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 (n=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, Abing- ton, Pa, from March 1995 to March 2000, were re- viewed retrospectively, and a correlative database was established to compare preoperative FNA biopsy cytopathologic reports with postoperative histopathologic reports.

Medical endocrinologists or radiologists on staff at Abington Memorial Hospital performed all FNA biopsies. Radiologists performed FNA biopsies on pa- tients using ultrasound guidance for small lesions for which palpation was ineffective in locating the nod- ule. 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. Mu- ltiple passes were made through the center and the periphery of the nodule (Figure). A cytopathology technician was present during the aspirations and pre- pared direct-smear air-dried and wet-fixed slides. In select cases, ThinPrep slides (Cytyc Corporation, Box- borough, Mass) were also made from the needle rinse. On-site assessment of the air-dried slides for ad- equacy 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 de- fined an adequate specimen.

We undertook this study with 3 objectives: to de- fine the diagnostic accuracy and clinical utility of thy- roid FNA biopsy in a community setting, to review a community teaching hospital’s thyroidectomy experi- ence during the past 5 years and to compare this expe- rience 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.

RESULTS

Two hundred eighty-two partial or total thyroidecto- mies were performed at our institution between March 1995 and March 2000. Of these patients, 183 under- went 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 thyrotoxico- sis or a large goiter with disfigurement or aerodigestive compression. The overall cancer prevalence in our pa- tient population was 38%. Seventy patients had thyroid cancer, which was established by surgical pathologic fea- tures.

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

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Fine-needle aspiration biopsy cytologic testing is performed by approaching the thyroid nodule from the medial to lateral direction, avoiding penetration of the trachea or larynx and the region of the recurrent laryngeal nerve and great vessels laterally. Reprinted with permission from the following: Kukora JL, ed. Current Surgical Therapy. 7th ed. St Louis, Mo: Mosby–Year Book Inc; 2001.

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

<table>
<thead>
<tr>
<th>FNA Biopsy Findings</th>
<th>Cancer</th>
<th>Adenoma</th>
<th>Benign Specimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Papillary cancer (n = 29)</td>
<td>27</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Suspicious for papillary cancer (n = 14)</td>
<td>8</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Atypical follicular cells (n = 5)</td>
<td>0</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Indeterminate follicular lesion (n = 60)</td>
<td>18</td>
<td>24</td>
<td>18</td>
</tr>
<tr>
<td>Hürthle cell lesion (n = 20)</td>
<td>7</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Benign specimen (n = 44)</td>
<td>8</td>
<td>11</td>
<td>25</td>
</tr>
<tr>
<td>Borderline specimen (n = 3)</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Insufficient specimen (n = 8)</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

*FNA indicates fine-needle aspiration.
The sensitivity and specificity were both 80%. If the in-
versity and tertiary referral center studies. In our study,
5-year thyroidectomy experience with reports from uni-
were classified as cancer, adenoma, or benign. Surgical pathologic specimens
lesions, Hu
cancer, atypical follicular cells, indeterminate follicular
creating diagnoses: papillary cancer, suspicious for papillary
tory in a community setting. This was achieved by cre-

We compared our community teaching hospital’s
year thyroidectomy experience with reports from uni-
the sensitivity and specificity were both 80%. If the in-
ger surgery) had a significant carcinoma representing
their clinically significant and biopsied nodule (6.8% false-
egative rate).
An FNA biopsy diagnosis of indeterminate follicular
lesion characterized the largest group, which con-
tained 60 patients. Of these 60 patients, 18 (30%) had a
istopathologic diagnosis of cancer, 10 (17%) had fol-
cellular variant of papillary carcinoma (FVPC), 6 (10%)
had papillary carcinoma, and only 2 (3%) had actual fol-
cellular carcinoma on final pathologic analysis. No cor-
relation 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 ma-
lignant 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 preponderance of FVPCs among the patients
proved carcinoma whose preoperative FNA biopsy
results demonstrated indeterminate follicular lesion rep-
resents a continuing diagnostic challenge. None of these
patients in our reported series had their FVPC diag-

<table>
<thead>
<tr>
<th>Source</th>
<th>Sensitivity, %</th>
<th>Specificity, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gharib and Goellner,7 1993</td>
<td>83</td>
<td>92</td>
</tr>
<tr>
<td>Hamburger8 1994</td>
<td>85</td>
<td>80</td>
</tr>
<tr>
<td>Baloch et al.9 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>

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

Table 2. Comparison With Previously Published Studies

<table>
<thead>
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<th>Source</th>
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</tr>
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The first objective of this study was to define the diag-
nostic accuracy and clinical utility of thyroid FNA bi-
opsy in a community setting. This was achieved by cre-
ting a database that compared the FNA biopsy diagnosis
with the final surgical pathologic diagnosis. The FNA bi-
opsy specimens were grouped according to the follow-
ing diagnoses: papillary cancer, suspicious for papillary
cancer, atypical follicular cells, indeterminate follicular
lesions, Hürthle 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 uni-
vanders.

The diagnosis of indeterminate follicular lesion on
FNA biopsy is inherently problematic because a diagno-
sis of benign or malignant cannot be made by FNA bi-
opsy. The entire neoplastic lesion must be removed to
determine if invasion has occurred or whether other cel-
ular characteristics of malignancy are present. Indeter-
mminate nodules comprised our largest group of FNA bi-
opsy diagnoses in patients undergoing surgery, accounting
for 60 of the 183 patients who underwent a preopera-
tive FNA biopsy. As stated previously, 18 (30%) of the
indeterminate subgroup had a malignant tumor identi-
fied on final pathologic results, but surprisingly only 2
(3%) of the total indeterminate group actually had fol-
cellular carcinoma in our study; 10 (17%) were FVPCs,
and 6 (10%) were papillary carcinomas. As seen in
Table 3, our study is comparable to a study by Gibb and Pasieka,10 in which they found an overall malignancy rate
in the indeterminate group of 25%, of which 11% were
FVPCs and 14% were papillary carcinomas. Interest-
ingly, the prevalence of FVPC was much lower in the re-
port by Gharib and Goellner.7 The reasons for this were
not readily apparent, although the variance may be sec-
ondary to referral patterns or the pathologist’s inter-
pretation.

The preponderance of FVPCs among the patients
with proved carcinoma whose preoperative FNA biopsy
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resents a continuing diagnostic challenge. None of these
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Table 3. Indeterminate Follicular Lesions
Diagnosed by FNA Biopsy*

<table>
<thead>
<tr>
<th>Source</th>
<th>Indeterminate Follicular Lesions on FNA Biopsy That Were Malignant at Final Histopathologic Testing, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamburger8 1994</td>
<td>15.0 7.5 0 7.5</td>
</tr>
<tr>
<td>Gibb and Pasieka,10 1995</td>
<td>25.0 11.0 14.0 0</td>
</tr>
<tr>
<td>Gharib and Goellner,7 1993</td>
<td>16.0 1.8 5.5 8.7</td>
</tr>
<tr>
<td>Present study</td>
<td>30.0 17.0 10.0 3.0</td>
</tr>
</tbody>
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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 section. 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.

REFERENCES