsy of the thyroid has been used at the Cleveland Clinic since the 1940's, when the Silverman needle first became available. At first it was used to diagnose diffuse goiters that might be lymphocytic types of thyroiditis, to diagnose subacute thyroiditis, and to establish histologic diagnosis of malignant tumors that were deemed inoperable [1].

As our experience increased, we grew more confident and began to take biopsies of nodules. The Tru-cut® Travenol needle then became available and gave not only a better core when the nodule contained a lot of colloid, but also specimens that were easier to interpret because they were not compressed as the Silverman cores so often were. Since 1970, therefore, we have routinely taken biopsies of all thyroid nodules as well as of diffuse non-toxic goiters [2-4].

Background

In the more than 2,000 biopsies that have been done at the Cleveland Clinic, there has been only one instance of an implant of cancer in the needle tract. This occurred in a man with an aggressive, partly undifferentiated papillary carcinoma that already had metastasized to bone. The skin nodule was excised and did not recur during the patient's period of survival.

There was 1 patient who, after a Tru-cut® needle biopsy, had bleeding into the extra-thyroid tissues and had to be observed overnight to make certain that decompression would not be necessary. Almost always this complication can be avoided by having the patient put firm pressure on the area for 5 minutes after the biopsy. The only other complication was a paralysis of the recurrent laryngeal nerve that occurred in the course of a Tru-cut® needle biopsy done by a relatively inexperienced member of the staff. If the needle is directed laterally away from the tracheo-esophageal groove, this complication need never occur. There have been no complications following 18-gauge or fine-needle biopsies.
Since 1970 needle biopsies that were interpreted as showing no evidence of malignancy have been taken from the thyroid nodules of more than a thousand patients. Surgery was not advised in these patients and subsequently only 2 of them have been found to have cancer. In 1, the tumor was an occult papillary carcinoma in the opposite lobe which was found when, at another hospital, subtotal thyroidectomy was done. The other was an undifferentiated cancer that appeared suddenly more than a year after our biopsy had been taken from a benign nodule.

Methods and Materials

In addition to the core biopsies, 2 types of aspiration biopsies have been used. In the first, an 18-gauge needle is employed. A drop of local anesthetic is placed in the skin, and the needle is run back and forth through the nodule with full suction of the syringe. The suction is then released, the needle is withdrawn, and the contents of the needle (or syringe, if there is anything in it) are squirted into a jar of fixative. This is then centrifuged and the pathologist makes a cell block of the sediment.

The other type of aspiration biopsy is done with a fine 23-gauge needle. This requires no local anesthetic. The material is obtained in the same way as with the 18-gauge, but it is then squirted onto a slide and spread like a Pap smear. The ABC biopsy (aspiration-biopsy cytology), popularized by Löwhagen in Sweden [5], is more difficult for untrained pathologists to interpret, but in the hands of experts it is highly competitive with core-type biopsies. Its advantages are its economy, its comfort for the patient, and its total lack of complications.

In 1979, Löwhagen demonstrated his technique to us, and one of us (CBE) began a study in which in every biopsy of the thyroid, he made an ABC smear as well as taking a core or 18-gauge aspiration biopsy. It is with the results of this study that this article is primarily concerned.

Results

One of the 5 surgeons who participated in this study obtained most of his biopsies with an 18-gauge needle, whereas the others usually used the Tru-cut® (Travenol) needle to obtain core biopsies, and one of them used both the Tru-cut® and ABC biopsies in all cases. As a result, we can now compare the results of ABC, 18-gauge, and Tru-cut® biopsies.

In comparing the results of the various types of biopsy, one must understand that in special situations there was selection toward using one method or another. For example, all 5 surgeons used the Tru-cut® with or without simultaneous ABC biopsies in the diagnosis of diffuse goiters suspected of being the result of thyroiditis, and all of the surgeons usually used the 18-gauge needle when a cyst was suspected or when the nodule was so small that it would be difficult to obtain a core from it without the danger of the needle penetrating the capsule of the gland and causing bleeding in the soft tissues of the neck. Since it is difficult to get a core biopsy from a cyst or from a very small nodule, the factor of selection tends to increase the number of failures with the 18-gauge needle.

There were 34 benign-appearing cysts in this series, and all of them were aspirated. There were no complications, and although many of them recurred and had to be reaspirated, none of the patients to date has required an operation.

In 1979 and 1980, there were 481 needle biopsies done in 360 patients, and the patients have been followed for from 1 to 3 years. One hundred fourteen were 18-gauge biopsies, 119 were fine-needle (ABC), and 248 were Tru-cut® biopsies. One hundred fourteen of these had 2 kinds of biopsies at the same time, usually Tru-cut® and ABC. Table 1 shows the incidence of failure of the various methods to obtain a specimen adequate for diagnosis.

In 46 of the 481 biopsies (9.6%), the material was insufficient for diagnosis, but the material was insufficient in only 23 (6%) of the 360 patients from whom biopsies were taken. It is thus apparent that performing 2 types of biopsies may increase the accuracy of diagnosis.

More than half of the biopsies were done by surgeon A, who had a special interest in the thyroid. Only 4% of his Tru-cut® biopsies failed to contain enough tissue for diagnosis. In the hands of all the surgeons, the Tru-cut® biopsies were the most successful. Only 7% contained insufficient material, but this was partly because this type of biopsy was used on the large goiters and the diffuse goiters of thyroiditis from which specimens are easily obtained.

Nine percent of the ABC biopsies failed to contain enough cells to enable the pathologist to rule out the presence of cancer. Fifteen percent of the

| Table 1. Relationship of type of biopsy to failure to obtain an adequate specimen |
|------------------------------|---|---|---|
| Type of biopsy | Tru-cut® | 18-Gauge | ABC |
| Number | 248 | 114 | 119 |
| Failure | 18 | 17 | 11 |
| % Failures | 7% | 15% | 9% |

*Selection of 18-gauge to obtain material from small and cystic nodules resulted in more failures in this group.*