On-site cytotechnician evaluation of the adequacy of fine needle aspiration in a neck lump clinic

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ABSTRACT

INTRODUCTION The gold standard for assessing neck lumps is a one-stop clinic with an on-site cytopathologist who can provide an immediate fine needle aspiration (FNA) report. However, this has considerable resource implications and is not available in all units. In our department, surgeons perform FNAs guided by palpation. The FNA is evaluated for specimen adequacy by an on-site cytotechnician. This study evaluated the impact of the cytotechnician on the adequacy of neck lump FNA.

METHODS FNA performed between June 2010 and February 2012 was examined. The FNA performed at a neck lump clinic with an assessment of adequacy by an on-site cytotechnician were considered the test group. All other neck lump FNAs from other sources without an assessment of adequacy by an on-site cytotechnician were considered the control group.

RESULTS Of the FNAs, 134 met the inclusion criteria for this study. Of these, 87 FNAs (65%) were analysed for adequacy by the on-site cytotechnician and the remaining 47 (35%) were not. The results demonstrated an FNA inadequacy with and without on-site cytotechnician assessment of 29.9% and 40.4% respectively. This is equivalent to an absolute risk reduction of an inadequate FNA of 10.5%, which equates to a number needed to treat of 9.5, ie the cytotechnician needs to assess 9.5 (ie the cytotechnician [...] specimen).

CONCLUSIONS In neck lump clinics where on-site cytopathology is not available, an on-site cytotechnician is a compromise measure that does reduce the number of inadequate FNAs.

KEYWORDS

Head and neck – Fine needle aspiration – Sample adequacy – On-site evaluation

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The investigation of neck lumps invariably involves fine needle aspiration (FNA) for cytology. This procedure is quick, safe, cheap and effective for indicating the underlying primary pathology.^{1,2} Reliable reporting of benign pathologies may obviate surgery for histological diagnosis. Timely diagnosis of malignancy will allow for staging and treatment without delay. The National Institute for Clinical Excellence (NICE) recommended the establishment of one-stop neck lump clinics with an on-site cytopathologist who can provide an FNA report.³ The NICE recommendation acknowledged that this would take time to implement and that interim measures might be necessary. The cost of providing a rapid access neck lump clinic with on-site cytological expertise has been estimated at £20,000 a year.³

There are clear benefits of implementation – not least to allay patient anxiety in the event of a non-malignant pathology – but there are considerable resource implications beyond the cost. Radiology and pathology departments may not have the capacity to provide a one-stop service. In our department's neck lump clinic, we do not have access to an

on-site cytopathologist or radiologist. Surgeons in this clinic perform FNAs guided by palpation, which are then evaluated for specimen adequacy by an on-site cytotechnician. If a sample is deemed to be inadequate, further FNAs are performed to achieve an adequate specimen.

The role of cytopathologists in the evaluation of neck lump FNAs is well established but the role of cytotechnicians in this respect is not. This study evaluated the impact of a cytotechnician on the adequacy of neck lump FNA samples in our institution.

Methods

This was a retrospective observational study of FNAs performed between June 2010 (when on-site cytotechnician support was introduced) and February 2012, under the care of consultant surgeons involved in the head and neck cancer service. The surgical team consists of two otolaryngology – head and neck surgeons (SAH and PHR), and two oral and maxillofacial surgeons (DJC and LCF).

All the surgeons have each performed or supervised many hundreds of FNAs. Although most patients with neck lumps present to our institution's clinic, many present to regular outpatient clinics under the care of these surgeons. Here, FNAs are performed without immediate assessment of adequacy as there is no on-site cytotechnician, outside the neck lump clinic.

For on-site analysis by a cytotechnician, the FNA is prepared on glass slides by the surgeon and given to the cytotechnician who stains it using Rapi-Diff II (Biostain Ready Reagents, Manchester, UK) and then assesses adequacy by microscopy. If the cytotechnician is not available, the prepared slides are sent to the cytology laboratory for routine processing.

FNAs performed at the neck lump clinic with an assessment of adequacy by an on-site cytotechnician were considered the test group. All other neck lump FNAs from other sources without assessment of adequacy by an on-site cytotechnician were considered the control group. The control group was therefore composed of neck lump FNAs presenting to general otolaryngology or maxillofacial surgery clinics under the care of the same head and neck surgeons in attendance at the neck lump clinic. These clinics had no on-site cytotechnician but the FNAs were taken by the same surgeons using the same equipment as in the test group so this was an appropriate control group.

All included FNAs, in both the test and control groups, were consecutive samples performed by the same surgeons during the period of study. Thyroid FNAs were excluded from this study as these patients mostly present to a separate thyroid clinic. Ultrasonography guided FNAs were also excluded as they fell outside the scope of this study.

The hospital pathology information system was queried by a data analyst to provide a list of neck lump FNAs performed under the care of the aforementioned surgeons. The corresponding cytology reports were obtained from the hospital laboratory reports system. Data including specimen identifier, type of tissue sampled, date of FNA, consultant surgeon and specimen adequacy were recorded on a Microsoft Excel spreadsheet (an Excel® spreadsheet (Microsoft, Redmond, WA, US)). Two of the (VMR and WOB) independently analysed the cytology reports to record whether a specimen was deemed to be adequate or inadequate by the cytopathologist. The authors were blinded to whether the specimen had been evaluated by the cytotechnician.

Statistical analysis

To establish the role of the cytotechnician in improving the adequacy rate of neck lump FNAs, the absolute risk reduction (ARR) was calculated. This is the reduction of the risk of an inadequate FNA between the control group (no cytotechnician assessment) and the test group (cytotechnician assessment). The ARR allows for the number needed to treat (NNT) to be calculated: this is the number of FNAs that need to be evaluated by the on-site cytology technician to prevent one inadequate FNA. Binary logistic regression analysis by forward stepwise method was performed using SPSS® version 20 (IBM, New York, US). FNA adequacy was considered as the dependent variable and all other variables were con-

sidered as explanatory (cytotechnician assessment, consultant and tissue type).

Ethical considerations

This study was a retrospective service evaluation and therefore did not require ethical approval.

Results

During the period of study, 134 FNAs met the inclusion criteria. This included 87 FNAs (65%) that were analysed for adequacy by the on-site cytotechnician (test group) and the remaining 47 (35%) that did not (control group). The distribution of tissue types in the test and control groups is shown in Table 1. The number of adequate and inadequate FNAs for the control and test groups is shown in Table 2.

The results demonstrate FNA inadequacy with and without on-site cytotechnician assessment of 29.9% and 40.4% respectively. This is equivalent to an ARR of an inadequate FNA of 10.5%, which equates to an NNT of 9.5. This means the cytotechnician needs to assess 9.5 FNAs to prevent one inadequate specimen.

Binary logistic regression by forward stepwise method considering FNA adequacy as the dependent variable demonstrated no statistically significant explanatory variables (cytotechnician assessment, consultant and type of tissue, $p > 0.05$). The odds ratio for on-site cytotechnician assessment of FNA adequacy was 1.32 with a 95% confidence interval of 0.897–1.942. This suggests that FNAs that are assessed by a cytotechnician are more likely to be adequate than those that are not.

Discussion

The ideal neck lump clinic provides a one-stop service with access to the expertise of surgeons, radiologists and cytologists. Such a model improves the patient experience by reducing the total number of hospital appointments as well as the time from referral to diagnosis.^{4,5} The findings of our study demonstrate that evaluation of FNA adequacy by an on-site cytotechnician in the head and neck lump clinic confers an absolute risk reduction of 10.5% in terms of FNA inadequacy. This translated to an NNT of 9.5. In the context of avoiding delays in investigations and excessive follow-up appointments for repeat FNAs following an unsuccessful attempt, this may be considered a clinically relevant improvement.

A systematic review and meta-analysis of studies reporting head and neck FNA results with definitive histology by Tandon *et al* found that this procedure has a sensitivity of 89.6%, a specificity of 96.5%, a false positive rate of 3.5% and a false negative rate of 10.3%.¹ The positive and negative predictive values were 96.2% and 90.3% respectively.

Current recommendations for improving head and neck lump clinic services advise the inclusion of an on-site cytopathologist and radiologist as such a model confers the best results in terms of FNA accuracy and diagnostic expediency.^{3,6} However, such resources do not exist in all units.⁷ It has been reported that a pathologist costs £81 an hour

Table 1 Distribution of tissue types in the control and test groups		
Tissue type	Test group (n=87)	Control group (n=47)
Lymph node	60	22
Parotid gland	18	19
Submandibular gland	6	1
Other	3	5

Table 2 Comparison of test group and control group in terms of FNA adequacy				
FNA adequacy	Test group (n=87)	Control group (n=47)	ARR	NNT
Adequate	61 (70.1%)	28 (59.6%)	10.5%	9.5
Inadequate	26 (29.9%)	19 (40.4%)		

FNA = fine needle aspiration; ARR = absolute risk reduction; NNT = number needed to treat

in the UK, compared with £20 an hour for a specialist cytotechnician.⁵ Cytotechnicians are commonly used where cytopathologists are not available to assess FNA adequacy.^{8,9} The ability of cytotechnicians to evaluate specimen adequacy has been proven in non-head and neck sites.¹⁰

Robinson and Cozens reported on their experiences of an ultrasound-guided FNA clinic, which included a radiologist and a pathologist.⁷ They demonstrated that FNAs from this clinic were inadequate or of uncertain diagnosis in 15.44% of specimens, compared with 33.3% of FNAs from other sources.

Ganguly *et al* reported on their neck lump clinic, which had on-site ultrasonography guided FNA and an on-site cytopathologist.⁵ They found that the absence of on-site cytological evaluation would have resulted in sample inadequacy in 15% of cases (41 of 274 cases), compared with 4% with on-site cytology (11 of 274 cases). In this series, on-site cytopathologist evaluation equated to an 11% risk reduction in the chances of an inadequate sample, which is comparable with the findings of our study with on-site cytotechnician assessment. Our overall percentage of inadequate specimens is very high compared with the reported series.

The reasons why pathologists may be better than clinicians in performing FNAs may include better information regarding history and clinical presentation, better preparation of specimens and better correlation between microscopic findings and disease processes.¹¹ Perhaps most importantly, cytopathologists are able to immediately assess the adequacy of the sample and perform further passes if needed.^{4,12} Wu studied head and neck FNAs performed by clinicians and cytopathologists guided by palpation.¹⁵ She established that diagnostic specimens were produced in 24% and 83% respectively, and suspicious/suggestive specimens were produced in 43% and 10% respectively (the remainder were non-diagnostic). Of those cases with histo-

logical correlates, agreement with FNA results was 94% for cytopathologists and 67% for clinicians.⁵

Our study does not consider the level of confidence of the cytotechnician in the adequacy of the FNA specimen submitted for processing as it is possible the specimens could not be bettered by the surgeon despite repeated attempts. This information was not recorded in the clinical notes and therefore could not be considered. A prospective study is currently being undertaken to investigate the relationship between the confidence of the surgeon and the cytotechnician in the adequacy of FNAs and the actual adequacy.

Apart from on-site radiology, cytopathology or cytotechnician support, other measures that may improve FNA adequacy include formal training in best practice FNA technique and cytological specimen preparation. While microscopic examination by a cytopathologist is the gold standard for assessing specimen adequacy, it has been shown that gross specimen appearance may indicate adequacy so surgeons may be trained in this skill.¹⁴ Alternatively, surgeons might be trained to evaluate FNA adequacy in the same way a cytotechnician does or to use ultrasonography guidance when performing FNAs. Robitschek *et al* conducted a randomised controlled trial comparing clinician-performed FNAs with and without ultrasonography guidance that demonstrated a specimen adequacy rate of 84% and 60% respectively.⁹

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Conclusions

In neck lump clinics where on-site cytopathology is not available, an on-site cytotechnician is a compromise measure that reduces the number of inadequate FNAs.

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