Recent Experience With Preoperative Fine-Needle Aspiration Biopsy of Thyroid Nodules in a Community Hospital

Joseph A. Blansfield, MD; Martha J. Sack, MD; John S. Kukora, MD

Hypothesis: The application and reliability of fine-needle aspiration (FNA) biopsy in community hospitals may be less efficacious in the clinical assessment of patients with thyroid nodules than in tertiary referral centers.

Design: Retrospective review.

Setting: One community teaching hospital.

Patients: One hundred eighty-three patients who underwent thyroidectomy after FNA biopsy.

Interventions: Preoperative FNA biopsy cytopathologic testing and thyroidectomy and postoperative histopathologic testing.

Main Outcome Measure: Preoperative cytopathologic reports were compared with postthyroidectomy histopathologic reports.

Results: Thyroid cancer was confirmed postoperatively in 70 patients (38%). An FNA biopsy diagnosis of papillary carcinoma (in 29 patients) correlated with a predictive accuracy of 93% (27 patients). Suspicious for papillary carcinoma (n=14) correlated with malignancy in 8 patients (57%). Indeterminate follicular lesion (n=60) correlated with malignancy in 18 patients (30%), of whom 16 (89%) had papillary carcinoma (10 patients had follicular variant) and 2 (11%) had follicular carcinoma. Indeterminate Hurthle cell lesion (n=20) correlated with malignancy in 7 patients (35%). Atypical cell clusters (n=5) did not correlate with malignancy. Benign FNA biopsy findings (n=44) in patients who underwent thyroidectomy for other clinical features correlated with malignancy in 8 (18%). Of 11 patients who underwent thyroidectomy for insufficient number of cells after repeated FNA biopsy attempts, 2 (18%) had carcinoma.

Conclusions: The accuracy of an FNA biopsy of thyroid nodules in a community hospital setting is comparable to results from major endocrine referral centers. An indeterminate follicular lesion was the most common FNA biopsy indication for thyroidectomy and correlated with the presence of differentiated thyroid cancers in 18 (30%) of 60 patients.

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For more than 2 decades, fine-needle aspiration (FNA) biopsy has become increasingly important in the assessment and management of thyroid nodules, and its increased use has been reported in 73% of hospitals during the past decade. This acceptance has been higher (3.6% of the anatomic pathologic caseload) in university hospitals than in nonuniversity hospitals (1.2% of the caseload), possibly because of the need for an expert cytopathologist on staff to interpret the FNA biopsy results.

A minimally invasive procedure, FNA biopsy permits nonoperative management of most thyroid nodules, with a low risk of complications, primarily neck hematoma. Fine-needle aspiration biopsy has increased the yield of cancer in surgically treated nodules to 25% to 40%, compared with 5% to 15% before its introduction.

Disadvantages of FNA biopsy include inadequate cytological specimens that require either a repeat FNA biopsy or surgical intervention and indeterminate aspirates that also require surgical intervention. Most of these aspirates are benign on final pathologic examination. Another disadvantage is false-negative rates of 5% to 10%, which underdiagnose thyroid cancer. Hopefully, these occasional false-negative nodules receive operative management ultimately because of the following: worrisome characteristics on physical examination, a repeat FNA biopsy that reveals cancer, or other factors.
MATERIALS AND METHODS

The medical records of all patients who underwent thyroidectomy at Abington Memorial Hospital, Abington, Pa, from March 1995 to March 2000, were reviewed retrospectively, and a correlative database was established to compare preoperative FNA biopsy cytologic reports with postoperative histopathologic reports.

Medical endocrinologists or radiologists on staff at Abington Memorial Hospital performed all FNA biopsies. Radiologists performed FNA biopsies on patients using ultrasound guidance for small lesions for which palpation was ineffective in locating the nodule. Fine-needle aspiration biopsy was performed with the patient in the supine position and the neck fully extended by a pillow underneath the shoulder. A 22- or 25-gauge needle attached to a 5-mL syringe or a handgun aspirator was used to collect tissue. Multiple passes were made through the center and the periphery of the nodule (Figure). A cytopathology technician was present during the aspirations and prepared direct-smear air-dried and wet-fixed slides. In select cases, ThinPrep slides (Cytyc Corporation, Boxborough, Mass) were also made from the needle rinse. On-site assessment of the air-dried slides for adequacy was performed in most cases. Usually, 5 to 10 slides were prepared per nodule; 6 clusters of more than 10 cells or 10 clusters of more than 6 cells defined an adequate specimen.

RESULTS

Two hundred eighty-two partial or total thyroidectomies were performed at our institution between March 1995 and March 2000. Of these patients, 183 underwent a preoperative FNA biopsy. The 99 patients who did not undergo a preoperative FNA biopsy underwent the operation because of other clinical situations for which an FNA biopsy was not warranted, such as thyrotoxicosis or a large goiter with disfigurement or aerodigestive compression. The overall cancer prevalence in our patient population was 38%. Seventy patients had thyroid cancer, which was established by surgical pathologic features.

The FNA biopsy results were categorized and then compared with the final pathologic classifications including recurrent laryngeal nerve palsy, lymphadenopathy, history of prior neck irradiation, or a recent increase in the size of the nodule.

We undertook this study with 3 objectives: to define the diagnostic accuracy and clinical utility of thyroid FNA biopsy in a community setting, to review a community teaching hospital’s thyroidectomy experience during the past 5 years and to compare this experience with those published from university and referral center studies, and to better define the implications of a diagnosis of indeterminate follicular lesion on FNA biopsy.

**Table 1. Comparison of Preoperative FNA Biopsy Findings With Pathologic Diagnoses**

<table>
<thead>
<tr>
<th>FNA Biopsy Findings</th>
<th>Pathologic Diagnoses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cancer</strong></td>
<td>27  8  0</td>
</tr>
<tr>
<td><strong>Adenoma</strong></td>
<td>2   3   3</td>
</tr>
<tr>
<td><strong>Benign Specimen</strong></td>
<td>18  24  18</td>
</tr>
</tbody>
</table>

*FNA indicates fine-needle aspiration.

An FNA biopsy diagnosis of papillary cancer had a predictive accuracy of 93%. Of 29 patients diagnosed as having papillary cancer by an FNA biopsy, 27 actually had papillary cancer at the time of surgery. An FNA biopsy diagnosis in which papillary cancer was suspected but not confirmed had a predictive accuracy of 57% (8 of 14 patients). Eleven patients had either a borderline or an insufficient specimen by FNA biopsy after several (>3) attempted FNA biopsies. These 11 patients underwent thyroidectomy, and only 2 (11%) had cancer by histopathologic findings. Both of these cancers were incidental micropapillary carcinomas (diameter, <1 cm) that were not the clinically significant nodule. All 44 patients with an FNA biopsy diagnosis of a benign nodule who underwent surgery were operated on because of worrisome clinical characteristics. Eight of these patients had carcinoma. Of these 8 patients, 3 (3% of the total population undergoing surgery) had an incidental microcarcinoma with a diameter of less than 1 cm that did not correspond to the clinically significant nodule, and only 3 (1.6% of the total population under-
going surgery) had a significant carcinoma representing their clinically significant and biopsied nodule (6.8% false-negative rate).

An FNA biopsy diagnosis of indeterminate follicular lesion characterized the largest group, which contained 60 patients. Of these 60 patients, 18 (30%) had a histopathologic diagnosis of cancer, 10 (17%) had follicular variant of papillary carcinoma (FVPC), 6 (10%) had papillary carcinoma, and only 2 (3%) had actual follicular carcinoma on final pathologic analysis. No correlation was found between nodule size and malignant potential in the indeterminate follicular lesion group. Of the 53 nodules smaller than 4 cm, 16 (30%) were malignant and 37 (70%) were benign. Of the 7 nodules 4 cm or larger in the indeterminate follicular lesion group, 2 (29%) were malignant and 5 (71%) were benign.

The first objective of this study was to define the diagnostic accuracy and clinical utility of thyroid FNA biopsy in a community setting. This was achieved by creating a database that compared the FNA biopsy diagnosis with the final surgical pathologic diagnosis. The FNA biopsy specimens were grouped according to the following diagnoses: papillary cancer, suspicious for papillary cancer, atypical follicular cells, indeterminate follicular lesions, Hurthle cell lesion and benign, borderline, and insufficient specimens. Surgical pathologic specimens were classified as cancer, adenoma, or benign.

We compared our community teaching hospital’s 5-year thyroidectomy experience with reports from university and tertiary referral center studies. In our study, the sensitivity and specificity were both 80%. If the indeterminate microcarcinomas in this study are analyzed differently and grouped with the benign category because of their incidental nature (ie, not representing the clinically significant nodule) and unthreatening pathologic features, the sensitivity and specificity are 91% and 83%, respectively. The term occult tumor has been proposed to describe these clinically nonvicious tumors (<1 cm), and these microcarcinomas may be considered clinically nonsignificant bystanders because they create little or no risk to the patient. Our overall data correlate favorably with data from larger tertiary endocrine referral centers (Table 2).

Table 2. Comparison With Previously Published Studies

<table>
<thead>
<tr>
<th>Source</th>
<th>Sensitivity, %</th>
<th>Specificity, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gharib and Goellner, 1993</td>
<td>83</td>
<td>92</td>
</tr>
<tr>
<td>Hamburger, 1994</td>
<td>85</td>
<td>80</td>
</tr>
<tr>
<td>Baloch et al, 1998</td>
<td>92</td>
<td>84</td>
</tr>
<tr>
<td>Present study</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total series</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Excluding microcarcinomas</td>
<td>91</td>
<td>83</td>
</tr>
</tbody>
</table>

Table 3. Indeterminate Follicular Lesions Diagnosed by FNA Biopsy

| Source                      | Indeterminate Follicular Lesions on FNA Biopsy That Were Malignant Overall FVPC Papillary Folicular |
|-----------------------------|---------------------------------|---------------------------------|---------------------------------|
| Hamburger, 1994             | 15.0                            | 7.5                             | 0                               |
| Gibb and Pasieka, 1995      | 25.0                            | 11.0                            | 14.0                            |
| Gharib and Goellner, 1993   | 16.0                            | 1.8                             | 5.5                             | 8.7                             |
| Present study               | 30.0                            | 17.0                            | 10.0                            | 3.0                             |

*FNA indicates fine-needle aspiration; FVPC, follicular variant of papillary carcinoma.

Table 3 shows our study is comparable to a study by Gibb and Pasieka, in which they found an overall malignancy rate in the indeterminate group of 25%, of which 11% were FVPC and 14% were papillary carcinomas. Interestingly, the prevalence of FVPC was much lower in the report by Gharib and Goellner. The reasons for this were not readily apparent, although the variance may be secondary to referral patterns or the pathologist’s interpretation.

The preponderance of FVPC among the patients with proved carcinoma whose preoperative FNA biopsy results demonstrated indeterminate follicular lesion represents a continuing diagnostic challenge. None of these patients in our reported series had their FVPC diag-

REFERENCES


COMMENT

The diagnosis of indeterminate follicular lesion on FNA biopsy is inherently problematic because a diagnosis of benign or malignant cannot be made by FNA biopsy. The entire neoplastic lesion must be removed to determine if invasion has occurred or whether other cellular characteristics of malignancy are present. Indeterminate nodules comprised our largest group of FNA biopsy diagnoses in patients undergoing surgery, accounting for 60 of the 183 patients who underwent a preoperative FNA biopsy. As stated previously, 18 (30%) of the indeterminate subgroup had a malignant tumor identified on final histopathologic results, but surprisingly only 2 (3%) of the total indeterminate group actually had follicular carcinoma in our study; 10 (17%) were FVPC, and 6 (10%) were papillary carcinomas. As seen in Table 3, our study is comparable to a study by Gibb and Pasieka, in which they found an overall malignancy rate in the indeterminate group of 25%, of which 11% were FVPC and 14% were papillary carcinomas. Interestingly, the prevalence of FVPC was much lower in the report by Gharib and Goellner. The reasons for this were not readily apparent, although the variance may be secondary to referral patterns or the pathologist’s interpretation.

The preponderance of FVPC among the patients with proved carcinoma whose preoperative FNA biopsy results demonstrated indeterminate follicular lesion represents a continuing diagnostic challenge. None of these patients in our reported series had their FVPC diag-

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nosed at the initial operation by intraoperative frozen sections because of the stringent pathologic signs required to diagnose this entity, which typically can be seen only on permanent sections. Most of these patients required a second operation to complete thyroidectomy when an initial unilateral thyroid lobectomy was performed to establish the diagnosis. We did not find the size of the indeterminate follicular lesion to correlate with a diagnosis of malignancy. A better preoperative or intraoperative method of diagnosing FVPC would be desirable to prevent the need for a second operation in such patients.

**CONCLUSIONS**

Fine-needle aspiration biopsy is useful in the assessment and management of thyroid nodules, and its use should continue. The accuracy of an FNA biopsy of thyroid nodules in a community hospital setting compares favorably with results reported by major endocrine referral centers. The diagnosis of papillary cancer by FNA biopsy closely correlates with the surgical outcome and enables the definitive operation to be performed without reliance on frozen section in most instances. Indeterminate follicular cytological features on FNA biopsy, the most common indication for operation in our series, necessitates thyroidectomy for diagnosis. Indeterminate follicular lesions by cytological features correlate with FVPC in 17% of patients and have an overall 30% predictability of cancer.