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A Comparative Study of Various Needle Gauges in Diagnostic Fine Needle Aspiration Cytology

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Objective: To compare various needle gauges (23, 24 and 29) in diagnostic accuracy in aspiration of cytology.
Design: A comparative- cross-sectional study.
Setting: Islamabad Institute of Pathology & Pakistan institute of medical sciences, Islamabad
Subjects: 33 cases with six Fine Needle aspiration Cytology (FNAC) aspirates on each; two each by using 23, 24 butterfly needle and 29 gauge insulin syringe needles
Results: With 23-gauge needle, definite diagnosis without any difficulty was reached in 16 (48.5%) cases, a definite diagnosis with some difficulty in 10 (30.3%) cases, a probable diagnosis in 4 (12.1%) and no definite diagnosis in 3 (9.1%) cases. With 24- gauge butterfly needle definitive diagnosis reached in 12 (36.4%), a definite but difficult diagnosis in 14(42.4%), probable in 3 (9.1%), and no diagnosis in 4 (12.1%). Finally, with 29- gauge a definite diagnosis was possible in 18 (54.5%) cases while there were 5 (15%) cases each. in all other categories i.e. definite but with some difficulty, probable and no diagnosis. The P-value was .377
Conclusion: There was no statistical difference among various gauge needles. Since the finer needle the needle better it is, the thinnest needle i.e. 29-gauge needle seems to be the most appropriate needle for routine use in superficially located masses.

Introduction

The Fine Needle Aspiration Cytology (FNAC) has become very popular diagnostic modality world wide in last two decades. The main advantage of the technique lies with the fineness of the needle. The finer the needle, better it is! Any needle thicker than 21 gauge is not considered fine and most advantages e.g. less pain, less hemorrhage and less chance of tumor implantation in the needle tracts disappear with thicker needles.[1]

True fine needles for aspiration (22- to 27-gauge vs. 18-gauge) were first introduced by Lopez-Cardozo in The Netherlands and Soderström in Sweden in the 1950s. In general adequacy of material in FNAC depends on the skill of operator, technique, nature of the tissue and type of pathological lesion. The rates of inadequate smears vary markedly, being particularly operator dependent.[2]

Apart from other factors various authors in terms of obtaining adequate material have also assessed needle gauge. Needles most frequently employed for FNAC are of either 21 or 23 gauge. Our aim was to compare the three needle gauges (23, 24 and 29) and subsequent cytology results of FNAC in terms of sample quality for accurate diagnosis.

A few studies have been carried out comparing efficacy of 21-gauge needle against 23 gauge.[3, 4, 5] However to the best of our knowledge no such study has been carried out comparing the three gauges of fine needle 23, 24 and 29 for cytologic diagnostic accuracy.

Materials and Methods

33 cases in continuous order disregarding age, sex and site of FNAC were selected at the Islamabad Institute of Pathology. In each case three needles i.e. 23 gauge needle attached to 5 cc syringe, 24 gauge butterfly needle and 29 gauge needle attached to insulin syringe were used (Figure 1). Two cytology smears from each needle aspirate were made. Thus a total of 198 smears were prepared on 33 cases. The smears were immediately fixed in alcohol and stained

with H & E. The slides were meticulously examined by a senior pathologist and definite diagnosis was rendered whenever it was possible. Subsequently slides were reviewed by two pathologists at the Pathology department of Pakistan Institute of medical sciences, Islamabad. It was a 2 months long study spanned on May 2005 and June 2005. It was a comparative cross- sectional study. Only those patients in whom all the 3 gauges of fine needle (23, 24 and 29) were used were included in this study. Patients like those of testicular FNAC in whom only 29-gauge needle was used were excluded from the study.

The slides were assessed for quality in terms of cellularity of smear, pattern if any, preservation of cell morphology and the ease with which diagnosis could be reached. A score of 0-3 was given for quality in the following order thus making four categories of the cases:

3= definite diagnosis with no difficulty.
2= definite diagnosis with some difficulty.
1= probable diagnosis.
0= no definite diagnosis.

All data was entered into SPSS, version 10 and chi- square test applied.

Results

With 23-gauge needle, definite diagnosis without any difficulty was reached in 16 (48.5%) cases, a definite diagnosis with some difficulty in 10 (30.3%) cases, a probable diagnosis in 4 (12.1%) and no definite diagnosis in 3 (9.1%) cases. With 24 gauge butterfly needle definitive diagnosis reached in 12 (36.4%), a definite but difficult diagnosis in 14 (42.4%), probable in 3 (9.1%), and no diagnosis in 4 (12.1%). Finally, with 29- gauge a definite diagnosis was possible in 18 (54.5%) cases while there were 5 (15%) cases in all other categories i.e. definite but difficult, probable and no diagnosis (Table: 1). The P-value was .377 implying that there was no significant statistical difference among various gauges needles. Table.2 shows individual lesions against four diagnostic categories.

The morphology of almost all cases were quite comparable. With finest needle i.e. gauge 29; the cytological details were as crisp as with 23 and 24 gauge needles (Figure 2-4)

Discussion

Fine Needle Aspiration Cytology (FNAC) has caused considerable impact on patient management in almost all spheres. Its marriage with powerful imaging modalities has considerably widened the diagnostic horizon with proportional reduction in pain, cost, hassle and other family-social problems. Of course the aspirated samples must bring out adequate representative material. The diagnostic sensitivity and specificity of FNAC largely depends on this factor provided the spreading technique, fixation and staining are satisfactory. FNAC is an art of pathology that requires considerable experience and patience. A specimen is first examined at low power to determine the overall cell population and the predominant pattern if any. Individual cell morphology is then studied at higher magnification i.e. at 100, 400 and 1000 times enlargement.[6]

Table 1: Comparison of Needle Gauge with Quality of Smear

Needle Gauge	Definite Diagnosis with No Difficulty	Definite Diagnosis with Some Difficulty	Probable Diagnosis	No Definite Diagnosis	Total
23	16 48.5%	10 30.3%	4 12.1%	3 9.1%	33 100.0%
24	12 36.4%	14 42.4%	3 9.1%	4 12.1%	33 100.0%
29	18 54.5%	5 15.2%	5 15.2%	5 15.2%	33 100.0%

Total Smears	92 46.5%	58 29.3%	24 12.1%	24 12.1%	198 100.0%

Table 2: List of Various Lesions and Their Diagnosis

Diagnosis	Category I Definite Diagnosis with No Difficulty	Category II Definite Diagnosis with Some Difficulty	Category III Probable Diagnosis	Category IV No Definite Diagnosis	Total
Adenomatous goitre	1	1	1	1	4
Basal cell carcinoma	1				1
Fibrous dysplasia			1		1
Chronic granulomatous inflammation c/w tuberculosis	4	4		1	9
Duct ectasia	1				1
Epithelial tumor with areas of Necrosis		1			1
Fibroadenoma	1	1			2
Fibrocystic disease	3		1		4
Hodgkin's lymphoma	1				1
Infiltrating ductal carcinoma	1		1		2
Lipoma		1			1
No dysplastic cells seen				1	1
Pleomorphic adenoma	1	1			2
Reactive lymphoid hyperplasia	1				1
Squamous cell carcinoma	1				1
Sub-acute thyroiditis	1				1

It has been routine practice world wide past to use 21-23 gauge needles for FNAC. The finer needle of 25 gauge is usually recommended for children and for particular sensitive areas such as the orbits, the eyelids and testis. Our current study shows that the diagnostic yield to be just as good using a thinner 29 gauge needles. A few studies are on record comparing 21 and 23 gauge needles for FNAC.[3, 4, 5] However to the best of our knowledge no study has compared 23, 24 and 29 gauge needles. Our aim was to determine whether there is any statistical difference in the diagnostic accuracy of smears obtained through these needles of various gauges.

As is seen in Table: 1, definite diagnosis was attained in 18 cases with 29 gauge needle in contrast to 24 and 23 gauge needles where definitive diagnosis was possible in 12 and 16 cases respectively. No diagnosis could be obtained in 3, 4 and 5 cases with 23,

24 and 29 gauge needles respectively. Probable diagnosis was attained in 4, 3 and 5 cases with 23, 24 and 29 gauge needles respectively. Although not very significant but no definite and probable diagnosis was obtained in 5 cases each from 29- gauge needle. The reasons for this low diagnostic yield can be multiple including small length of the needle, lack of multiple passes and difference of site. The smaller length of 29- gauge needle is a disadvantage as at time the needle might not even reached well into the lesion. It should be noted that in order to not to increase the discomfort to the patient only one pass was made with each needle (Total three passes with three different needles) as a result the adequacy of the smears with each needle would be less than our routine 3 passes with one needle. However since over all there were passes (Three passes), the over all sensitivity and specificity was quite high and in par with international standards. Finally each pass was made at a different site within the same lesion so there was a possibility that each needle did not obtain the same amount and type of aspirate, which may differ from site to site.



Figure 1: Needles of Left 23-Gauge Middle 24-Gauge Right 29-Gauge

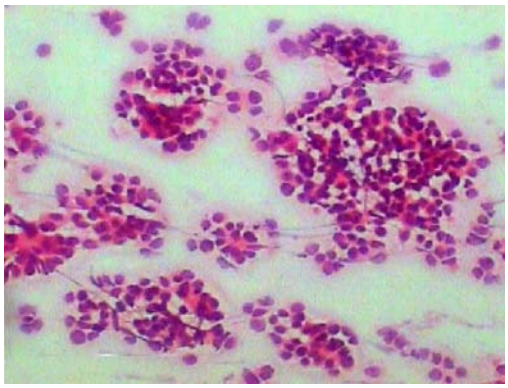

Figure 2: Basal Cell Carcinoma. 24-Gauge. (X100)

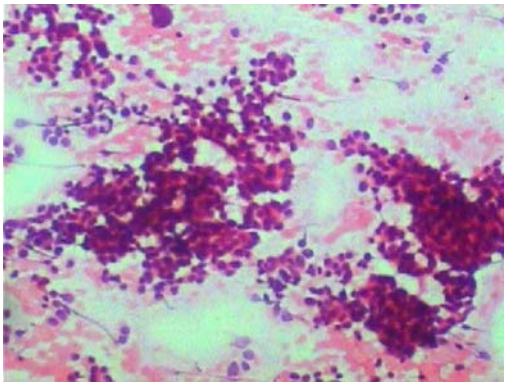

Figure 3: Basal Cell Carcinoma. 29-Gauge. (X100)

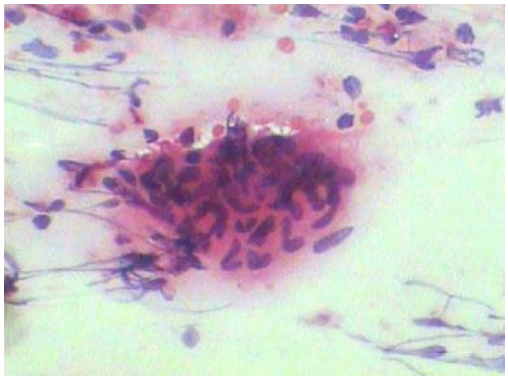

Figure 4: A Granuloma showing Epitheloid Cells. 29-Gauge. H&E (X200)

We also noted that with 29-gauge needle there was less blood in the background and a thin core of the aspirate was obtained with well-preserved morphology. (Figure.3).

Conclusion

From our study of 33 cases we conclude that there was no statistical difference in the quality of smears obtained by various gauges of fine needles (23, 24 and 29). As finer needles are less traumatic and less painful and displays almost same morphology, 29 gauge needles may be utilized wherever feasible. As available 29 gauge needles are of shorter length, there is also need for manufacturing stronger and longer 29 gauge needles. Where knife can't reach easily, the fine needles reach out and fetch out the representative material without much pain and trouble. The finer needles are particularly suitable for vascular, sensitive and organs where loss of even small amount of tissue may matter i.e. some areas in brain.[6, 7] There is a need for further studies on utilization of 29 gauge and thinner needles in FNAC of various organs.

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