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Original Article

Pathology Section

Comparative and Evaluative Study of Fine Needle Aspiration Versus Capillary Sampling Techniques in Superficial Lymph Nodes

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ABSTRACT

Background: Fine needle aspiration cytology (FNAC) is a well established widely used primary diagnostic modality in both neoplastic and non-neoplastic conditions of superficial and deep seated mass lesions. Fine needle capillary sampling (FNCS) has been attempted in various organs and studies have shown this procedure to yield qualitatively superior material compared with FNAC. Studies evaluating the efficacy of this technique in lymph nodes are rare. The present study has been attempted to compare the efficacy of FNCS with that of FNAC of superficial lymph node lesions.

Materials and Methods: Both the tecniques were conducted in 50 randomly selected superficial enlarged lymph nodes. All needle sampling procedures were done by single operator. All the smears were evaluated according to objective scoring system devised by Mair et al. The score of individual parameters in each case as well as total scores for FNCC and FNAC procedures were calculated separately. Diagnosis was confirmed by histopathological examination.

Result: Greater number of diagnostically superior samples were obtained by FNCS, however FNAC yielded more number of diagnostically adequate smears. FNCS scored marginally over FNAC in all the parameter except for amount of cellular material. Total score and average score per case by FNCS were slightly higher than by FNAC and difference was statistically significant. The diagnostic accuracy was higher for FNAC(86.3%) than by FNCS (81.8%).

Conclusion: FNCS offers a distinct advantage of diagnostically better quality smears but FNAC assures diagnostically adequate material quantitatively. Our study proved the technical superiority of the FNCS technique in cellular lymph node lesions, emphasizing the need for the less publicised procedure to be more widely applied.

Keywords: Aspiration cytology, Capillary sampling, Fine needle, Lymphadenopathy, Non aspiration

INTRODUCTION

Fine Needle Aspiration Cytology (FNAC) was first described by Martin and Ellis in the year 1930 in the United States and is currently a widely used technique in the etiological diagnosis of many superficial palpable masses [1]. The method is simple, safe, economical, rapid, reliable and accurate and has hence replaced the earlier method of wide bore needle biopsy [2,3]. The use of suction is known to distort the cells and effect the cytological interpretation. Therefore, a modified technique of performing the fine needle biopsy eliminating the need for aspiration / suction has been suggested [4]. This is referred as “Fine Needle Capillary Cytology (FNCC)”, “Non–Aspiration Cytology“, “Capillary Suction Cytology“, and “Fine Needle Capillary Sampling (FNCS)“[3,5-7]. In this technique material is obtained by the action of capillary pressure within the needle used for sampling the tissue. It is then attached to a syringe and the smear is made in a usual manner. The cellular material is most likely drawn by the capillary action because no suction is applied in this technique. It is reported to be easier to perform and most likely less painful [8-10]. The procedures has been attempted in the lesions of the breast, thyroid, salivary glands and various other organs [3,6,7]. Despite its proven advantages over the fine needle aspiration technique, unfortunately it has not been widely publicised and promoted [2,3]. Lymph Nodes are one of the sites commonly subjected to FNA procedure for diagnosing various neoplastic and non neoplastic lesions. Except for an occasional study, there has been a paucity of comparative studies dealing exclusively with the FNCS vs FNAC of superficial lymphadenopathy [11]. Hence, project was taken up to assess the relative advantages and disadvantages of both the techniques in patients presenting with superficial lymphadenopathy. The present study has been attempted to compare the efficacy of FNCS with that of FNAC of superficial lymph node lesions.

MATERIALS AND METHODS

The study population comprised of 50 random patients who presented with superficial lymphadnopathy at the

Department of Pathology (cytology section) at our institution. After thorough clinical examination patients were subjected to both FNAC and FNCS. The procedure was explained to the patient and verbal consent was obtained prior to performing the procedure. For standardization all the procecedures were performed by a single person without changing size of the needle. In both the procedures, 22 gauge needle were used. FNCS was performed using the needle alone. After inserting the needle into the target organ, quick to and fro movements were made in multiple directions in order to assure a representative material. Subsequently the needle was withdrawn and fitted into a syringe.The material was expressed onto the clean glass slides and smears were made by applying gentle pressure. Smears were also prepared using the conventional FNAC technique. The procedure uses a thin-bore (22-25 gauge) needle attached to a syringe, which in turn is attached to a holder. After a needle is introduced into the lesion, negative pressure is applied through the syringe holder to facilitate the cell aspiration. Half of the smears obtained by each technique were immediately fixed in 95% ethanol for Hematoxylin & Eosin (H&E) staining and rest were air dried for performing May Grunwald Giemsa stain (MGG), and any other special stain such as Ziehl-Neelsen (ZN) where ever indicated. For standardization the staining procedure was performed by a single laboratory technician. The smears from both the techniques were simultaneously examined and scored by two observers and the consensus scores were taken for analysis.

The scoring was based on the five objective criteria developed by Mair et al., [6]. The details of scoring system is given in [Table/Fig-1].

RESULTS

Fifty samples using both procedures (FNAC and FNCS) were obtained. There were 34 male and 16 female patients. The sites included 26 Cervical, 5 submandibular and 10 supraclavicular, 2 submental, 6 axillary and 1 inguinal lymph nodes were sampled. Cytological diagnosis by both the procedures are given in [Table/Fig-2].

Out of 50 cases sampled, the FNCS technique yielded less diagnostically adequate but more diagnostically superior smear when compared with aspiration technique. A total of 2 cases were unsuitable for cytological diagnosis by both non aspiration and aspiration technique [Table/Fig-3]. The diagnostic accuracy was higher for FNAC (86.3%) than by FNCS (81.8%) [Table/Fig-4].

FNCS scored marginally over FNAC in all the parameters except for amount of cellular material which was more with FNAC technique. P-value obtained by paired t-test was statistically significant in favour of non-aspiration sampling for background blood and degree of cellular degeneration [Table/Fig-5].The total scores and average score percase by FNCS were slightly higher than by FNAC and the difference was statistically significant [Table/Fig-6-12].

DISCUSSION

FNAC is an important tool for the cytological assessment of patients with superficial as well as deep seated lesions. It is traditionally carried out using 20cc syringe attached to handle to apply suction. The non-aspiration method is becoming popular for its ease of learning and use. The present study

No.	Criteria	Quantitative Description	Score
1.	Background Blood or Clot	Large amount, great compromise to diagnosis	0
		Moderate, diagnosis possible	1
		Minimal, diagnosis easy, specimen of text book quality	2
2.	Amount of Cellular Material	Minimal to absent, diagnosis not possible	0
		Sufficient for cytodiagnosis	1
		Abundant, diagnosis simple	2
3.	Degree of Cellular Degeneration	Marked, diagnosis impossible	0
		Moderate, diagnosis possible	1
		Minimal, good preservation, diagnosis easy	2
4.	Degree of Cellular Trauma	Marked, diagnosis not possible	0
		Moderate, diagnosis possible	1
		Minimal, diagnosis obvious	2
5.	Retention of Appropriate Architecture	Minimal to absent, non-diagnostic	0
		Moderate, some preservation of cell pattern e.g. follicles, papillae, acini, flat sheets, syncytia	1
		Excellent architectural display	2

[Table/Fig-1]: Specimen quality analysis: On the basis of the five criteria tabulated above, a cumulative score between 0 and 10 points were allocated to each specimen. The specimens were divided into three categories: Unsuitable for diagnosis (0 – 2 points); Adequate for cytological diagnosis (3 – 6 points); Diagnostically superior (7 – 10 points)

Type of Lesion	No. of Cases	Percentage
Metastatic Squamous Cell Carcinoma	8	16
Metastatic Adenocarcinoma	1	2
Primary Lymphoma	4	8
Reactive Lymphadenitis	15	30
Tubercular Lymphadenitis	15	30
Suppurative Pathology	2	4
Miscellaneous	1	2
Descriptive	4	8
Total	50	100

[Table/Fig-2]: Frequency of various lymph node lesions

Performance	Test	Percentage
	FNAC	FNCS
Diagnostically Superior	8 (16%)	19 (38%)
Diagnostically Adequate	40 (80%)	29 (58%)
Unsuitable For Diagnosis	2 (4%)	2 (4%)

[Table/Fig-3]: Performance of aspiration and non-aspiration techniques

Lymph Nodes	HP Confirmed		Diagnostic Accuracy	
	FNAC	FNCS	FNAC	FNCS
22 Cases	19	18	86.3 %	81.8 %

[Table/Fig-4]: Diagnostic Accuracy of FNAC & FNCS (22 cases)

Parameter	Aspiration	Non Aspiration	p-value
Backgroundblood or clot	1.04	1.3	< 0.05
Amount ofcellular material	1.34	1.22	> 0.05
Degree ofcellular degeneration	0.96	1.18	< 0.05
Degree ofcellular trauma	0.92	1.02	>0.05
Retention ofappropriate architecture	0.98	1.16	> 0.05

[Table/Fig-5]: Average score and p-value for each parameter

Site and number of cases	FNCS		FNAC		p-value
	Total score	Average score per case	Total score	Average score per case	< 0.05
Lymph Node (50)	294	5.88	262	5.84	

[Table/Fig-6]: Total and average score for 50 cases

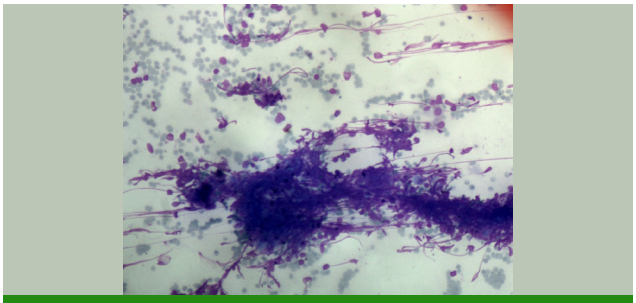
compared the efficacy of FNCS over FNAC in 50 cases of superficial lymphadenopathy using scoring system devised by Mair et al., [6].

Two important factors that determine the success of cytological biopsy of lymph node are, firstly, the amount of cellular material obtained and secondly, the quality of smear [11].

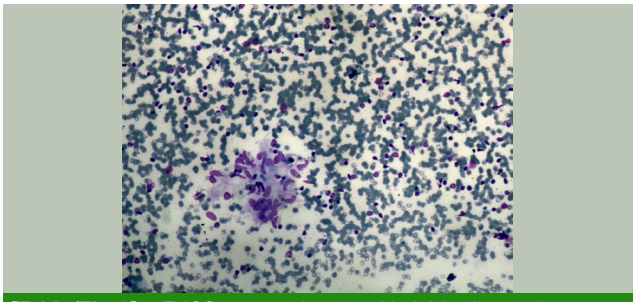
Tubercular lesions and reactive lymphadenitis emerged out as most common cause of lymphadenopathy in our study.

Comparing the performance of FNAC and FNCS in total 50 cases, diagnostic accuracy of FNAC was more (86.3%) as compared to FNCS (81.8%). This is comparable with results of Raghuveer et al., [8] (81.25% by FNCS and 87.5% by FNAC) and Akhtar et al., [11] (88% by FNAC and 86% by FNCS).

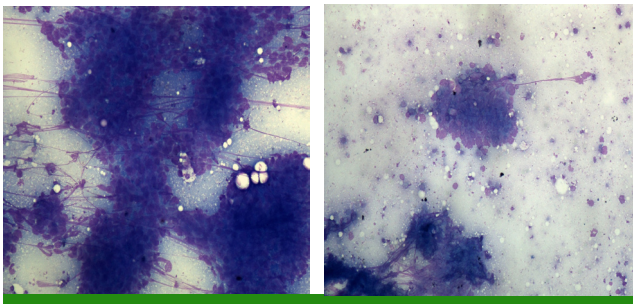
The most significant study in respect to FNCS is that of Mair et al., [6]. Applying their five objective parameters they compared 100 samples each of FNAC and FNCS from various body sites. They reported FNA sampling was diagnostically greater in more number of cases whereas FNCS produced diagnostically more superior smears.



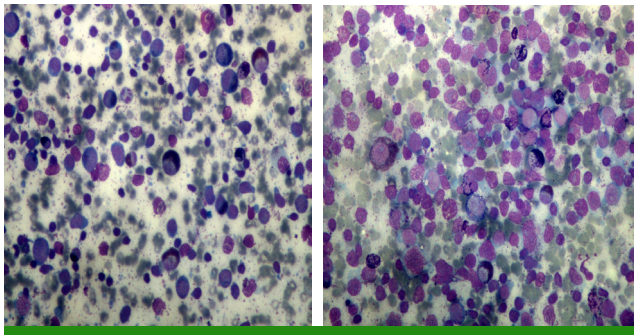
[Table/Fig-7]: FNAC: cellular smear show presence of crushing artefact along with the presence of scattered epitheloid cell collection with minimal degree of hemorrhage in the background. (MGG x 400)



[Table/Fig-8]: : FNCS: smear shows epitheloid cell granuloma with moderate degree of blood in the background, no significant distortion and degeneration noted. (MGG x 400)



[Table/Fig-9]: FNAC: highly cellular smear of squamous cell carcinoma showing diagnostic adequacy with minimal degenerative changes (MGG x 400) **[Table/Fig-10]:** FNCS: moderately cellular smear of the same case of squamous cellcarcinoma with maintained architecture and well preserved malignant squamous cells in an almost blood- less background, no significant distortion and degeneration (MGGx400)



[Table/Fig-11]: FNAC: Moderately cellular smear of granulocytic sarcoma with moderate blood in background, no significant degeneration and trauma identified (MGG x 400). **[Table/Fig-12]:** FNCS: highly cellular smear of same case as above with little background blood, cellular degeneration and trauma (MGG x 400)

In the present study, both the techniques yielded 4% of inadequate smears, while in a study done by Maurya et al., [12] on thyroid lesions, 34% cases were unsuitable for diagnosis with FNAC as compare to 38% by FNCS. Study done by Ghosh et al., [13] showed number of inadequate smears were more by non- aspiration technique (10%) than by aspiration technique (5.6%). The more failure rates of FNCS in some studies could be because of fact that cystic swellings were included in the study. In small benign cystic lesion aspiration is therapeutic and non-aspiration lacks usefulness.

In the present study, more diagnostically superior and less diagnostically adequate smears were obtained by non-aspiration technique. This is in concordance with studies done by other authors [2,6,8].

Cumulative scores for FNCS (5.88) was more as compare to FNAC (5.84) and difference was statistically significant (p-value <0.05). This is comparable with study done by Sajeev et al., [2] having total scores in favour of FNCS and statistically significant difference (p-value = 0.0335). However, importance of FNCS, particularly in cellular lesions can better be understood by study of Raghuveer et al., [8] who reported histologically comparable results (diagnostic accuracy 80.52%) of FNCS as compared with FNAC which was 77.92%.

Regarding the individual criteria, in present study except for amount of cellular material, all other criteria favoured non-aspiration and difference is statistically significant in background blood and degree of cellular degeneration (p-value <0.05). Our findings are in correlation with studies done by Raghuveer, in which FNCS scored marginally over FNAC in all the criteria except for amount of cellular material. But individual parameters were not significant in their study. However studies done by Akhtar [11] and Sajeev etal.,[2] who had dealt exclusively with lymph node lesions, observed that cellularity was higher in non-aspiration smears.

It was observed that in case of tuberculous lymphadenitis, though non-aspiration smears contain epithelioid cell granuloma and Langhans giant cell but caseous material was more easily aspirated with suction clinching to diagnosis. Similarly, contamination with blood was more in malignancy because of vascular nature of tumour tissue and malignant cells being fragile were more prone to degeneration and trauma of suction. Aspiration traumatizes fragile cells resulting in artefacts that can lead to diagnostic error, so non-aspiration performs better in malignant lesions.

Results when compared for background blood contamination supported the FNCS technique and the results were statistically significant. The amount of blood present may partially depend on the number of times needle is moved forward and backward at different depths and angles through the tissue and therefore can be more operator dependent that method dependent. The present study used a single operator which avoids the bias introduced by differing skills and experience of each participant. It was not planned that the patient would be subjected to additional needle puncture unnecessarily. Also when two samples are obtained from each lesion, one with and one without suction, there is strong possibility that trauma produced by procedure will affect the quality of the other. This was avoided by randomly selecting the method on each occasion.

Similar to the study of Raghuveer et al., [8] the amount of cellular yield in lymph node aspirate was found to be better by aspiration but the difference was not statistically significant. However, study of Akhtar et al., [11] and Sajeev et al., [2], observed that cellularity was higher in FNCS smears.

Cellular degeneration and cell trauma was greater in aspiration similar to the various studies [2,8,12,13], but the difference was statistically significant in cellular degeneration in our study (p-value 0.003).

FNCS yielded better retention of architecture with similar findings reported by others.

There was statistically significant difference in the total score in favour of NA as compared to aspiration (p-value 0.001). Studies by other authors also found total scores higher for non-aspiration but their results were not statistically significant [2,8,12].

In our study, all the smears of both the techniques were diagnostic with statistically considerable difference in two of the parameters and the total scores which convincingly proved the technical superiority of the FNCS technique.

Perhaps ease of application of FNCS, as the discomfort of maintaining the negative pressure is totally removed and better grip for easier manipulation of the needle, tend to increase the chances of covering a wider area with better cellular yield. Also patients' apprehension is minimized with this technique.The lack of suction pressure helped in improving the retention of

histologic architecture and minimizing the cellular degeneration and trauma.

Although, FNCS is not routinely performed in our laboratories, our experience with this technique is similar to that reported by other authors [2,4]. In addition, peripheral blood contamination in FNCS is less, which makes slide preparation and interpretation of surface markers easier in evaluation of suspected cases of lymphoma.

CONCLUSION

FNCS offers a distinct advantage of diagnostically better quality smears, FNAC assures diagnostically adequate material quantitatively. In fibrotic lesion, FNAC considered superior to FNCS, however we did not encounter any such lesion.

Both the techniques have their own merits and demerits and neither is superior to the other. By combining both the techniques better diagnostic accuracy can be achieved. However, with FNCS superior quality smears for interpretation can be achieved. In contrast to most other studies, our study show slight improvement in all the parameters, low sample size of our study and absence of any fibrotic lesion limited our study for all the parameters. Such studies are likely to provide more meaningful results with regard to the utility of FNCS in lymph node lesions; thus emphasizing the need for the less published procedure to be more widely applied.

REFERENCES

[1] Martin HE, Ellis EB. Biopsy by needle puncture and aspiration. *Ann Surg.* 1930;92(2):169–81.
[2] Sajeev S, Siddaraju N. A comparative analysis of fine-needle capillary cytology vs. fine-needle aspiration cytology in superficial lymph node lesions. *Diagn Cytopathol.* 2009;37(11):787–91.
[3] Santos JE, Leiman G. Nonaspiration fine needle cytology. Application of a new technique to nodular thyroid disease. *Acta Cytol.* 1988;32(3):353–56.
[4] Cajulis RS, Sneige N. Objective comparison of cellular yield in fine-needle biopsy of lymph nodes with and without aspiration. *Diagn Cytopathol.* 1993;9(1):43–5.
[5] Zajdela A, Zillhardt P, Voillemot N. Cytological diagnosis by fine needle sampling without aspiration. *Cancer.* 1987; 59(6):1201–05.
[6] Mair S, Dunbar F, Becker PJ, Du Plessis W. Fine needle cytology--is aspiration suction necessary? A study of 100 masses in various sites. *Acta Cytol.* 1989;33(6):809–13.
[7] Fagelman D, Chess Q. Nonaspiration fine-needle cytology of the liver: a new technique for obtaining diagnostic samples. *AJR Am J Roentgenol.* 1990;155(6):1217–19.
[8] Raghuveer CV, Leekha I, Pai MR, Adhikari P. Fine Needle Aspiration cytology versus Fine Needle Sampling without aspiration. A prospective study of 200 cases. *Indian J Med Sci.* 2002;56(9):431–39.
[9] Mishra M, Chawla S, Bandyopadhyay S. Fine needle capillary sampling (Non aspiration technique) vs conventional FNAC in cytological diagnosis. *J Cytol.* 2001;18(1):25–30.
[10] Kumarasinghe MP, Sheriffdeen AH. Fine needle sampling without aspiration. *Pathology.* 1995;27(4):330–32.
[11] Akhtar SS, Imran-Ul-Huq, Faiz-U-Din M, Reyes LM. Efficacy of fine-needle capillary biopsy in the assessment of patients with superficial lymphadenopathy. *Cancer.* 1997;81(5):277–80.
[12] Maurya AK, Mehta A, Mani NS, Nijhawan VS, Batra R. Comparison of aspiration vs non-aspiration techniques in fine-needle cytology of thyroid lesions. *J Cytol.* 2010;27(2):51–4.
[13] Ghosh A, Misra RK, Sharma SP, Singh HN, Chaturvedi AK. Aspiration vs nonaspiration technique of cytodiagnosis--a critical evaluation in 160 cases. *Indian J Pathol Microbiol.* 2000;43(2):107–12.

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