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EFFICACY OF NEEDLE ASPIRATION CYTOLOGY WITH OR WITHOUT ULTRASONOGRAPHY GUIDANCE IN EVALUATION OF THYROID NODULE AT A TERTIARY CARE CENTRE OF NEPAL

ABSTRACT

Objectives:

To compare the diagnostic efficacy of conventional FNAC with USG guided FNAC in the evaluation of patients with a thyroid nodule.

Materials and methods:

The study was carried out at ENT Head and Neck Surgery Department of Tribhuvan University Teaching Hospital, a tertiary carecentre of Nepal and the study period was from June 2017 to November 2018. We retrospectively reviewed all the medical records of subjectspresenting with a solitary thyroid nodule that underwent FNAC, had a record of all required information and available final histopathology report. They were randomly recruited 40 in each group of conventional FNAC (cFNAC) and USG guided FNAC (USG-FNAC).

Results:

The majority of the patients were middle-aged female. The sensitivity of USG-FNAC was 100% and it was 64.7% of conventional FNAC. The specificity was similar in both groups with 69.56% in conventional and 66.7% in the USG guided FNAC group. The accuracy in conventional FNAC was 67.5% and in USG guided FNAC group was 82.5%.

Conclusion:

The sensitivity and accuracy of USG guided FNAC was higher than conventional FNAC but the specificity was similar in both groups.So, the use of USG guided FNAC in evaluating solitary thyroid nodule can reduce the chances of missing the diseased cases.

Keywords: Diagnostic accuracy, Fine-needle aspiration cytology, Thyroid nodule, Ultrasonography guided.

INTRODUCTION

Thyroid nodules are detectable in 2-6% of the population by palpation and their clinical relevance is because of their malignant potential.[1] They usually present as a distinct lesion within the thyroid gland that can be evaluated radiologically. The chances of solitary nodule being malignant are more as compared to multinodular swelling. Although there is an increase in the incidence of thyroid malignancy in recent days, the mortality due to thyroid malignancy has been however stable.[2] Nepal is a known iodine-deficient region due to its challenging geography. The prevalence of thyroid disorder in Nepal is quite high. Report from 2005 suggested only 63 % of Nepalese household consumed iodized salts.[3] Studies have been suggestive of iodine deficiency as a major risk factor for thyroid malignancy.[4] With no available study on the prevalence of thyroid malignancy, one can assume a considerable number of Nepalese populations suffering from thyroid malignancy.

Although history and physical examination are key aspects of analyzing thyroid nodule, fine needle aspiration to directly visualize the cytology is considered to be the first-line investigation.

Fine needle aspiration cytology (FNAC), however, is attributed to certain pitfalls such as inadequate

sampling, sizeable false negative, inability to detect small thyroid lesion such as papillary microcarcinoma.[5] Hence, ultrasonography (USG) guided FNAC as an alternative procedure allows real-time visualization of the needle as it aspirates from the lesion is now advocated to minimize false negative and inadequacy rates. It is, therefore, increasingly preferred over conventional FNAC.

The difference in diagnostic accuracy in these two modalities of FNAC in Nepalese population has not been well-grounded. With this in mind, we aimed to compare the diagnostic efficacy of conventional FNAC with USG guided FNAC, when compared to the gold standard "histopathological evaluation" in a tertiary centre hospital of Nepal.

MATERIALS AND METHODS

This was a descriptive cross-sectional study conducted in the Department of ENT- Head and Neck Surgery (ENT-HNS), Tribhuvan University Teaching Hospital, Nepal. The ethical clearance was obtained from the institutional review committee of Institute of Medicine, Nepal (Ref: 177/(6-11)E²076/077).The study period was of 18 months from June 2017 to November 2018. The medical records of the patients who underwent thyroidectomy in the department were reviewed retrospectively. All the files with available preoperative FNAC and final histopathology report were included in the study. The FNAC reporting based on the Bethesda system (TBSRTC) was only considered to be included in the study. The convenient sampling method was used and eighty cases were included in the study. The number of patients with USG guided FNAC group meeting the inclusion criteria were 40 during the study period. Similarly, 40 patients were selected in the conventional FNAC group for the comparison purpose. Other inclusion criterion was age group above 15 years. The cases with indeterminate or inadequate cytology finding, incomplete or missing information in the medical record and FNAC reports not according to the TBSRTC were excluded from the study for the uniformity of reporting system. We recorded age, sex, FNAC findings according to The Bethesda System for Reporting ThyroidCytology (TBSRTC) and histopathological findings of subjects enrolled in the study. For the uniformity and standardization, the Bethesda category II was taken as benign disease and categories V and VI were taken as malignant. Category I (inadequate for reporting), Category III and Category IV were excluded from the study as they represented the group overlap of benign and malignant lesion.

The raw data were entered into Microsoft Excel spreadsheet 2016. We used social sciences for statistical package 16 (IBM-SPSS V.16) for data analysis. Sensitivity, specificity, positive predictive value, negative predictive value and accuracy for both conventional FNAC and USG guided FNAC were calculated and compared.

RESULTS

There were 80 patients included in the study who met the inclusion criteria and whose medical records had complete required information. These were equally divided into conventional FNAC (cFNAC) and ultrasound-guided FNAC (USG-FNAC) groups with 40 in each group. Mean age in our study for conventional FNAC group was 39.0±14.68years and USG guided FNAC was 40.3±14.21 years. The age group distribution shows that majority of patients were less than 45 years (Figure I). In both groups, the majority of the patients were females (Figure II).

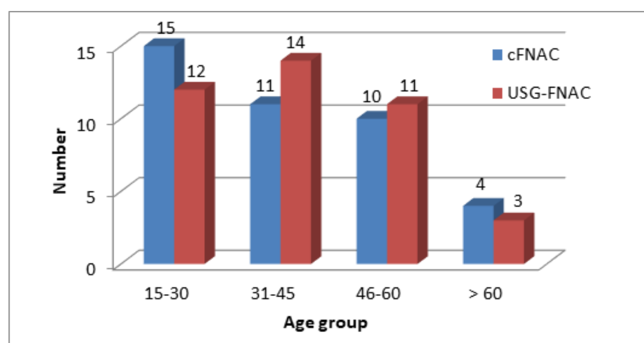

Figure I. Distribution of patients according to the age groups in two FNAC groups (n=80)

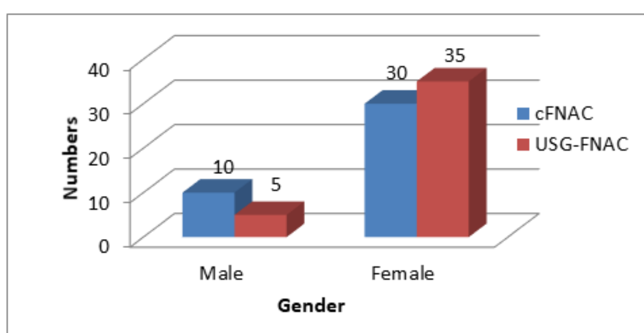

Figure II. Gender distribution of patients in two FNAC groups (n=80)

The FNAC findings were compared with the final histopathological report after the surgery which

was taken as the gold standard for the diagnosis. For the purpose of cross-tabulation of findings in a 2x2 table, the benign diagnosis was taken as negative (negative for malignancy) and the malignant finding was taken as positive (positive for malignancy) (Table 1 and Table 2). The true positive rate in the cFNAC group was 11/40 and the true negative rate was 16/40. The result of 13 patients was different in final histopathology as compared to the cFNAC. Hence, the sensitivity and the specificity were 64.7% and 69.56% for the cFNAC respectively (Table 1 &3).

Table 1. Tabulation of the conventional FNAC (cFNAC) findings with the post-operative histopathological finding (n=40).

		Histopathology findings		Total
		Positive	Negative	
cFNAC	Positive	11	7	18
	Negative	6	16	22
	Total	17	23	40

In the ultrasound-guided FNAC (USG-FNAC) group, the true positive and true negative findings were 19/40 and 14/40 respectively. Only 7/40 patients had changed diagnosis on final histopathology from the FNAC finding. There were no cases of false negative results with this method. Hence, the sensitivity and specificity were 100% and 66.7% for USG-FNAC respectively (Table 2 &3).

Table 2. Tabulation of the Ultrasonography guided FNAC (USG-FNAC) with the histopathological finding (n=40)

		Histopathology findings		Total
		Positive	Negative	
USG-FNAC	Positive	19	7	26
	Negative	0	14	14
	Total	19	21	40

Table 3. Diagnostic indices of cFNAC and USG-FNAC compared with histopathology report.

	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
cFNAC	64.7	69.56	61.11	72.72	67.5
USG-FNAC	100	66.7	73.07	100	82.5

DISCUSSION

Fine needle aspiration cytology (FNAC) is a widely used investigation in thyroid nodule as a part of the initial evaluation. The cytological analysis helps the surgeon in planning further management of the patient. As conventional FNAC is limited by inadequacy and false-negative findings, better aid such as USG guidance gives a clear edge over conventional blind FNAC.[6] With ultrasonography guidance, the non-palpablelesions and the suspicious site of the lesion on ultrasonography findings can be targeted. As the surgeon's conundrum lies in decision making of which lesion to undergo thyroidectomy, they prefer a diagnostic procedure which yields high accuracy.The female preponderance in our study corroborated with existing studies.[7–10] The mean age of the selected patients in our study group was also a similar presentation as other studies.[8,9]

The sensitivity of conventional FNAC to identify the malignant disease was far less than USG-FNAC (64.7% vs 100%). Low sensitivity of cFNAC in ourstudy corroborates with other similar studies.[8, 11]The possible reason for low sensitivity of c-FNAC can be attributed to its inability to aspirate from the correct site. Six lesions diagnosed as a benign lesion by c-FNAC were proven to be malignant on final post-operative histopathology while there were none such cases in the USG-FNAC group. All six lesions were incorrectly diagnosed as colloid goitre by cytology. Histopathological evaluation; however, diagnosed five of them as papillary thyroid carcinoma (PTC) and one lesion diagnosed as follicular carcinoma. A high false-negative result in PTC may be due to the heterogeneous nature of PTC. This could be due to confusing smears due to dispersed follicular cells. Also, co-existing benign and malignant lesion, overlapping cytomorphological featuresbetween benign and low-grade malignant lesion also leads to a high false-negative result.[12] Hence, diagnostic ability of USG guided FNAC was found to be higher with a sensitivity of 100% which was comparable with other studies.[7,8] It was far better than a study conducted in eastern Nepal where the sensitivity of USG FNAC was reported to be only 63.64%.[9] Ultrasonography features highly suggestive of malignancy are solid composition,ill-defined margin, irregular shape, microcalcifications, taller than wider shape. Ultrasonography guidance helps aspiration from sites that are suggestive of malignancy which is the likely reason for the low false-negative rate in existing literatures, including ours. Also, non-

palpable lesions were easily aspirated, further reducing false-negative rates.[7,9,13] In this study also, there were two papillary micro-carcinomas which USG-FNAC was accurately able to identify.

The specificity of FNAC was low and similar in both conventional and USG guided FNACgroups. This low specificity of FNAC does not decrease its utility as a screening tool but high false-positive rate may lead to unnecessarily aggressive treatment such as thyroidectomy. The high false-positive rate of FNAC could be due to the overlapping cytopathological features and also possibly due to the presence of pseudo-papillary findings with nuclear features suggestive of PTC.[14] Out of seven false-positive findings, five were found to be colloid goitre. Possibly, the lesions could have been micro-carcinoma subjected to disappearance due to post-FNAC infarction and necrosis.Similarly, nuclear atypia of benign lesion might also misdirect the pathologist. Another plausible cause of false-positive finding could be alteration in histology due to passage of the needle.[15]The overall accuracy of USG-FNAC was higher compared to c-FNAC which confirms thatUSG-FNAC is a better choice to investigate thyroid nodule. The accuracy of USG FNAC in evaluating thyroid nodule was in line with Chakravarthy et al.[16] The higher diagnostic accuracy when comparing conventional FNAC and USG guided FNAC was also noted by Jalan et al. and Sajikumar et al.[10,17]

Because of the lack of records of inadequacy finding in FNAC, we decided not to investigate inadequacy rates in c-FNAC and USG guided FNAC. As we included only suspicious lesion in our study, most of the benign findings in our study were excluded introducing selection bias to the study. So, naturally, we might have missed false negatives. As this was a retrospective study highly dependent on available records, we couldn't thoroughly evaluate lesions. Another apparent limitation in this study was a smaller sample size. Hence, prospective study with larger sample size is suggested to yield better findings from a similar study.

CONCLUSION

USG guided FNAC was a more sensitive tool to diagnose thyroid malignancy with the sensitivity of100% compared to 64.7% sensitivity of Conventional FNAC. But, the specificity was low in both groups. The diagnostic accuracy was higher in USG guided FNAC group. So, preoperative USG guided FNAC is preferable to conventional FNAC when feasible. The results need to be verified with prospective studies with larger sample size.

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