

Nigerian Journal of Clinical Practice
June 2010 Vol. 13(2):163-166

REVIEW OF FINE NEEDLE ASPIRATION CYTOLOGY IN THE MANAGEMENT OF GOITRES IN IBADAN, NIGERIA

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ABSTRACT

Objective: The use of Fine Needle Aspiration Cytology (FNAC) in the investigation of goitres was introduced into our practice more than a decade ago. This is a review of its diagnostic accuracy for thyroid carcinoma seven years after the first evaluation and following the establishment of the 'FNAC Clinic'.

Method: This is a retrospective study of patients who had FNAC of goitres and the histopathology of their thyroidectomy specimens between 1995 and 2004. The accuracy of the cytology reports were evaluated against the histology reports. The turnaround time of the patients for surgery was also determined.

Results: There were 130 females and 21 males with an age range of 7-86 years. The diagnostic accuracy of the procedure for carcinoma was 89% with a sensitivity of 35%, specificity of 97%, positive predictive value of 64%, and a negative predictive value of 91%. The average turnaround time for surgery was 178.7 ± 248.7 days with a range of five days to three and a half years.

Conclusion: The diagnostic accuracy of FNAC of goitre for carcinoma improved in the period under review. However, the long surgery turnaround time may reduce the usefulness of the procedure. The accuracy may be improved further by a protocol of ultrasound guidance, capillary collection with no-aspiration technique, on-site review of slides with a repeat of FNA as necessary.

Key Words: Fine needle aspiration cytology, Histology, Goitre, Accuracy, Surgery turnaround time.
(Accepted 16 April 2009)

INTRODUCTION

Fine Needle Aspiration Cytology (FNAC) of the thyroid gland is performed in the preoperative evaluation of patients who present with goitres. The outcome of the test can be used to determine if thyroidectomy is indicated in a patient and the extent of the procedure. It therefore plays a significant role in the management of patients with thyroid lesions¹. This role is also enhanced by its simplicity and low cost^{2,3,4}. The initial experience with the use of FNAC for the evaluation of goitre in our hospital has been documented⁵. Fine Needle Aspiration (FNA) was performed by surgeons and pathologists when it was introduced into our centre. The need for quality control necessitated the establishment of the 'FNAC Clinic' and the performance of FNA exclusively by the pathologists since 1994. The impact of this on the accuracy of the procedure in the preoperative diagnosis of thyroid carcinoma is not known and there has not been a re-evaluation of the procedure since the first study. This study was therefore conducted to review the accuracy of the procedure and its impact on the management of goitre patients;

with the surgical turnaround time in the University College Hospital, Ibadan, Nigeria.

STUDY POPULATION

The study population included 151 patients who had both FNAC of goitres and histology of their thyroidectomy specimens between 1995 and 2004 in the hospital.

METHODS

The Fine Needle Aspirations were performed using the standard method described previously^{3,4,5}. The reports of the cytology, performed by the pathologists, were sent to the surgeons who then performed thyroidectomy on the patients. Histology was then performed on the paraffin-embedded tissues of the thyroid specimens. The cytology reports were classified according to the guidelines of the Papanicolaou Society of Cytopathology for the examination of fine-needle aspiration specimens from thyroid nodules^{6,7}. One of the surgeons (AOA) compared the cytology reports with the histology reports of the patients retrospectively. The parameters studied include the age, gender, cytological diagnoses, the histological diagnoses of the patients and the interval between when the patient presented and when surgery was performed.

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The sensitivity, of the research was conducted in compliance with the guidelines of the International Committee on Harmonisation on Good Clinical Practice.

RESULTS

There were 130 females and 21 males with a ratio of 6.2:1. The ages of the patients were between 7 and 86 years. The frequency distribution of the histological diagnosis of the thyroidectomy specimens is shown in Table 1.

The sensitivity of FNAC in the diagnosis of carcinoma was 35% while the specificity was 97%. The negative predictive value and the positive predictive value were 91% and 64% respectively. The diagnostic accuracy of FNAC for carcinoma was 89% (Table 2). The time interval between when the patient presented and when surgery was performed was five days to three and a half years, with an average of 178.7 ± 248.7 days.

Table 1: Final Histologic Diagnosis of the Thyroidectomy Specimens.

Histological diagnosis	n	%
'Benign' (nodular or colloid goitre, thyroiditis, hyperplasia)	125	82.78
Hurthle cell adenoma	1	0.66
Follicular adenoma	7	4.64
Hurthle cell carcinoma	3	1.99
Follicular carcinoma	7	4.64
Papillary carcinoma	6	3.97
Medullary Carcinoma	1	0.66
Insular carcinoma	1	0.66
Total	151	100

Table 2: The diagnostic accuracy of FNAC of goitre for thyroid carcinoma

True Positives	7
True Negatives	127
False Positives	4
False Negatives	13
Sensitivity	35%
Specificity	97%
Positive predictive value	64%
Negative predictive value	91%
Accuracy	89%

DISCUSSION

Fine needle aspiration cytology is performed routinely in the evaluation of patients who present with goitres in our practice. It has been reported as a useful test in the therapeutic approach of thyroid lesions¹. However, it is utilized differentially by surgeons depending on the incidence of endemic

goitre, Graves' disease and thyroid cancer. In a series of patients, no clinically significant thyroid cancers were found in the histology of the surgical specimens of the patients who did not undergo preoperative FNAC. The authors therefore suggested that in the hands of experienced thyroid surgeons, FNAC could be utilized selectively based on the clinical presentation⁸.

The diagnostic accuracy of FNAC for carcinoma of 89% in this study is an improvement on the accuracy of 80.6% obtained in the previous review of FNAC of goitre in our hospital⁵. The specificity also improved from 80% to 97%. However, there was a marked reduction in the sensitivity from 83% to 35% after seven years. The recent accuracy compares well with that of Ko *et al* of 84.4%¹. The lower sensitivity of 35% and positive predictive value of 64% in our study compared with their values of 78.4% and 99% respectively is attributable to the high rate of false negative results (65%) and of false positive results (36%). In practical terms, this low sensitivity may be due to the 'blind' aspiration of the thyroid lesions without ultrasonic guidance, which has been shown to highly facilitate the detection of non palpable thyroid lesions, and the routine use of the procedure in all patients including those who had diffuse goitres. It may also be explained by the inter-observer variation in the interpretation-skill of the various cytologists since the result of FNAC is observer-dependent. False-negative diagnoses may also be due to inadequate samples, geographic misses of the lesion, dual pathology (e.g. a dominant benign nodule may obscure a smaller or more diffusely growing carcinoma) and errors in interpretation^{9,10}.

In a correlative study of FNA of the thyroid with histopathology, Sclabas *et al* found that false-negative FNAC results were uncommon¹¹. They noted that in the patients with indeterminate biopsy results, high-risk subgroups include patients with FNAC results suspicious for papillary carcinoma and follicular neoplasms greater than 2cm in diameter. Total thyroidectomy is advised for the patients with FNAC report of indeterminate follicular lesions. This is because of the high prevalence of malignancy in this category of patients¹². This is corroborated by Baloch *et al* who reported a malignancy rate of 49% on repeating FNAC in patients with thyroid nodules diagnosed on initial FNAC as non-diagnostic and indeterminate for neoplasm¹³.

Smith *et al* suggest that in follicular lesions of the thyroid, a benign FNAC report from an experienced cytopathologist has a high positive predictive value. However, they warned that it may not be high enough to preclude surgery and suggested that other factors be considered before recommending a non-operative management approach¹⁶. Despite the low sensitivity of FNAC in the diagnosis of follicular variant of

papillary thyroid carcinoma, it identifies patients with suspicious lesions in whom intraoperative pathologic study may assist in determining the appropriate extent of thyroidectomy¹⁷. The accuracy may be improved with the guidance of FNA by ultrasonic and or radionuclide scanning to enhance the aspiration of suspicious lesions¹³. Ultrasonography altered the clinical management for 63% of a group of patients referred to the thyroid nodule clinic after abnormal results on thyroid physical examination¹⁸.

The combination of ultrasound guidance, capillary collection with no-aspiration technique, and on-site review of slides, is an advantageous method for thyroid nodule fine-needle biopsy¹⁴. Rizvi *et al* recommended that the non-aspiration technique should be used alone or in tandem with FNAC for better diagnostic yield¹⁵. They described it as simple and easy to perform. It also produces better results in the quality of the cellularity and less field obscuration by blood in lesions of the thyroid compared to FNAC.

The negative predictive value of FNAC of goitre in this study (91%) is higher than the 66.3% reported by Ko *et al*¹. The probability of malignant goitre being present in those patients with a negative result in our series is 9% compared to 33.7% in that series. The probability that a patient in our study does not have a malignant goitre when the FNAC report states so is therefore higher than in their own study. The higher diagnostic accuracy of the FNAC for malignancy in this study compared to the previous study is beneficial to the patient. This enables the surgeon to perform a more effective therapeutic surgery on the patient, thereby reducing the incidence of histological 'surprises'. The initial performance of total thyroidectomy will also resolve the dilemma of the management of patients with incidental thyroid carcinomas.

Hashimoto's thyroiditis is the second most common thyroid lesion next to endemic goitre diagnosed on FNAC in iodine deficient areas². In this study, there was a false positive cytological diagnosis and two missed cases. The diagnosis of Hashimoto's thyroiditis is likely to be missed in smears showing cytological evidence of hyperplasia or abundant colloid. Multiple punctures and immunological investigations are advised to improve its diagnostic accuracy.

The delay of thyroidectomy for five days to three and a half years reduces the benefit of FNAC of goitres to the patient. The common cause of the delay is usually a lack of funds by the patients for further management. The out-of-pocket method of paying for health services has a negative effect on effective health care. The FNAC reports might have become obsolete by the time of thyroidectomy. This may lead

to an under treatment of patients, especially if less than total thyroidectomy had been performed initially. The increasing performance of total thyroidectomy even for benign goitres will offset the disadvantages caused by the delay in surgery and availability of histopathology reports. More importantly, it may also make the routine use of FNAC for the evaluation of goitres unnecessary.

In conclusion, FNAC of the thyroid gland remains a simple and cost effective test for the initial evaluation of patients who present with goitre. The diagnostic accuracy of the procedure for carcinoma improved in the seven years after the first evaluation. Its accuracy can be improved by the combination of ultrasound guidance, capillary collection with no-aspiration technique, and on-site review of slides. The immediate repeat of the procedure for the patients with indeterminate and non-diagnostic results will further improve its accuracy. The introduction of health insurance scheme to finance the management of patients is recommended to reduce the surgery turnaround time. This will enhance the benefit of the FNAC to the patients. It is also recommended that FNAC should be performed selectively for patients who have nodular goitre. It should not be performed in patients for whom total thyroidectomy is indicated clinically. This selective utilization will reduce the overall cost of treatment and the delay in definitive management.

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