Ultrasound Guided FNAC for Evaluation of Neck Lumps to Improve Inadequacy Rates; A Complete Audit Cycle

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Abstract: We present a completed audit cycle evaluating inadequacy rates in neck lump and thyroid fine needle aspiration cytology with and without ultrasound scan guidance.

The first cycle of the audit was from January to July 2010 comparing free hand fine needle aspiration cytology (FNAC) with ultrasound guided fine needle aspiration cytology (USS+FNAC). Changes to practice were made, firstly all thyroid FNAC would be performed with USS+FNAC and a reduced threshold for referral for USS+FNAC for non-thyroid neck masses. The second audit cycle was completed sixteen months later to assess for an improvement in practice. 1st phase; 155 patients, 70 freehand, 85 USS+FNAC. 50% of the thyroid FNAC freehand were inadequate compared to 18% of the thyroid USS+FNAC. 2nd phase; 196 patients, USS+FNAC 134, freehand 62. Thyroid FNAC 105 (USS+FNAC-104, freehand-1). Inadequate USS+FNAC = 21/104 (20%). The completed audit cycle shows an increased proportion of thyroid FNACs performed by ultrasound guidance, improving from 82% to 99%, with an overall reduction of inadequate thyroid FNACs from 24% to 21%. There was a noticeable variability in the inadequacy rates from radiologist to radiologist with the head and neck senior radiologist demonstrating the lowest inadequacy rate at 9.6% in the second cycle. Although ultrasound guidance for FNAC is important for the reasons of increased sensitivity, specificity and accuracy, we have demonstrated that the operator experience and skill are just as important.

Keywords: Thyroid, aspiration, cytology, ultrasound, neck lump.

INTRODUCTION

It is accepted practice that fine needle aspiration cytology (FNAC) is performed on patients presenting to neck lump clinics. Combining FNAC with Ultra-Sound Scanning (USS+FNAC) has been shown to increase both sensitivity from 91.8% to 97.1% and specificity from 68.8% to 70.9% for this investigation [1]. The content of the USS report also provides useful information to aid decision-making, especially with regard to thyroid nodules [2]. However, access to USS guided FNAC is not routinely available in the NHS, for investigation of neck lumps, and remains aspirational for many NHS Trusts, probably due to the resource implications involved. In 2011 the head and neck cancer multidisciplinary guidelines were published, outlining the importance of ultrasound assessment. It was recommended that thyroid nodules over 10mm should be investigated with USS+FNAC whenever possible [3]. In addition, it was recommended that if a nodule is below 10mm then FNA is not indicated unless clinically suspicious on USS, and also that there should be USS assessment of cervical nodes in FNA proven cancers [3].

It has been noted previously that the adequacy rate of the cytological sample harvested is dependent on the experience of the investigator [4] and potentially on the specific technique and equipment utilised [5, 6]. Also, the cystic and vascular nature of thyroid nodules can have a negative impact on adequacy rates; cyst fluid yielding no thyroid epithelium needs to be interpreted alongside USS findings but by definition is an inadequate sample for cytology. Therefore, within our departments of ENT Surgery and Radiology we undertook an audit of neck lump FNACs to evaluate our own practice, to compare our own data to that published, and to evaluate the influence that the expertise of the operator had on the outcome of the FNAC.

METHOD

A complete audit loop was performed. For the initial phase, the Department of Histopathology database was searched for all patients that had undergone FNAC of a lymph node, salivary gland, thyroid or neck lump between January 2010 and July 2010. A retrospective case note review was performed, datum analysed, and the findings were presented at a directorate audit meeting. Following a change in practice as a consequence of the initial results, a second phase of the audit was performed, with data collated at the end of the second study period between October 2011 and April 2012, analysed and presented. The complete audit cycle is presented here.

RESULTS

In the 6 months study period there were a total of 155 patients, 70 had freehand FNAC and 85

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Table 1: Site and Inadequacy Rates of the Freehand FNAC in the First Audit Phase

TYPE OF FNAC	TOTAL NUMBER	INADEQUATE SAMPLE	% INADEQUATE
Parotid	12	3	25
Nodes	35	9	26
Thyroid	16	8	50
Submandibular	4	2	50
Others	3	1	33

Table 2: Site and Inadequacy Rates of the Ultrasound Guided FNAC in the First Audit Phase

TYPE OF FNAC	TOTAL NUMBER	INADEQUATE SAMPLE	% INADEQUATE
Thyroid	71	13	18.3
Parotid	4	0	0
Nodes	9	0	0
Thyroglossal	1	0	0

USS+FNAC. There were 36 inadequate samples, 23 were freehand and 13 USS+FNAC. Therefore 33% of our freehand FNAC were inadequate compared to 15% of the USS+FNAC (p=0.005, Fisher's exact test).

During the first audit phase there were 87 thyroid FNAC samples performed of which 21 were inadequate (21/87, 24%). Sixteen of these (16/87, 18%) were performed freehand and of these, 8 (8/16, 50%) were inadequate. Seventy-one (71/87, 82%) where performed as USS+FNAC and only 13 of these samples (13/71,18%) were inadequate, the difference reaching statistical significance, p=0.004 (Fishers exact test). The overall inadequacy rate for thyroid FNACs in this patient cohort was 21/87 (24%).

Details of the operator of the USS+FNAC were available in 74 cases. There were four radiologists with two of them performing over 94% of USS+FNAC as shown in Table **3**. The inadequacy rates varied from 50% to 0% with the difference between the two radiologists whom performed the majority of the USS+FNAC (A and B) was 8%, [p=0.17]. Of clinical significance was the overall percentage performed by the senior (most experienced) head and neck radiologist, which was 74%.

There were 105 Thyroid FNAC performed in the second phase of the audit with only 1 performed freehand and 104 by ultrasound guidance. In the ultrasound guided group 21 (20%) of the samples were inadequate, the only freehand sample was also inadequate. Overall the inadequacy rate for thyroid FNACs in this patient cohort was 22/105 (21%). There was no statistically significant difference in the overall inadequacy rates for thyroid FNACs between the first and second loops of the audit, p=0.7 (Chi square test).

During the second phase there were 4 radiologists used to perform the USS+FNAC. Similar to the first phase there was a large variation in adequacy rates as shown by Table **4**. The senior head and neck radiologist performed 59% of the total USS+FNAC.

Table 3: Inadequacy Rates for Different Radiologists Performing USS+FNAC in the First Audit Cycle

ULTRASONOGRAPHER (RADIOLOGIST)	TOTAL THYROID USS+FNAC	INADEQUATE SAMPLES	PERCENTAGE INADEQUATE
A	55	10	18%
B	15	4	26%
C	2	1	50%
D	2	0	0%

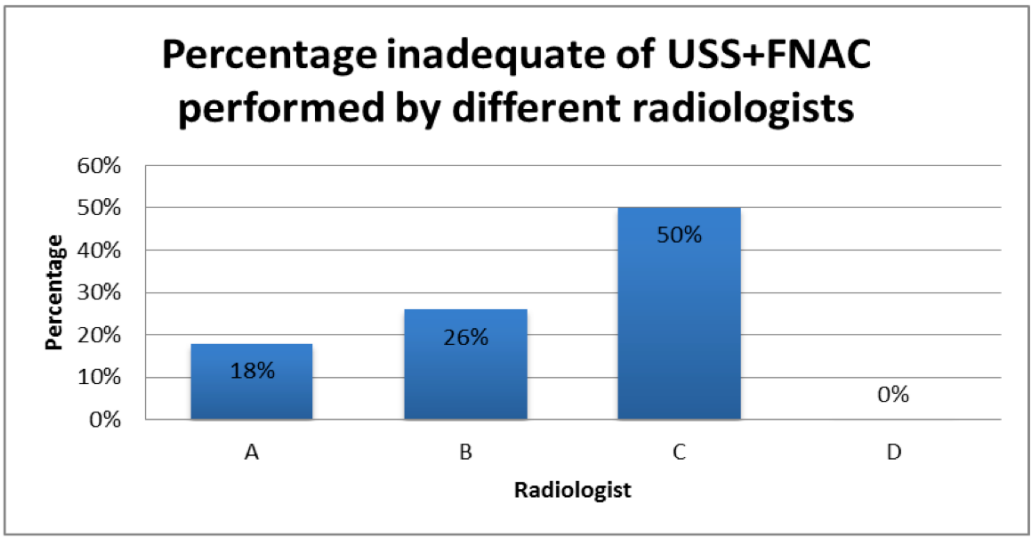

Figure 1: Inadequacy rates for different radiologists performing USS+FNAC in the first phase of the audit.

Table 4: Inadequacy Rates for Different Radiologists Performing USS+FNAC in the Second Audit Cycle

ULTRASONOGRAPHER (RADIOLOGIST)	TOTAL THYROID USS+FNAC	INADEQUATE SAMPLES	PERCENTAGE INADEQUATE
A	62	6	9.60%
B	22	8	36%
C	19	7	37%
D	1	0	0%

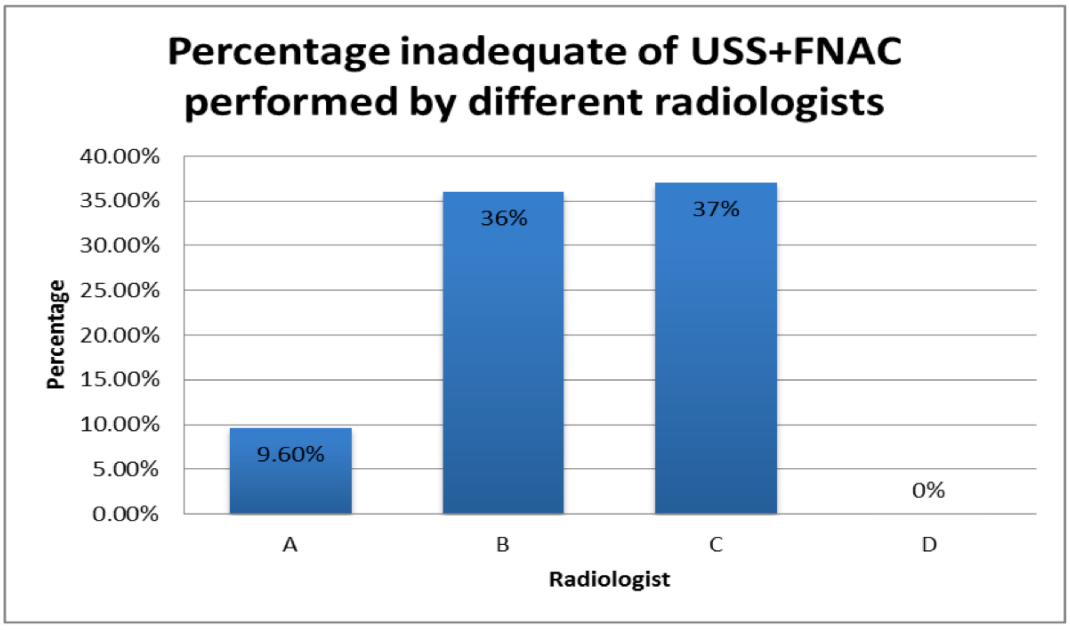

Figure 2: Inadequacy rates for different radiologists performing USS+FNAC in the second audit phase.

DISCUSSION

These data presented here demonstrate the role of a completed audit cycle to affect change in clinical practice with regards to investigation of neck lumps of thyroid origin. The main outcome established after the first audit phase was the poor inadequacy rate of freehand FNAC for thyroid lesions. The change of practice we implemented was for all thyroid nodules to be investigated by FNAC to be performed under

ultrasound guidance. The principal change was away from a technique where half of the samples proved inadequate, reducing the freehand thyroid FNAC rate from 18% down to just 1%. The inadequacy rates for USS + FNAC remained reasonably consistent between the two audit phases (20% & 18%) despite the move towards cytological material being harvested under USS guidance. Since the majority of the thyroid FNAC performed in the first audit phase were also USS guided, it was always going to be difficult to demonstrate a statistically significant improvement in inadequacy rates for thyroid FNACs in the second audit phase. Another reason for the perceived lack of improvement in overall inadequacy rates is possibly due to maternity leave taken by one of the lead thyroid radiologists, which was far from ideal but represents an accurate reflection of clinical practice at the time of the audit. Also, the change in practice led directly to the lead radiologist performing proportionally less scans in the second audit phase (74% then 59%), which may account for some of the findings.

Of interest is the change in inadequacy rates for the radiologists between the 2 phases of the audit. All radiologists involved are permanent consultant staff with considerable experience of neck and thyroid ultrasound scanning, and with specific training in appropriate FNAC technique. However this audit cycle show as big an improvement in one radiologists performance as there is a reduction in the other. The reasons for this are not known, but again reflect true to life clinical radiology.

A large Dutch study by De Meer *et al.* looked at FNAC of thyroid nodules comparing 743 performed by USS+FNAC and 868 performed freehand [4]. Interestingly their inadequacy rates for freehand FNAC were more favourable than those performed with USS guidance. Various reasons were presented for this but their main theme was that operator experience and the numbers of operators can significantly reduce the adequacy rates of USS+FNAC.

Referral for all thyroid nodules to USS+FNAC leads to an increase in demand for USS appointments; one possibility to deal with this would be for the surgeon to perform the ultrasound scan at the time of FNAC. Obviously this is not a diagnostic scan, but a scan performed to facilitate harvesting FNAC material. A recent randomized controlled trial looked at this very point and found an overall inadequacy rate of 14% for the ultrasound guided and 42% for freehand, and, a statistical significant advantage in the thyroid samples, but not in the salivary or lymph node FNACs was demonstrated [12].

When comparing freehand against USS guided FNAC, USS+FNAC has been shown to not only decrease the rate of non-diagnostic specimens [1, 7, 11] but it also helps aid the diagnosis and can change the management of patients with significant thyroid nodules [8]. The benefits of freehand FNA of thyroid nodules are its reduced cost as well as its logistical efficiency. Real time adequacy assessment of FNAC samples by a cytopathologist or biomedical scientist at the time of either freehand or USS guided FNAC has been shown to decrease non-diagnostic samples, and when combined with ultrasound scanning the inadequacy rates reduce further [9, 10]. Nice guidelines in 2004 set out recommendations for investigation of head and neck lumps, the guidelines suggested that there should be a specialist clinic that includes a histopathologist and preferably ultrasound guidance [11]. The major obstacle to setting up the clinics appears to be financial with an estimated cost of £20,000 per clinic per year [9].

A recent large retrospective study in Liverpool found that by using ultrasound guidance and having a histopathologist present in clinic reduced the inadequacy rates to 4%, which is similar to other similar studies demonstrating a one-stop clinic [9, 12]. Interestingly they also found that if the same person performed the FNA and interpreted the slides then the inadequate rates were better than if another clinician performed the FNAC [9].

Can *et al.* looked at the cost effectiveness of USS+FNAC compared to freehand [7]. They demonstrated inadequacy rates of 42% with freehand and 29% with USS and found that there was a cost saving with USS+FNAC. The freehand strategy cost €534 compared to the USS+FNAC strategy costing €523.

CONCLUSION

Overall, our study demonstrates the value of clinical audit to implement change to the patient pathway, and lends support to the argument that operator skill and experience can play an important role in determining the outcome of this investigative technique.

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