Fine needle aspiration of thyroid nodules: three years’ experience

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SUMMARY To overcome the difficulties arising in the management of cold nodules of the thyroid—many are unnecessarily resected because of the risk of malignancy—fine needle aspiration cytology was used in the assessment of thyroid lesions in 113 patients. Aspirates were categorised into three groups as follows: group (i), consistent with simple goitre or cyst; group (ii), suspicious of underlying cellular lesion or tumour; group (iii), malignant. Resections for simple goitre were reduced from eight of 14 (40%) to two of 42 (3%) over three years, and the yield of neoplastic lesions coming to surgery as a result of aspiration increased from two of 12 (16%) to nine of 14 (69%) over the same period.

It is concluded that fine needle aspiration cytology is an effective means of discriminating between simple and neoplastic thyroid lesions. This permits more appropriate patient management and a beneficial saving of resections for simple goitre. False negative diagnoses (two cases) in our series are of more concern than false positive results, but can be minimised by careful attention to sampling and cytological detail.

Cold nodules of the thyroid are a common clinical problem and pose difficulties in management. Many will be resected because of the risk of malignancy, but only a small proportion (around 10%) will prove to be so. Better means of assessment are therefore needed. With the increasing interest in fine needle aspiration, it was considered appropriate to apply this to thyroid nodules. This paper presents the results of three years’ experience with fine needle aspiration of thyroid nodules.

Material and methods

Over the three years between 1985 and 1988, 113 patients underwent fine needle aspiration of thyroid lesions, mainly a dominant cold nodule. A small proportion of the aspirates were sent by individual clinicians, but most were performed after referral by the author. A standard technique was used as described by Lowhagen and others.12 A syringe holder was found useful. Early experiments with direct smears were abandoned in favour of cytopsin preparations which were stained routinely with haematoxylin and eosin and Papanicolaou stains.

Interpretation of the cytological appearances followed the guidelines indicated by Suen and others.1-3 Although in some instances specific diagnoses could be made, experience showed that classifying the aspirates into one of three diagnostic groups was more appropriate. These were as follows:

GROUP (I) (CONSISTENT WITH SIMPLE GOITRE OR CYST)

Aspirates from simple or colloid goitre generally contained large cohesive sheets of acinar cells, sometimes with evidence of focal oxyphil change, ample colloid, and often large numbers of haemosiderin-laden macrophages (figs 1a, b). In simple cysts macrophages predominated with scanty epithelial elements. Aspirates of Hashimoto’s thyroiditis had a more alarming cytological appearance with loss of normal follicular sheet architecture and pronounced pleomorphism of nuclei due to oxyphil change (figs 1c, d). The cohesive nature of the cell groups, however, the presence of recognisable lymphoid aggregates, and the raised autoantibodies were helpful features.

GROUP (II) (SUSPICIOUS OF CELLULAR LESION OR TUMOUR)

This group included aspirates from follicular adenoma (the cellular lesion referred to), well differentiated follicular carcinoma, papillary and medullary carcinoma. Aspirates from cellular simple goitre also...
Fig 1  (a) Typical colloid goitre with regular acinar cell sheet, macrophages and colloid (bottom). (b) Detail of cell sheet from colloid goitre. The cells have a regular uniform arrangement. Enlargement of cells (right) is due to oxyphil change. (c) Hashimoto's thyroiditis. Irregular but cohesive cellular clusters and focal lymphoid aggregate (arrow head). (d) Detail of 1 (c). Nuclear variation is due to oxyphil change.
Fig 2  (a) Follicular adenoma. The cells have slightly enlarged nuclei with indistinct nucleoli. (b) Oxyphil adenoma. Note nuclear variation and abundant granular cytoplasm of oxyphil cells. (c) Medullary carcinoma. Fairly uniform cells with visible nucleoli. (d) Papillary carcinoma. Irregular cell clusters with nuclear pseudoinclusions (top). (e) Poorly differentiated follicular carcinoma. Enlarged irregular cells with prominent nucleoli. (f) Anaplastic carcinoma. Bizarre cells set in a background of debris and neutrophils.
sometimes fell into this category. Aspirates were cellular, poorly cohesive (seen as fragmentation into small groups of cells and individual cells), and with enlarged nuclei with some degree of pleomorphism (figs 2a–c). Colloid was scanty and other cellular elements such as macrophages variable. In some cases of papillary carcinoma the presence of intranuclear pseudo-inclusions permitted a specific diagnosis (fig 2d).

GROUP (III) (MALIGNANT)
This group included aspirates from poorly differentiated follicular carcinoma and anaplastic carcinoma. The degree of nuclear pleomorphism permitted a diagnosis of underlying malignancy (figs 2e, f). Necrotic debris and acute inflammatory cells were often prominent in this type of specimen.

Results
For the purposes of analysis of the results and the correlation of cytological and histological diagnosis, groups ii (suspicious) and iii (malignant) were amalgamated. Table 1 shows the numbers of specimens in each year, tables 2 and 3 analyse the individual categories in more detail.

Table 2 shows the reduction over the three years in resections for non-neoplastic conditions from 40% to 3% of the screened population. Commensurate with this is the increasing yield of neoplastic conditions in those coming to surgery increased from 16% to 65% (table 3).

Tables 2 and 3 also identify the false positive and false negative results. False positive results were mainly confined to Hashimoto's thyroiditis and cellular colloid goitre. It should be noted that follicular adenoma is not classified as a false positive result. The aspirate is often indistinguishable from others in group ii and the biological behaviour is uncertain.

There were two clinically important false negative results, one papillary and one anaplastic carcinoma.

Discussion
Although sampling a lesion widely, fine needle aspiration produces a small volume of tissue with cytological and microarchitectural features. In thyroid aspirates, as with those from any other tissue, this imposes certain limitations on the extent of the information derived. Some published series and accounts of fine needle aspiration thyroid diagnosis seem to imply that specific diagnosis can be achieved in most cases, but this has not been our experience. Over the course of the three years, a policy was developed which categorises aspirates into one of the three diagnostic categories outlined: (i) consistent with simple goitre or cyst; (ii) suspicious of cellular lesion or tumour; and (iii) malignant. We feel that this is a more realistic target for cytological diagnosis.

The effect of the introduction of fine needle aspiration for thyroid nodules has been similar to that seen in other series. The proportion of resections for benign conditions in the screened population fell from 40% to 3% and the yield of neoplastic lesions in those coming to surgery increased from 16% to 65%. From the management point of view, patients with aspirates consistent with simple goitre or cyst can be treated conservatively if desired. A repeat aspiration is performed if there is a clinical indication. A suspicious or malignant aspirate calls for definitive treatment, further investigation, or repeat aspiration as appropriate.

The advantages of better discrimination of simple and neoplastic nodules with fine needle aspiration have to be weighed against the potential problems of false positive and negative diagnoses. False positive diagnoses are less of a concern than false negative ones as many of the nodules would otherwise in any case be

Table 3 Aspirates considered to be suspicious or malignant

<table>
<thead>
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<th>Histology</th>
<th>% Total resections</th>
<th>Other</th>
<th>No resection</th>
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<tr>
<td>Total Neoplastic</td>
<td></td>
<td></td>
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<tr>
<td>1985</td>
<td>2</td>
<td>1 Carcinoma</td>
<td>16%</td>
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<tr>
<td>1986</td>
<td>6</td>
<td>1 Adenoma (2 died)</td>
<td>25%</td>
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<tr>
<td>1987</td>
<td>12</td>
<td>4 Carcinomas</td>
<td>65%</td>
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<tr>
<td></td>
<td></td>
<td>5 Adenomas</td>
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<td></td>
<td></td>
<td>1 Hashimoto's goitre</td>
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<td></td>
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<td>1 Hashimoto's*</td>
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<td></td>
<td></td>
<td>1 Cellular goitre</td>
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<td></td>
<td></td>
<td>1 Colloid goitre</td>
<td>2†</td>
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<td>20</td>
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* = on repeat aspirate.
† = one not suspicious on repeat aspirate.

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removed. Hashimoto’s thyroiditis proved the main source of false positive diagnoses. It is therefore essential to know the autoantibody titres when interpreting the aspirate to put the more alarming cytological appearances into context. Of the two clinically important false negative diagnoses, review showed that one aspirate in a papillary carcinoma was inadequate. The other in an anaplastic carcinoma with central cystic necrosis contained only very scanty abnormal cells. Attention to sampling and cytological detail should help to minimise the false negative rate.

Technically, fine needle aspirate specimens can be examined either as smears or as cytospin preparations. In our experience cytospin preparations have proved more satisfactory, providing a more uniform technical quality. An additional advantage is that the red cell component of the specimen, often considerable, can be lysed by adding 1% acetic acid in excess before centrifugation, thereby concentrating the cellular constituent.

In summary, our experience supports that of others that fine needle aspiration is an effective investigation in the discrimination of simple and neoplastic nodules with a beneficial saving of resections for benign conditions. In our hands, rather than attempting specific diagnoses, categorisation into the groups outlined has proved more realistic while still providing adequate information for management.

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References