Audit: Assessing the use of liquid-based cytology in fine-needle aspiration biopsies of the thyroid gland and neck masses

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Authors: R. Gupta, N. A. Khan; Woolwich, London/UK
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Aims and objectives

Fine needle aspiration biopsy (FNAB) is used for the assessment of thyroid nodules as it is considered a relatively non-invasive technique associated with a number of advantages. They include the ability to be performed in an outpatient clinic setting, safety, and reduction in number of unnecessary surgical procedures [1-3]. Furthermore, it allows for differentiation between suspicious and non-suspicious nodules, resulting in improved follow up of lesions thought to be of harm to the patient.

A number of guidelines have been published to aid with differentiation between suspicious and non-suspicious features of thyroid nodules. The Society of Radiologists in Ultrasound suggests that FNAB should be considered for a nodule 1.0 cm or more at the largest diameter, if microcalcifications are present and for a nodule 1.5 cm or largest diameter if the nodule is solid or if there are coarse calcifications within the nodule [4]. The American Association of Clinical Endocrinologists recommends FNAB should be performed in cases where clinical history or ultrasound features raise suspicions of malignancy even if the nodule is smaller than 10mm [5].

Either palpation or ultrasonography (US) may be used for guidance during FNAB but USS results in fewer complications as well as increased collection rates of adequate sample material for ongoing cytological assessment [6].

Although the actual technique for FNAB has changed little over the last few years, there have been a number of important developments. These include the use of CytoLyte, a form of liquid based cytology, which has increased in popularity as a collection and preparation technique for FNABs as compared to conventional direct smears because of its efficiency, simplicity and cost-effectiveness. The samples taken are placed in CytoLyte solution and sent to cytology for analysis, hence removing the need for the cytologist to be present.

The CytoLyte fluid method has been used at our hospital since 2009 to assess thyroid nodules for suspected malignancy.

The aims of our audit were to assess the adequacy of ultrasound (USS) guided fine needle aspiration using liquid based cytology as opposed to conventional smears for the assessment of thyroid nodules in our District General Hospital. We sought to compare our own results of liquid based cytology against a standard based on the literature and results of an initial audit which had previously assessed performance. At a previous audit done from 01/11/05 to 31/10/06 there were 13 FNAB of the thyroid. 9/13 (69%) of these were adequate samples i.e. follicular cells seen. Cytology at that time was performed using conventional smears. In order to meet the standards, 70 - 80% of our FNABs of
thyroids should be diagnostic (demonstrating sufficient cellularity) as per local data and consensus [7].

**Methods and materials**

The audit was performed in a 500 bed acute district general hospital which provides a range of acute hospital services mainly to the residents of Greenwich and neighbouring Bexley.

We reviewed the results of retrospective data which determined the number of FNABs performed between 2010 and 2013 in the Radiology Department at our Hospital. A list of all FNABs performed between the time period was obtained from our hospital's patient record system using keyword criteria. Once all suitable patients had been identified, their corresponding cytology reports were obtained from the hospital's results system.

We used a combination of aspiration and non-aspiration technique for our aspirate samples.

The adequacy of our results using this technique was compared against the locally agreed standard. Cytological assessment using Thy staging was recorded for thyroid FNAB and used as the indicator for specimen adequacy. Assessment includes both a text report and classification into a diagnostic category: Thy1- Thy5. The Thy staging system used was as per Table 1.

**Images for this section:**
**Table 1: Thy staging system**

<table>
<thead>
<tr>
<th>Thy staging</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thy 1</td>
<td>Non-diagnostic for cytological diagnosis (fewer than 6 clusters of follicular cells)</td>
</tr>
<tr>
<td>Thy 1c</td>
<td>Sample in keeping with fluid from a cyst</td>
</tr>
<tr>
<td>Thy 2c</td>
<td>Non-neoplastic cystic lesion</td>
</tr>
<tr>
<td>Thy 3</td>
<td>Neoplasm possible- cellular atypia ( Thy3a) or follicular neoplasm is possible (Thy3f)</td>
</tr>
<tr>
<td>Thy 4</td>
<td>Suspicious of malignancy. Cases of definite malignancy but a specific diagnosis cannot be made</td>
</tr>
<tr>
<td>Thy 5</td>
<td>Malignant</td>
</tr>
</tbody>
</table>

**Fig. 1**: Table 1: Thy imaging system
Results

A total of 138 fine needle aspiration biopsies were performed in the Radiology Department at our hospital from the period 2010 to 2013, with 131 of these being aspirations of the thyroid and 7 non-thyroid/other neck masses. A range of Radiology Consultants performed these procedures.

Cytolyte fluid was used as the technique for preservation of specimens.

There was a female preponderence of 3:1. The age of women who had FNABs ranged from 18-89 years, with the majority aged between 40-50 years old. The age of men who had FNABs ranged from 26-74 years with the majority aged between 50-60 years old.

Of the 131 FNABs of the thyroid performed, 27% of these were Thy1 and therefore insufficient for cytological analysis. Of the Thy1 nodules there was no correlation with size of the nodule. 73% of the FNABs of thyroid were adequate for cytological analysis.

Of the 73% of the FNAB thyroid which were sufficient for cytological analysis:

- 19/131 samples (15%) were graded as Thy1 c sample and in keeping with fluid from a cyst.
- 62/131 samples (47%) of samples were Thy2 which equates as non-neoplastic samples with adequate cellularity.
- 3/131 FNAB (2%) of thyroid samples were Thy2 c which are classed as non-neoplastic cystic lesion.
- 12/131 (9%) were Thy3, i.e. possibility of neoplasm, requiring further assessment (Fig. 1.)

Of the 12 Thy3 lesions, histology was obtained in 4 patients after their surgery. 3/4 of the histology samples demonstrated papillary carcinoma and in one case, histology showed a follicular adenoma. (Table 2)

Of the 7 fine needle aspirations of non-thyroid/other neck masses, 6/7 were sufficient samples. (Table 3)
Fig. 1: FNABs of thyroid gland results (total = 131 FNAB thyroid performed)

Fig. 2: FNABs of thyroid gland results (total = 131 FNABs thyroid performed)
### Table 2: Histology results of Thy 3 lesions

<table>
<thead>
<tr>
<th>Thy 3 Lesion Sample</th>
<th>Histology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right thyroid lobectomy</td>
<td>Follicular adenoma. No evidence of malignancy.</td>
</tr>
<tr>
<td>Left lobectomy</td>
<td>Papillary carcinoma. Follicular variant.</td>
</tr>
<tr>
<td>Left lobectomy</td>
<td>Papillary carcinoma. Follicular variant.</td>
</tr>
<tr>
<td>Right thyroid lobectomy</td>
<td>Papillary carcinoma.</td>
</tr>
</tbody>
</table>

**Fig. 3:** Table 2: Histology results of Thy 3 lesions

### Table 3: Aspirate results of non-thyroid/other neck masses sampled

<table>
<thead>
<tr>
<th>Non thyroid/other neck mass aspirates</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submental mass</td>
<td>Likely derivation from lymph node, biopsy recommended</td>
</tr>
<tr>
<td>Left submandibular mass</td>
<td>Origin from lymph node, excision required</td>
</tr>
<tr>
<td>Left neck lump</td>
<td>Sample adequate, further biopsy required</td>
</tr>
<tr>
<td>Mass tail right parotid</td>
<td>Pleomorphic adenoma, nil malignant cells</td>
</tr>
<tr>
<td>Lymph node submandibular region</td>
<td>Reactive lymph node</td>
</tr>
<tr>
<td>Right tail parotid mass</td>
<td>Warthin tumour, no malignant cells</td>
</tr>
<tr>
<td>Left parotid mass</td>
<td>Insufficient sample</td>
</tr>
</tbody>
</table>
Fig. 4: Table 3: Aspirate results of non-thyroid/other neck masses sampled
Conclusion

Liquid-based cytology is a useful alternative technique to preserve specimens. It eliminates the need for the cytologist to be present on site during FNABs. We anticipate our diagnostic yield would increase if multiple passes were able to be made into the nodule.

It would be useful to discuss the results of the audit with referring clinicians and agree a protocol for referral for fine needle aspiration.

Patients are often very anxious and nervous when they come to have the procedure. Sometimes they have not seen the consultant beforehand. Patients would like an explanation from the referring doctor as to why they are being sent for fine needle aspiration and brief explanation of the procedure to expect. It would be useful to have a patient information leaflet explaining the need for this, reducing patient anxiety levels and further improving results.

Personal information

References