

Clinico-Pathological Correlation of U3 Thyroid Nodules: A Retrospective Review

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Abstract

Background: The incidence of thyroid cancer is increasing globally mainly due to increased detection of papillary microcarcinoma. The British Thyroid Association (BTA) guideline (2014) recommends the use of U1-U5 classification on ultrasound to assess thyroid cancer risk. U3 nodules have low, but indeterminate risk and therefore need FNAC. This retrospective review analyses the outcome of U3 nodules in an outer London hospital. **Methods:** Thyroid ultrasound performed between 2016 and 2017 were searched and those with reported U3 nodules were selected (n=104) for this retrospective review. The static images were interrogated against the BTA guideline for U3 characteristics, corresponding cytology and histology. People with overt hypo or hyperthyroidism were excluded. **Results:** Nearly 81% (n=84) were female (mean age 48 years). Multiple nodules were noted in 54% (n=56) of which only 5% (n=2) were larger than 4 cm compared to 19% (n=9) among solitary nodules. The nodules were mainly heterogeneous (87%) and mixed vascularity was the most common reported U3 characteristic (94.5%) followed by isoechoic nodules (55.5%); other features were reported less frequently (<30%). FNA was done at least once in 86% (n=89). In those with multiple nodules, 86% had THY2 cytology and 9% had THY3a/f whereas 26% with solitary nodule had THY3a (n=11), 7% THY3f and 5% THY5 (n=2). Nineteen patients (18%) had thyroid surgery, which included four total thyroidectomies (two THY5, two large goitre). Both THY5 total thyroidectomy patients had papillary cancer (pT1a pN1a) and were treated with radioiodine. None of the fifteen who had hemithyroidectomy needed any further procedure. This included 7 of the 22 who had THY1 on first FNA. **Conclusion:** In summary, this review showed a bias towards mixed vascularity in reporting U3 nodule, negligible indeterminate cytology rate in multiple nodules and a reassuringly low rate of clinically significant papillary cancer risk (<3%).

Background

- Thyroid cancer is the 16th most common cancer worldwide.
- In the UK, the incidence of thyroid cancer has increased by 148% since 1992, which is partly due to increased detection of papillary microcarcinoma
- The British Thyroid Association (BTA) guidelines of 2014 recommends the use of a classification system, U1-U5 to assess the risk of thyroid cancer.
- U3 thyroid nodules have a low but indeterminate risk and therefore need Fine Needle Aspiration (FNA) for cytological analysis.
- BTA guidelines state U3 sonographic characteristics as:
 - Homogenous, markedly hyperechoic, solid, halo (follicular lesion)
 - Hypo-echoic, equivocal echogenic foci, cystic change
 - Mixed/central vascularity

Method

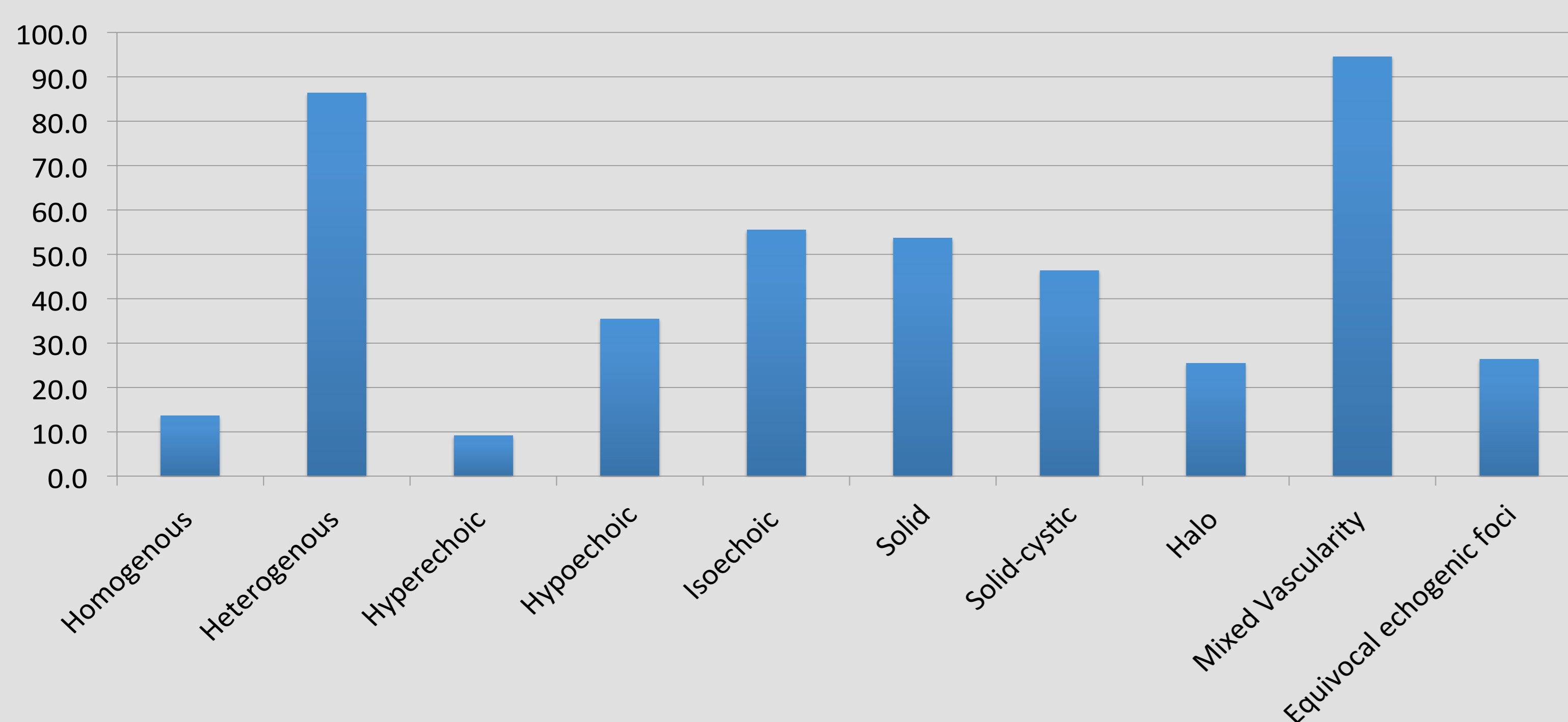
- Thyroid and neck ultrasounds performed between 2016-2017 at Central Middlesex Hospital were searched and those that reported U3 nodules were selected (n=107).
- The acquired static images were interrogated against BTA guidelines for the various U3 characteristics.
- The features of the nodules were reviewed with the corresponding cytology and histology for the 83 patient that had a FNA needle aspiration performed.
- People with hypo or hyperthyroidism were excluded.

Results

- The average age of patients in this review was **48**
- 81%** of patients were female.
- 46%** of patients had solitary nodules, with 54% having multiple thyroid nodules.

U3 Nodules	U3 Nodules	
	> 4cm	< 4cm
Multiple Nodules	5%	95%
Solitary Nodules	19%	81%

- On interrogation of the static sonographic images, the prevalence of BTA U3 characteristics in our cohort was:



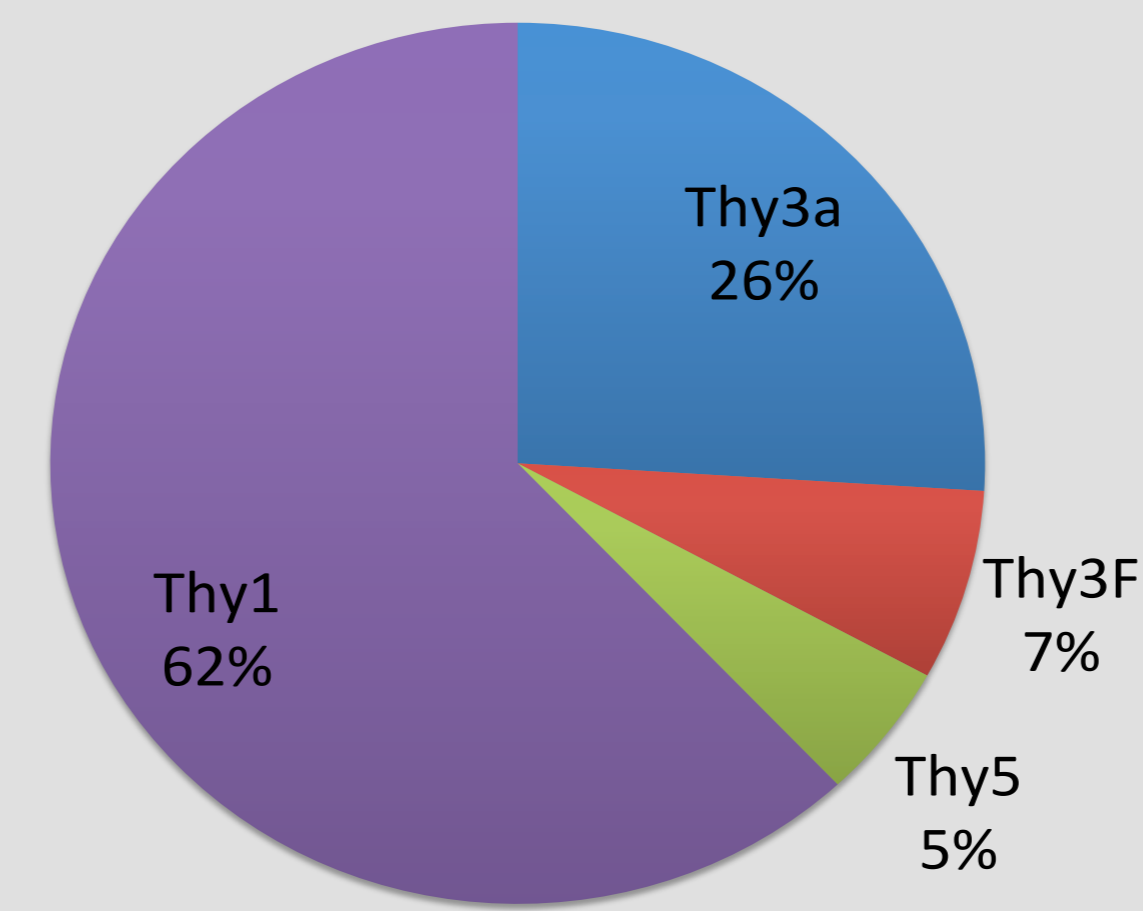
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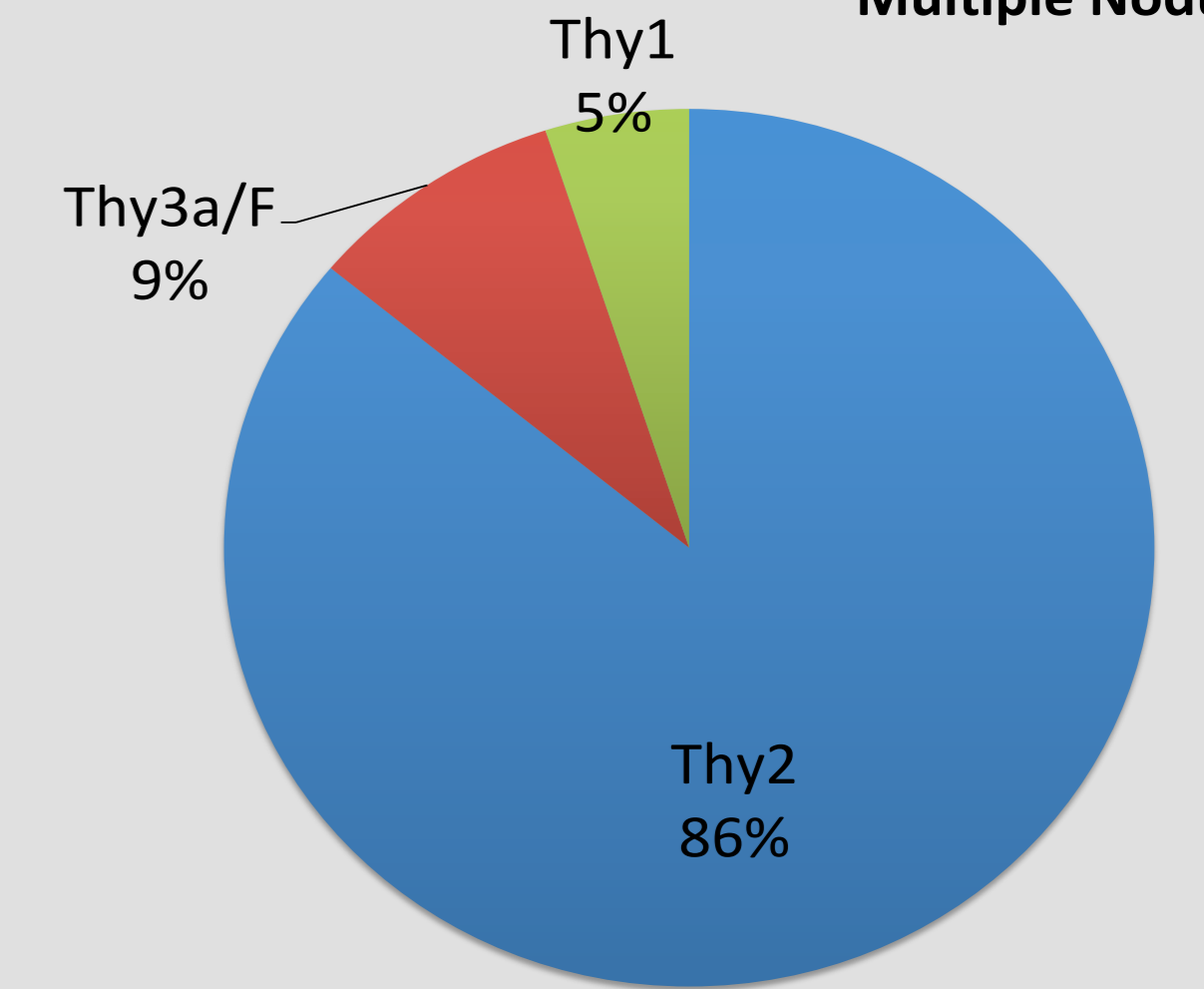
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- Fine needle aspiration was performed in **77%** of our patients.

Cytology Results for Patients with Solitary Nodule



Cytology Results in Patients with Multiple Nodules



- The overall Thy1 cytology rate for our cohort was **25%**
- Out of this cohort of patients, nineteen patients went on to have thyroid surgery. Four of these had total thyroidectomies:
 - Two were performed due to large goitres
 - The second two were performed due to Thy5 cytology and these had papillary cancer (pT1a pN1a) and were treated with iodine. (percentage of cancers)

Discussion

- There is scope for improving reporting accuracy of U3 nodules and we are currently proposing a template to incorporate all sonographic characteristics from the BTA guidelines (table 2):

Proposed Ultrasound Template for Thyroid Nodules

Thyroid echotexture: (Heterogenous/Homogenous)

Thyroid vascularity: (Increased/Normal/NA)

Retrosternal extension: (Yes/No)

Nodules: (None/Single/Multiple)

Cervical Lymph Nodes: (Normal/Enlarged)

Nodule number: []

• Size: (mm)

• Echotexture: (Homogenous/Heterogenous) and (Hypoechoic/Hyperechoic/Isoechoic)

• Appearance: (Spongiform/Cystic/Solid/Solid-Cystic)

• Vascularity: (Peripheral/Central/Mixed)

• Other features: (Halo/Echogenic foci/ Peripheral calcification/Micro-calcification/Irregular outline)

• BTA classification: U1 / U2 / U3 / U4 / U5

- Our Thy1 rate is within the recommended range by the Royal College of Radiologists but may be improved further by introducing a cytopathology technician to Head and Neck ultrasound lists to improve yield of FNAs.
- Considering the yield of cancer in U3 nodules is very low, and with a significant Thy1 yield of FNAs, it raises the question of the overall benefit in sampling U3 nodules.

Conclusion

- The BTA classification system is effective in picking up Papillary microcarcinoma in patient's with equivocal U3 thyroid nodules.
- Overall, FNA acquired cytology yield is good, in particular in patients with multiple nodules.
- There seems to be an overall reliance on mixed vascularity as a sonographic feature of U3 nodules compared to other characteristics.
- There is a reassuringly low rate of clinically significant papillary cancer risk, less than 3%

References

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