Thyroid cytology

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Main issues with thyroid FNA:
- commonest indication is to investigate cold thyroid nodule(s)
- most important is to decide whether the thyroid nodule needs to be excised or not
  - obvious carcinoma e.g. papillary carcinoma
  - follicular neoplasm

REPORTING CATEGORIES:
Unsatisfactory / non-diagnostic: blood only; scant follicular cells
Benign: thyroiditis; colloid nodule; hyperplastic nodule
Atypical / indeterminate: focal atypia in a hyperplastic nodule; lesion borderline between cellular hyperplastic nodule and follicular neoplasm
Follicular or Hurthle cell neoplasm / suspicious for neoplasm
Suspicious for malignancy: features favouring but not quite diagnostic of malignancy
Malignant: definitely malignant (papillary, medullary, anaplastic carcinoma, lymphoma, etc)

ADEQUACY: requires at least 5-6 groups of well-preserved, well-visualised follicular cells, each group consisting at least 10 cells, in each of the 2 slides from separate passes (at least 3 passes recommended from different parts of the lesion)

Exceptions:
Cyst - Features consistent with cystic change / content but underlying lesion cannot be assessed. Mention limited follicular cells for assessment. Recommend repeat FNA esp. if recurrent cyst; cyst >4cm; complex or solid areas; residual mass after drainage.

Colloid nodule - Abundant colloid but not a lot of follicular cells. This is not considered unsatisfactory.

Normal thyroid:
- low cellularity
- small monolayered, honeycombed sheets of evenly distributed follicular cells and single cells with colloid in the background
- in one study, features favouring normal thyroid tissue over a hyperplastic nodule: more cells (>50% of the population) have paravacuolar granules; less Hurthle cells; cells don’t have prominent nucleoli or feathered cytoplasmic edges

Colloid:
- may be geometric or cracked, Swiss cheese, bubble gum (thick, dense in papillary carcinoma)
Pap: pink-orange in thick smears, pale green to grey-green in thin smears
Diff-Quik: violet-blue
- may see calcium oxalate crystals in colloid
Paravacuolar granules:
- 1 or more vacuoles lying close to the nucleus of a follicular cell. Within the vacuoles are small granules.
- These represent lysosomes containing haemosiderin or lipofuscin: blue (Diff-Quik) or green (Pap)

Amyloid:
- Amorphous or dense homogeneous appearance
- May be surrounded by multinucleated giant cells
- Stains similarly to colloid

Flame cells or fire-flare:
- Vacuoles of secretory material extruded from follicular cells, reflecting hyperactivity
- Stains pink on Diff-Quik, pale green on Pap
- May be seen in Graves’ disease, Hashimoto’s thyroiditis, hyperplastic nodule, follicular neoplasm and follicular variant of papillary carcinoma
- Presence of flame cells in a metastasis may suggest thyroid in origin

Microfollicles seen in:
1. Hyperplastic nodule
2. Chronic lymphocytic thyroiditis
3. Follicular neoplasm
4. Hurthle cell neoplasm
5. Follicular variant of papillary carcinoma
6. Parathyroid adenoma

Papillary pattern seen in:
1. Graves’ disease
2. Hyperplastic nodule (with papillary hyperplasia)
3. Thyroiditis
4. Papillary Hurthle cell neoplasm
5. Papillary carcinoma
6. Medullary carcinoma (papillary variant)

Nuclear grooves seen in:
1. Papillary carcinoma
2. Thyroiditis
3. Nodular hyperplasia
4. Follicular neoplasm
5. Insular carcinoma

Intranuclear pseudoinclusions seen in:
1. Nodular hyperplasia
2. Hashimoto’s thyroiditis
3. Papillary carcinoma

Colloid tends to surround follicular cells. Serum accumulates at the edges of the slide during smearing and around clumps of platelets and erythrocytes.
4. Follicular neoplasm
5. Hurthle cell neoplasm
6. Medullary carcinoma
7. Anaplastic carcinoma
8. Insular carcinoma
9. Hyalinising trabecular adenoma
10. Metastases e.g. melanoma

**Pale nuclei with powdery chromatin seen in:**
1. Papillary carcinoma
2. Hyperplastic nodule

**Bubble-gum colloid seen in:**
1. Papillary carcinoma
2. Graves’ disease

**Psammoma bodies seen in:**
1. Nodular hyperplasia
2. Hashimoto’s thyroiditis
3. Graves’ disease
4. Papillary carcinoma
5. Medullary carcinoma
6. Mucoepidermoid carcinoma

**Differential diagnosis of Hurthle cell lesions:**
1. Hyperplastic nodule
2. Hurthle cells in Hashimoto's thyroiditis
3. Hurthle cell neoplasm
4. Oxyphilic or Warthin-like variant of papillary carcinoma
5. Parathyroid hyperplasia and adenoma

**Differential diagnosis of clear cell lesions:**
1. Graves’s disease
2. Hashimoto’s thyroiditis
3. Multinodular goiter
4. Follicular neoplasm
5. Papillary carcinoma
6. Medullary carcinoma
7. Parathyroid lesions
8. Metastatic renal cell carcinoma

**Differential diagnosis of lesions with signet-ring cells:**
1. Multinodular goiter
2. Follicular neoplasm
3. Papillary carcinoma
4. Metastatic carcinoma from the breast or stomach

**Multi-nucleated giant cells:**
1. De Quervain’s thyroiditis
2. Other granulomatous thyroiditis e.g. TB, sarcoidosis
3. Multinodular goitre
4. Hashimoto’s thyroiditis
5. Papillary carcinoma
6. Anaplastic carcinoma

**Lymphocyte-rich smears:**
1. Thyroiditis
2. Multinodular goiter (usually associated with lymphocytic thyroiditis)
3. Around tumours: papillary, anaplastic carcinoma
4. Lymphoma

**Specific entities:**

**Thyroid cyst:**
- may be due to degeneration, accumulation of colloid, haemorrhage
- an entirely cystic nodule does not necessarily mean that it is benign
- contains colloid, serum, blood, foamy macrophages with no or few degenerate epithelial cells (these findings are non-diagnostic as to the true nature of the cyst)
- should always comment on paucity of follicular cells
- always follow-up the patient, even if the cyst is completely collapsed after FNA

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10-15% of thyroid cysts are malignant. Look carefully for nuclear features of papillary carcinoma.
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**Cyst lining cells:**
- these cells line dilated cystic follicles and they show reactive / repair-like changes, mimicking papillary carcinoma
- they form 2D flat monolayered sheets with no nuclear crowding and presence of “windows” in-between the cells
- no papillae present
- the cells have enlarged round to ovoid nuclei, intranuclear grooves (can be quite a lot), fine chromatin and a distinct nucleolus
- no intranuclear pseudoinclusions
- the cytoplasm is typically spindled and granular
- epithelioid cells may also be seen, resembling Hurthle cells
- nuclear crowding, intranuclear pseudoinclusions, absence of cytoplasmic spindling, papillary structures and psammoma bodies favour a cystic papillary carcinoma
- CK19 and HBME1 may be helpful. Both negative in benign lesions. Both strongly positive indicating papillary carcinoma.

**Colloid nodule:**
- aspirate contains abundant colloid, scant follicular cells
- follicular cells may be dispersed or grouped into follicles and small monolayer sheets
- the cells are small, uniform with central nucleus; cytoplasm pale and containing abundant parvacuolar granules; inconspicuous nucleoli
- may have Hurthle cells, isolated or in monolayers

**Acute thyroiditis:**
-numerous neutrophils, degenerate debris
-occasional reactive follicular cells with prominent nucleoli
-may see organisms in the background

**Graves’ disease:**
-cellular smear with similar features to hyperplastic nodule
-small and large groups of follicular cells with thin colloid
-characteristic flame cells are seen (cytoplasmic vacuoles with red to pink granular material, corresponding to phagolysosomes)
-considerable nuclear atypia may occur: nuclear enlargement, overlapping, enlarged nucleoli
-pseudopapillary groups can be seen
-psammoma bodies have been reported
-diagnosis needs to be correlated with clinical history and biochemistry

**Granulomatous (subacute, de Quervain’s) thyroiditis:**
-in early stage: neutrophils, reactive follicular cells, scarce granulomas
-later stage: granulomas, giant cells, chronic inflammation, few neutrophils, fibrous fragments
-giant cells often contain phagocytosed colloid
-usually scant follicular epithelium
-“dirty” background with inflammatory cells, colloid (not abundant) and debris

The FNA procedure is often very painful which is a clue to the diagnosis.

**Riedel’s thyroiditis:**
-almost always paucicellular
-mainly shows fibrous tissue fragments and chronic inflammatory cells
-only few follicular cells present
-granulomas are absent

**Hashimoto’s thyroiditis:**
-heterogeneous lymphoid population with Hurthle cells. Both must exist to make this diagnosis
-abundant follicular centre fragments, tingible body macrophages and lymphoglandular bodies
-lymphocytes embedded within the groups of follicular / Hurthle cells a characteristic feature
-Hurthle cells may show increased N/C ratio, prominent nucleoli and nuclear irregularity; some spindling also present
-colloid is scant
-squamous metaplastic cells, foam cells, giant cells, fibrous tissue, granulomas and psammoma bodies may be present
-beware co-existing Hurthle cell neoplasm (separate monotonous population of Hurthle cells devoid of lymphocytes), papillary carcinoma or lymphoma

A complete absence of follicular or Hurthle cells should raise possibility of an intrathyroidal lymph node.
**Dyshormonogenetic goiter:**
- diagnosis requires clinical correlation
- hyperplastic changes with papillary structures
- may have extreme cytological atypia

**Hyperplastic nodule:**
- variable amount of colloid
- numerous follicular cells arranged mainly in monolayers, follicles and tissue fragments
- large monolayered honeycombed sheets (representing macrofollicles) with evenly distributed nuclei without overlapping is an indicator of benignity
- true papillae with fibrovascular cores can be seen. Pseudopapillary structures are not uncommon (usually short and nonbranching). There should not be significant overlapping or crowding of nuclei.
- occasional microfollicles are present. Increased numbers of microfollicles may be seen in a cellular hyperplastic nodule. Predominance of microfollicles is suspicious for follicular neoplasm. Difficult to distinguish cellular hyperplastic nodule from follicular neoplasm in some cases.
- follicular cells are slightly enlarged and may be found isolated in the background
- the cytoplasm is abundant, delicate or dense
- may have Hurthle cells

**Main features of hyperplastic nodule:**
- normal follicular cells and Hurthle cells; lack of microfollicles; monolayered honeycombed sheets with no nuclear overlapping; degenerative changes
- occasional nuclear grooves may be found in most hyperplastic nodules. If many cells have grooves, beware papillary carcinoma.

**Follicular neoplasm:**
- markedly hypercellular with little or no colloid
- usually microfollicular or solid pattern
- microfollicles: a ring of 5-15 cells with well-defined lumen, sometimes surrounding a ball of colloid
- rosettes: rings of cells without a true central lumen
- follicular cells can be arranged in tissue fragments, 3-D clusters with syncytial pattern, trabeculae and in microfollicles / rosettes
- microfollicular pattern >50% of aspirate or distinct (low-power) on 1-2 slides
- monolayers in honeycomb pattern are rare or absent
- follicular cells tend to be crowded and disorganised. They are monomorphic, the cytoplasm pale with no paravacuolar granules or oxyphilic changes. The nucleus is round and has a smooth contour. Nuclear chromatin appears finely to coarsely granular and uniformly dispersed. The nucleolus is small and uniform.
- features suggestive of carcinoma: moderate to high cellularity within cell groups, poorly formed follicular structures, disarray and crowding of cells in the cell groups, numerous isolated cells, moderate to large nuclear size, chromatin irregularly distributed, prominent or multiple nucleoli, necrotic debris
The diagnosis of follicular carcinoma is not made on cytology. The diagnosis is made histologically in the presence of transcapsular and/or vascular invasion. The term “follicular neoplasm” is used in cytology to include adenoma/carcinoma.

**Hurthle cell neoplasm:**
- same as follicular neoplasm except the majority of the cells are Hurthle cells
- forms clusters, microfollicles and single cells with scant colloid
- rare cases may show papillae
- some cells may have intranuclear grooves and pseudoinclusions
- cells with prominent nucleoli favour Hurthle cells, as compared to small nucleoli in cells from papillary carcinoma with squamoid cytoplasm

**Papillary carcinoma:**
- cellular
- little or no colloid in the background (colloid may appear as dense, globular, bubble gum-like – uncommon feature)
- cells arranged in papillary, monolayer tissue fragments, clusters or dispersed as single cells
- well-formed papillary clusters that appear as 3-D finger-like (smears do not always contain papillae)
- most frequently seen architectural feature: sheets of cohesive cells, focally with nuclear crowding and overlapping and in parts with a distinct well defined “anatomical” edge of a row of cuboidal or columnar cells (due to flattening of papillae when the sample is smeared)
- cells have a polygonal contour with well-defined margins and a central nucleus
- cytoplasm generally abundant, sometimes dense and homogeneous or granular with well-defined cytoplasmic borders (may look squamoid or metaplastic)
- cells may contain numerous vacuoles or show clear-cell change
- nuclei are oval or angled (arrow-head shape) and moderately enlarged
- chromatin is finely granular, delicate, 'powdery', hypochromatic and the nucleolus is small
- optically clear “Orphan Annie” nuclei are not seen (fixation artifact) on routine Pap stain
- however, nuclear clearing has been described in Ultrafast Papanicolaou-stained smears
- nuclear pseudoinclusions and longitudinal folds are often noted (the more cells that are involved, the more specific is the diagnosis)
- nuclear pseudoinclusions are more specific than grooves for papillary carcinoma
- more than 20% of the cells with grooves are virtually diagnostic for papillary carcinoma. Less than 10% of the cells with nuclear grooves virtually excludes a diagnosis of papillary carcinoma.
- multinucleated giant cells are found up to 50% of cases (some believe this is relatively specific; giant cells may be seen in Hashimoto’s thyroiditis and nodular hyperplasia)
- psammoma bodies (only with typical concentric lamination counts) are seen
Follicular variant:
-syncytial fragments, monolayered branched sheets with irregular contours, microfollicular structures
-lack papillae
-presence of typical nuclear features including nuclear grooves, powdery hypochromatic chromatin and intranuclear pseudoinclusions
-thick colloid in the background

Always look at the microfollicles carefully for nuclear features of papillary carcinoma.

Oncocytic / oxyphilic variant:
-usually a follicular growth pattern
-typical nuclear features are seen, along with abundant granular cytoplasm

Solid / trabecular variant:
-syncytial tissue fragments and trabeculae, without papillae or follicles

Macrofollicular variant:
-features easily confused with those of a hyperplastic nodule; need to look carefully for the typical nuclear features
-tissue fragments and follicles
-abundant colloid in the background

Diffuse sclerosing variant:
-dense lymphoplasmacytic inflammation
-monolayer sheets of squamous metaplastic cells
-numerous psammoma bodies
-abundant fibrous tissue in the background

Tall-cell variant:
-columnar cells with poorly to well demarcated cytoplasm and high N/C ratio
-cells are twice as tall as they are wide

Columnar-cell variant:
-papillary fragments covered by characteristic pseudostratified columnar cells with picket-fence nuclei
-cells with clear cylindrical cytoplasm and polarised oval nucleus
-nuclei containing stippled chromatin and indistinct nucleoli
-nuclear grooves are uncommon
-nuclear pseudoinclusions are absent

Key diagnostic criteria: pseudoinclusions, grooves, papillary structures and metaplastic cytoplasm. If all are present, a diagnosis of papillary carcinoma is almost guaranteed. Diagnostic nuclear features often involve most of the cells in a well-sampled papillary carcinoma. Just a few grooves, for example, are not sufficient for a diagnosis of malignancy.
**Hyalinising trabecular tumour (adenoma / carcinoma):**
- Some believe this to be a variant of papillary carcinoma
- May show psammoma bodies, fine chromatin, nuclear grooves and pseudoinclusions
- Papillary structures and bubble-gum colloid are absent
- Cells characteristically separated by metachromatic stromal substance
- Cells may be single and/or in follicles
- Spindle cells are present

**Medullary carcinoma:**
- Cellular smear with loosely cohesive syncytial cell clusters, rosettes or isolated cells
- May be as a population of single or admixture of cell-types
- Cell types include plasmacytoid, spindle, polygonal, round or triangular
- Nuclei with coarsely granular or speckled chromatin and inconspicuous nucleoli (neuroendocrine morphology)
- Bi and multinucleation are seen frequently
- Intranuclear pseudo-inclusions are also present
- Cytoplasm is finely granular and may contain red granules (seen in 30% of cases with Diff-Quik) – important feature
- Amyloid is present in the background (often with rounded edges, finely fibrillary, Congo-red positive, apple-green birefringence under polarised light)

**Insular carcinoma:**
- A cross between papillary carcinoma and follicular carcinoma
- There are solid syncytial aggregates, trabeculae, microfollicles and single cells with no colloid
- The cells appear monotonous with irregular nuclei, nuclear grooves, pseudoinclusions, nuclear overlapping, crowding and cytoplasmic vacuoles
- Papillae are not a feature
- Metaplastic cytoplasm is not seen
- Necrosis is frequent

**Anaplastic carcinoma:**
- Tumour cells are mostly dispersed but monolayers and three-dimensional clusters can be uncommonly found
- Background is usually rich in necrotic debris and blood
- An inflammatory component rich in neutrophils may be present
- A mixture of giant cells and spindle cells
- Tumour cells vary in the size and shape and may be pleomorphic, round or spindled
- Cells are mostly mononucleated though bi or multi-nucleation may be seen
- Nuclei are round, oval, irregular or bizarre with hyperchromasia and coarse, uneven chromatin structure
- Nucleoli can range from small to large, often single and irregular
- Cytoplasm is moderate to abundant, basophilic and well-defined which sometimes may be vacuolated or granular
- Some cells may have a plasmacytoid appearance while others may have a squamoid appearance
- Intranuclear inclusions are relatively frequent
- Osteoclast-like giant cells can sometimes be seen
- Differentiated structures such as papillae or follicles may be present in some cases
**Lymphoma:**
- cellular smears of monotonous population of atypical lymphoid cells
- small to large cells depending on the subtype
- lymphoglandular bodies in the background
- large numbers of Hurthle cells or follicular cells are not seen

**Radioactive iodine effect:**
- clinical correlation is mandatory
- increased cellularity
- cellular enlargement but low N/C ratio, hyperchromasia, intranuclear grooves, pseudoinclusions, metaplastic oxyphilic cytoplasm with vacuolisation
- papillary groups, high N/C ratio, powdery chromatin absent

**FALSE POSITIVES:**
- atypical adenoma with bizarre cells
- dyshormonogenetic goitre with anisokaryosis and nuclear atypia
- treated Graves' disease
- post chemoradiotherapy or radioactive iodine treatment
- atypical oxyphilic cells in Hashimoto's thyroiditis
- pseudopapillary structures in non-neoplastic thyroid lesions
- intranuclear vacuoles, nuclear grooves, psammoma bodies in benign lesions

**FALSE NEGATIVES:**
- cystic papillary carcinoma
- follicular variant of papillary carcinoma
- follicular carcinoma with bland cells
- paucicellular variant of anaplastic carcinoma, tumour with extensive necrosis or inflammation
- lymphoma arising from a background of Hashimoto's thyroiditis

**PRACTICAL TIPS:**

1. Know your radiologist, the clinical history, solitary or multinodular lesion, gauge of needle used, with or without suction.

2. Markedly cellular material with large "sheared out" sheets is probably due to aggressive sampling. They are usually monolayered honeycombed sheets. It does not indicate a follicular neoplasm.

3. Occasional markedly pleomorphic cells in a follicular lesion are more likely to be from a benign lesion than malignancy. It may represent a degenerative
phenomenon. Can be seen in treated Graves’, dyshormonogenetic goiter, post-
therapy.

4. Uniform nuclear enlargement and atypia without much variation in size and shape
is more suggestive of malignancy in follicular lesions.

5. Hurthle cell atypia may be more pronounced in Hashimoto’s thyroiditis than from
a Hurthle cell neoplasm.

6. Look very carefully for features of papillary carcinoma in any cystic lesion.
Features that a cyst may be a papillary carcinoma: increased cellularity, epithelial
atypia and psammoma bodies.

7. Abundant colloid may be present in cystic and macrofollicular variants of
papillary carcinoma. The amount of colloid present is not a reliable indicator
whether the lesion is benign or malignant.

8. Presence of papillary structures does not always mean papillary carcinoma. Look
for the typical nuclear features.

9. Presence of psammoma bodies in acellular fluid from a cystic lesion or in smears
from cervical lymph nodes strongly suggests papillary carcinoma and must be
excluded clinically. Cystic degeneration in a cervical lymph node in a young
patient should raise suspicion of metastatic papillary carcinoma and the thyroid
should be carefully examined.

10. Beware significant numbers of inflammatory cells in the background which may
be easily overlooked. May well be dealing with a thyroiditis. In true thyroiditis,
epithelial cells are usually scanty.

11. Small numbers of microfollicles are seen in a hyperplastic nodule. Abundant
microfollicles strongly suggest follicular neoplasm. Always look for other features
that are more typical of a hyperplastic nodule. Hence, multiple sampling of
different parts of the lesion is very important.

12. If both abundant colloid and marked cellularity are present, the lesion is probably
a cellular hyperplastic nodule or follicular neoplasm with macrofollicular areas. If
both colloid and cellularity are low, repeat FNA is recommended.
### Parathyroid adenoma vs thyroid lesion:

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<th>Parathyroid</th>
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<tr>
<td>Hyperparathyroidism</td>
<td>+</td>
<td>-</td>
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<td>Cells</td>
<td>Usually smaller</td>
<td>Usually larger</td>
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<tr>
<td>Nuclei</td>
<td>'Salt and pepper' coarse chromatin Intranuclear vacuoles Many naked nuclei</td>
<td>Fine chromatin Fewer naked nuclei</td>
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<tr>
<td>Cytoplasm</td>
<td>Fine, red (neurosecretory granules) Cytoplasmic vacuoles</td>
<td>Coarse, blue</td>
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<td>Colloid</td>
<td>Absent</td>
<td>Present</td>
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<td>Background</td>
<td>Usually clean; no foamy macrophages; no calcium oxalate crystals under polarized light</td>
<td>Often degenerated; calcium oxalate crystals identified</td>
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<td>Immunostains</td>
<td>PTH+</td>
<td>Thyroglobulin, TTF-1+</td>
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Fig 1. Colloid with a definite edge.

Fig 2. Colloid with a cracked appearance.
Fig 3. Thick and globular “Bubble-gum” colloid in a papillary carcinoma.

Fig 4. Amyloid deposits.
Fig 5. Blood, serum and clumped platelets.

Fig 6. Monolayered honeycombed sheet of uniform follicular cells (Implies sampling from a benign macrofollicle).
Fig 7. Hurthle cells with granular eosinophilic cytoplasm.

Fig 8. Hurthle cells.
Fig 9. Graves’ disease. Note: Occasional cells with nuclear enlargement.

Fig 10. Hashimoto’s thyroiditis. Hurthle cells and lymphocytes within the groups and in the background.
Fig 11. Hashimoto’s thyroiditis with spindled and epitheloid Hurthle cells.

Fig 12. De Quervain’s thyroiditis. Multi-nucleated giant cells.
Fig 13. Hyperplastic nodule. Sheets of follicular cells with abundant colloid in the background. No microfollicular structures.

Fig 14. Hyperplastic nodule. Follicular cells with colloid.
Fig 15. Aggressive sampling from a hyperplastic nodule with many monolayered sheets and no microfollicles.

Fig 16. Papillary hyperplasia. Well-formed papillary groups but lacking nuclear features of papillary carcinoma. Follicular cells have round nuclei.
Fig 17. Occasional atypical cells in an otherwise typical hyperplastic nodule do not indicate malignancy (Arrow).

Fig 18. Reactive follicular cells with prominent nucleoli and vacuolated cytoplasm (degenerative change).
Fig 19. Follicular neoplasm with marked cellularity.

Fig 20. Follicular neoplasm with marked cellularity and microfollicles.
Fig 21. Follicular neoplasm with rosettes (no lumen).

Fig 22. Follicular neoplasm with trabecular arrangement. This pattern is not seen in hyperplastic nodules.
Fig 23. Follicular neoplasm with trabecular arrangement.

Fig 24. Hurthle cell neoplasm with marked cellularity.
Fig 25. Hurthle cell neoplasm with microfollicles (Arrow).

Fig 26. Papillary carcinoma with complex papillae.
Fig 27. Papillary carcinoma. Papillary group with anatomical straight edge (Arrow).

Fig 28. Papillary carcinoma. Note row of palisaded tumour cells (Arrow).
Fig 29. Papillary carcinoma. Note nuclear enlargement and intranuclear pseudoinclusion (Arrow).

Fig 30. Papillary carcinoma. Nuclear grooves (Arrows).
Fig 31. Papillary carcinoma. Note fine powdery chromatin.

Fig 32. Papillary carcinoma. Note squamoid “metaplastic” cells (Arrow).
Fig 33. Follicular variant of papillary carcinoma. Look carefully for the typical nuclear features.

Fig 34. Cystic papillary carcinoma. Note cells with intranuclear pseudoinclusions.
Fig 35. Papillary carcinoma. Psammoma body present.

Fig 36. Cyst-lining cells, mimicking papillary carcinoma. The spindled appearance is typical.
Fig 37. Cyst-lining cells with intranuclear grooves and elongated granular cytoplasm, the latter not seen in papillary carcinoma.

Fig 38. Medullary carcinoma.
Fig 39. Medullary carcinoma. Tumour cells with finely granular chromatin and inconspicuous nucleoli.

Fig 40. Medullary carcinoma. The cells are rather “bland” with round nuclei and granular cytoplasm. The cytoplasm is focally elongated.
Fig 41. Medullary carcinoma with a mixture of epithelioid and spindled cells.

Fig 42. Anaplastic carcinoma with giant and spindled cells.
Fig 43. Parathyroid adenoma. Oncocytic cells and chief cells (stripped nuclei).

Fig 44. Parathyroid adenoma. Oncocytic and chief cells are smaller than Hurthle and follicular cells of the thyroid. There is no colloid in the background.
Fig 45. Non-Hodgkin lymphoma of the thyroid.

Fig 46. Metastatic adenocarcinoma from the lung to the thyroid.
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