MED-PHOENIX: JOURNAL OF NATIONAL MEDICAL COLLEGE

ORIGINAL ARTICLE

A COMPARATIVE STUDY OF ASPIRATION VERSUS NON-ASPIRATION TECHNIQUE IN FINE NEEDLE CYTOLOGY OF THYROID LESIONS

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Date of Submission : October 15, 2024

Date of Acceptance : October 20, 2024

Date of Publication : January 3, 2025

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Citation:

Shah A, Shrestha A, Poudel A, Samdurkar AP, Chaurasiya A, Gurmaita RK.A Comparative Study of Aspiration versus Non-aspiration Technique in Fine Needle Cytology of Thyroid Lesions. Medphoenix. 2024;9(2):40-44.

DOI:https://doi.org/10.3126/medphoenix.v9i2.73412

Conflict of interest: None, ***Funding:*** None

Publisher: *National Medical College Pvt. Ltd.*

MedPhoenix - Journal of National Medical College (JNMC); 2024,9(2), available at www.jnmc.com.np

ISSN:2631-1992 (Online); ISSN:2392-425X (Print)

ABSTRACT

Introduction: *Fine needle aspiration cytology (FNAC) is a well-established procedure used in diagnosis of palpable thyroid swelling. This technique is practiced worldwide and is investigation of choice in thyroid swelling. Fine needle non- aspiration cytology (FNNAC) avoids aspiration, uses capillary action. It is patient friendly with less pain and better perception of lesion. Hence present study was conducted to compare effectiveness of aspiration versus non- aspiration techniques for better specimen and cytological diagnosis in thyroid swellings.*

Materials and methods: *All patients who fulfilled the inclusion criteria were subjected to both FNAC and FNNAC techniques performed simultaneously at the same site. The study period was March 2020 to March 2021 at Universal College of Medical Sciences Teaching Hospital, Bhairahawa (UCMS-TH). Points were allocated to each specimen according to Mair et al. scoring system and categorized. All the lesions were analysed statistically by using Statistical Package for Social Sciences (SPSS) version 11.5.*

Results: *Total 79 cases of thyroid swelling were evaluated and there was significant difference ($p < 0.0001$) of the background blood/clot, amount of cellular material, degree of cellular trauma, and degree of cellular degeneration and retention of appropriate architecture. Diagnostically superior smears were obtained in 39 cases by both FNAC and FNNAC technique. The most common cytological impression was Autoimmune Thyroiditis and Benign Follicular Nodule.*

Conclusion: *FNNAC yields diagnostically better quality smears, while FNAC assures diagnostically adequate material quantitatively. Combining both FNNAC and FNAC can offer superior quality of the cytological material and quantity.*

Keywords: *FNAC, FNNAC, Thyroid Swelling*

INTRODUCTION

Fine Needle Aspiration (FNA) of the thyroid gland is now an established, first line diagnostic test for evaluation of diffuse and nodular thyroid lesions.[1] It is a procedure done without preparation or anesthesia, safe, painless, rapid and inexpensive.[2] The main advantages of FNA are minimal invasiveness, reduced cost, pathological assessment of small lesions, which are not amenable to core needle biopsy.[3,4]

The major limitation of FNA in thyroid includes inadequate and bloody specimen.[5] To avoid these problems, new method called fine needle non aspiration cytology (FNNAC) was developed by Briffod et al. in France in 1982.[6] It avoids aspiration, utilizes only needle and relies on the pressure to suck the cells inside needl bore.[7] Although presence of blood cannot be prevented in thyroid cytology samples, it can be minimized by FNNAC technique compared to FNA technique. In comparing both techniques on parameter of blood clots, FNNAC gives a clear picture to cytopathologist and produce least hemorrhage by decreasing the trauma. The success of both the techniques depends highly on experience and also on heterogeneity of the lesion.[8]

As patients with thyroid lesions present commonly in our institute, current study is conducted to compare effectiveness of aspiration versus non- aspiration techniques for better specimen and cytological diagnosis of thyroid lesions.

MATERIALS AND METHODS

This was an institution based comparative cross sectional study using purposive sampling technique for selection of patient conducted in Department of Pathology, Universal

College of Medical Sciences- Teaching Hospital (UCMS-TH), Bhairahawa, Nepal from March 2020 to March 2021 after obtaining ethical approval from Institutional Review Committee (UCMS/IRC/055/18).The procedure was explained to the patient and written consent was obtained prior to performing the procedure.

Inclusion Criteria- All patients with diffuse or nodular thyroid swelling for FNAC; Aged > 15 years. Exclusion Criteria- Cases of non- palpable thyroid lesions requiring image guided FNA; Patient who has undergone previous surgery and irradiation; Non- compliance of the patient; Geriatric and Pediatric age group; Inadequate/ Non diagnostic samples from thyroid lesions

All patients who met the inclusion criteria were included in the study and underwent both Fine Needle Aspiration Cytology (FNAC) and Fine Needle Non-Aspirative Cytology (FNNAC) on palpable thyroid lesions. For patients with multiple nodules, the dominant nodule was selected for sampling. The patients were subjected to FNAC and FNNAC using a fine needle of 22 gauge attached to 5ml disposable syringe. At least 1 wet smear fixed on 95% methanol and 2 air dried smears were prepared. In cases of cystic lesion, the entire material was aspirated and then the residual nodule was sampled by both techniques. Every slide was assessed without the prior knowledge of techniques utilized. Mair et al[9,10] scoring system was used to classify the quality of cytological aspirate.(Table 1)

A cumulative scoring ranging between 0 and 10 points was calculated for each smear and then categorized into the following three categories:

i. Category 1 (scores 0-2): smear unsuitable for diagnosis

ii. Category 2 (scores 3-6): smear adequate for cytological diagnosis

iii. Category 3 (score 7-10): diagnostically superior smear

STATISTICAL ANALYSIS

Data entered in Microsoft excel sheet was exported to Statistical Package for Social Sciences (SPSS) version 11.5 for statistical analyses. For descriptive statistics: Frequency, percentage, mean, standard deviation (S.D.) were calculated. Graphical and tabular presentations like bar diagrams were made by Microsoft excel. For Bivariate analysis: unpaired t- test was used to analyze the association between variables at 95% Confidence Interval (CI), considering p-value < 0.05 to be significant.

RESULTS

A total 79 patients with palpable thyroid lesions referred to Department of Pathology and fulfilling the inclusion criteria were subjected to needle biopsies using both FNAC and FNNAC techniques during study period.A distribution of thyroid lesions with respect to age, sex and correlation of FNAC and FNNAC of thyroid lesions on the basis of Mair et al. scoring system was evaluated in this study.

In this study, the mean age of the patients presented with thyroid lesion was 38.71 with standard deviation of 16.15(Figure I).

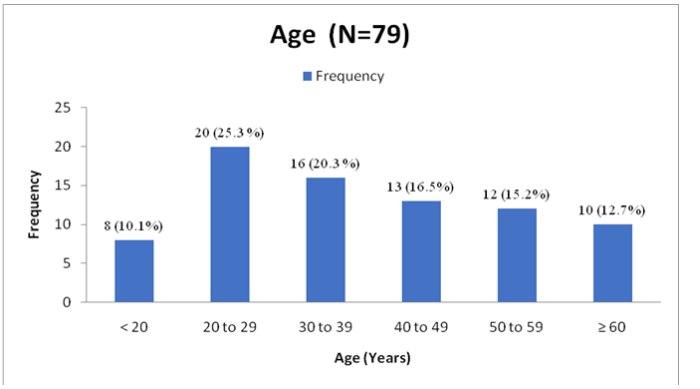

Figure I: Distribution of study patients according to Age (N=79)

The study showed females (68, 86.1%) were more commonly affected by thyroid lesions than males (11, 13.9%) with female to male ratio of 6:1.

The frequency of thyroid lesions encountered in the study is shown in Figure II.

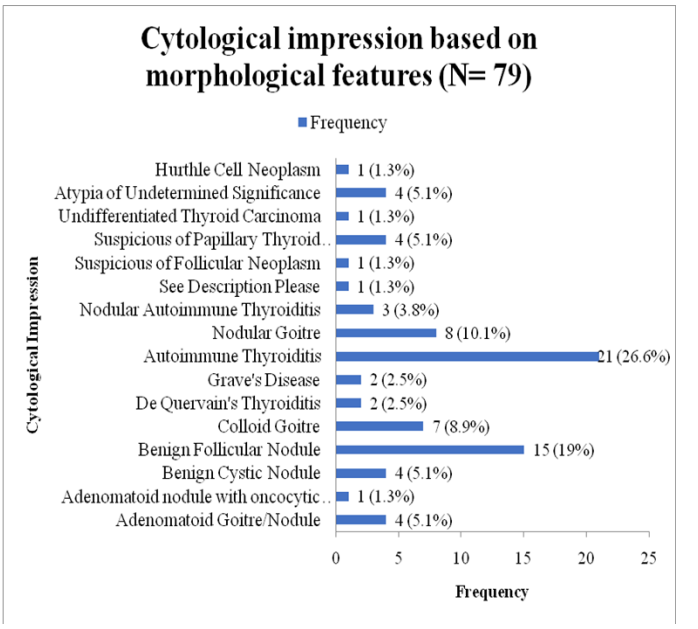

Figure II: Distribution of study patients according to Cytological impression based on morphological features (N=79).

Table 1 and Table 2 show comparision of both techniques. We found that FNNAC yielded more diagnostically superior smears 66 (88.3%) as compared to FNAC 43 (54.4%). FNNAC also showed fewer numbers of inadequate samples. Out of 79 cases, smears unsuitable for diagnosis according to Mair et al.[9] were seen in 5 (6.3%) cases in FNNAC and in 29 (36.7%) cases in FNAC group.

Table 1: Comparison of diagnostic quality between FNAC and FNNAC of thyroid lesions (N= 79)

Mair et al. Category	FNAC		FNNAC	
	Frequency	Percentage	Frequency	Percentage
Category I	29	36.7	5	6.3
Category II	7	8.9	8	10.1
Category III	43	54.4	66	83.5
Total	79	100	79	100

Table 2: Comparison of FNAC and FNNAC of thyroid lesions on the basis of Mair et al. Scoring System (N=79)

Parameters	Cytology	Total Points	Mean ± Standard Deviation	Unpaired "t" test	
				t-value	p-value
Background Clot	FNAC	63	0.80 ± 0.586	- 4.398	< 0.0001*
	FNNAC	96	1.22 ± 0.472		
Amount of Cellular Material	FNAC	64	0.81 ± 0.717	- 5.614	< 0.0001*
	FNNAC	111	1.41 ± 0.610		
Degree of Cellular Degeneration	FNAC	94	1.19 ± 0.935	- 4.647	< 0.0001*
	FNNAC	139	1.76 ± 0.560		
Degree of Cellular Trauma	FNAC	94	1.19 ± 0.935	- 4.647	< 0.0001*
	FNNAC	139	1.76 ± 0.560		
Retention of Appropriate Architecture	FNAC	73	0.92 ± 0.797	- 4.850	< 0.0001*
	FNNAC	117	1.48 ± 0.638		
Total	FNAC	388	4.91 ± 3.524	- 5.824	< 0.0001*
	FNNAC	602	7.62 ± 2.162		

Table 3.shows diagnostic quality between FNAC and FNNAC of thyroid lesions. In this study, it was found that there were two cases which were found to be in Category I in using both techniques. Similarly, there were 2 Category II cases and 39 Category III cases found using both FNAC and FNNAC

Table 3: Diagnostic Quality between FNAC and FNNAC of thyroid lesions

	Category I	Category II	Category III
FNAC	2	2	39
FNNAC			

DISCUSSION

FNAC of the thyroid gland is now a well-established, first line diagnostic test for the evaluation of diffuse thyroid lesions as well as of thyroid nodules with the main purpose of affirming benign lesions and thereby, reducing unnecessary surgery.[9] FNAC has become increasingly popular over last four decades. However, there is another technique FNNAC which avoids aspiration but still permits cytologic review of the masses.[2]

In the present study, mean age of the patients was 38.71 years. Similar findings were observed in Kour B et al.[11] Majority of patients were under the age group of 30-39 years in current study, similar to Sasikumar MN et al where most common age group was third decade. This study showed that thyroid lesions are common in females. This is justified by Tayde A et al., Kour B et al., Meherbano MK et al. and Tagore et al.[2,11,13,14] The higher frequency of thyroid problems in female patients may be attributed to stress related to multiple pregnancies and lactation.

A total of 67 (84.8%) cases were benign out of which Autoimmune Thyroiditis (AT) (21, 31.30%) was the most common thyroid lesion followed by Benign Follicular Nodule (BFN) (15, 22.40%). Yang et al. also had increased incidence of autoimmune thyroiditis mainly lymphocytic thyroiditis.[15] It is well-known that in iodine-sufficient areas there is a higher rate of AT prevalence than in iodine-deficient ones as iodine intake affects thyroid autoimmunity and the incidence of AT.[15] As this study is conducted at UCMS-TH, Bhairahawa this region is main entry points for salt entering into Nepal and the proportion of households using adequately iodized salt is higher in the western terai region (92%) according to Five Year National Plan of Action to Achieve Optimal Iodine Nutrition in Nepal (2013- 2017) making this iodine-

sufficient area.

In the present study, the results when compared for background blood/ clot supported FNNAC. This is similar to study done by Pandey Pinki et al,[16] Sasikumar MN et al[12], Kaur D. et al. [11] Tauro LF. et al[18]. FNNAC was found to cause lesser degree of contamination by background blood/ clot because specimen was obtained by a spontaneous capillary action rather than suction due to negative pressure. [11]However, the presence of blood cannot be totally prevented in thyroid gland cytology samples.[8] The cumulative score for background blood clot was found significantly more in case of FNNAC than FNAC similar to Kour B et al. [11]

Similar to study by Mahajan P et al.[7] and Maurya et al.[19] the cumulative score as well as mean score of amount of cellular material was more by FNNAC than FNAC. This can be because FNNAC technique afforded better control of both the needle and nodules during biopsy than did the FNAC technique. It was difficult to control the syringe movement while maintaining suction with one hand when using the FNA technique.[20] Amount of cellular yield was found to be better by FNNAC with a statistically highly significant difference in this study. An observation which is similar to that of Pandey Pet al.[16] and Malik NP et al.[21] Mair et al. observed no statistically significant difference in the amount of cellular material in their 27 cases.[9] In this study, the pitfalls were tried to overcome by performing both procedures (FNAC/FNNAC) on the same patient and evaluating the slides by the single pathologist.

Mair et al. studied cell preservation under three separate headings, i.e., degree of degeneration, cellular trauma and retention of appropriate architecture.[9] There was no statistically significant difference between the efficacies of the two sampling technique for any of the parameters studied. However, in the present study there was statistically significant difference in these three parameters while comparing both techniques. Kour B et al.[11]observed that mean scores for degree of cellular degeneration and trauma were more for FNNAC as compared to FNAC, which is in agreement with our study. Findings similar with our study were also reported by Mahajan P et al.[7] and Maurya et al.[19] Retention of appropriate architecture were better in FNNAC method in the present study similar to study done by Kashi Z et al.[22] It was in variance to Malik NP et al. [21] and Tauro LF et al(20). In study done by Malik NP et al.[21] the overall mean score for cell architecture preservation was higher for FNAC than FNNAC. However, this difference was not statistically significant. Tauro LF et al observed that cellular trauma and degeneration were generally the same in both techniques as these parameters depended on the method of smear making.[17] However, they concluded that FNA scored better since it had more cellular material, hence the destruction of some sheets of cells did not obscure the field for diagnosis. In the ultimate analysis when both the cumulative score as well as mean score for individual criteria were considered, it was observed that FNNAC scored over FNAC and the difference was statistically highly significant (P<0.001) i.e. amount of material was more with less contamination with blood and better preservation of cellular morphology and architecture.

In the present study, FNNAC yielded more diagnostically superior cases (66, 83.5%) as compared to FNAC (n=43, 54.4%) and the number of unsuitable smears was greater in FNAC (29, 36.7%) compared to FNNAC (5, 6.3%). This result was similar to study done by Kour B et al[11] and Romitelli F et al.[23] According to Romitelli F et al. the number of inadequate specimens between the two techniques may be attributable to the sampling method itself rather to the technical expertise in performing the procedures.[23] Moreover, they also assessed that no correlation was found between the hypervascularity of the nodules (if seen at ultrasound) and the rate of non-diagnostic results caused by hemorragic material. In the present study, diagnostically adequate smears were almost similar in both FNAC (7, 8.9%) and FNNAC (8, 10.1%) where FNNAC was better in 1 case than FNAC. This finding was in par with study by Ramachandra et al where FNAC was 47(68%) and FNNAC was 47 (68%).[24] However, this is in variance to Maurya et al.[19] In their study FNNAC yielded more unsuitable smears. Out of total cases which were statistically analysed only for 6 cases histological specimen were received.

CONCLUSIONS

The present study was done to compare the FNAC and FNNAC in thyroid lesions. In majority of lesions either benign or malignant FNNAC was found to be superior to FNAC. FNNAC is a simple, easy to perform, and produces better results in the form of better quality of cellularity and less field obscurity by blood in lesions of the thyroid than FNAC. For the five parameters studied according to Mair et al. there was a statistically significant difference in the total score in favour of non-aspiration as compared with aspiration technique. FNNAC offers distinct advantage of diagnostically better quality smears, while FNAC assures diagnostically adequate material quantitatively. However, in our study both FNAC and FNNAC produced adequate result in equal frequency. In case of cystic lesion there was no cellular material on smears by either of the technique. USG guided FNAC can be beneficial in such lesions. Hence, we conclude that FNNAC is a good technique that should be used alone or in combination with FNAC and USG guidance for better diagnostic yield.

FUNDING: Not any

CONFLICT OF INTEREST: No

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