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Role of USG Guided Fine Needle Aspiration Cytology in Diagnosis of Retroperitoneal Lesions with its Histopathological Correlation

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Abstract

Background: Ultrasonography (USG) guided Fine Needle Aspiration Cytology (FNAC) is an established, safe, reliable and accurate procedure for cytological diagnosis of various retroperitoneal lesions. *Aims & Objectives:* To study the sensitivity, specificity and diagnostic accuracy of USG guided FNAC in retroperitoneal lesions. *Materials & Methods:* USG guided Fine Needle Aspirations (FNA) were performed in 54 patients with various retroperitoneal lesions during May 2009 to December 2011. Their cytological diagnosis was compared to Histopathological (HP) diagnosis. True and false (positive and negative) data was analyzed to measure sensitivity, specificity and diagnostic accuracy of USG guided FNAC. *Results:* Adequate material was aspirated in all 54 cases (Sample adequacy rate 100%). Maximum cases were from Kidney (21) followed by Lymphnode (13), Soft tissue (9), Adrenal (5), Pancreas (4) and Germ cell tumors (2). FNAC was diagnostic in all 54 cases. Among which, 36 cases (66.7%) were malignant and 18 cases (33.3%) were benign. HP correlation was available in 35 (64.8%) cases. HP diagnosis was different from FNAC diagnosis in only 2 (5.7%) cases. Diagnostic Accuracy, Sensitivity and Specificity of USG guided FNAC in retroperitoneal lesions were 94.3%, 92.6% and 100% respectively. *Conclusion*: Having high sensitivity, specificity and diagnostic accuracy**,** USG guided FNAC is an OPD based safe, reliable and accurate diagnostic procedure for various retroperitoneal lesions. It doesn't only provide a preoperative diagnosis to aid in surgical management of resectable tumors, but also helps in avoiding a purely diagnostic laparotomy in cases of advanced cancer or benign lesions.

Keywords: USG Guided; FNAC; Retroperitoneal; Sensitivity; Specificity; Accuracy.

Introduction

Retroperitoneal space contains many organs like Kidneys, Adrenal, Soft tissues, Lymphnodes, Pancreas (except tail), Ureter, Aorta, Inferior vena cava, Thoracic Esophagus etc [1]. The main problem in dealing with retroperitoneal masses is their uninhibited growth without any facial boundaries often leading to development of large sized masses before appearance of any sign-symptoms and their proximity to vital neuro-vascular structures & other intra-abdominal organs [2]. Fortunately, various imaging modalities like Ultrasonography (USG), Computed Tomography (CT) Scan, Magnetic Resonance Imaging (MRI) Scan, Fluoroscopy etc. allow more precise localization of deep seated retroperitoneal lesions [3]. But radiological findings alone are insufficient for definite diagnosis or differentiating neoplastic from non-neoplastic lesions. For which, tissue diagnosis is must and therefore FNAC under USG guidance emerged as a first line diagnostic procedure which ensures aspiration of a representative sample avoiding areas of necrosis & haemorrhage and safely bypassing major vessels and other vital organs [4,5]. USG guidance is the first choice due to its mobility, portability, rapidity, easy availability and zero radiation exposure. It is now routinely possible to aspirate and yield adequate cellular material under USG guidance from retroperitoneal sites which were previously inaccessible by conventional FNAC [6]. However,

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some associated risk and complications like hemorrhage, peritonitis, needle tract tumor seedling etc. should also be consider before doing the procedure [4]. The main objective of our study is to study the sensitivity, specificity and diagnostic accuracy of USG guided FNAC by diagnosing and differentiating various benign and malignant retroperitoneal lesions.

Material and Methods

The study was carried out in 54 patients having retroperitoneal masses referred to Pathology Department of our tertiary care teaching hospital in Ahmedabad, Gujarat, India between May 2009 to December 2011 after approval from institutional ethics committee. Prior USGs were done and patients found to have retroperitoneal masses were subjected to USG guided FNAC after taking informed consent, proper history and ruling out any absolute contraindication. With strict aseptic precautions, USG guided FNAC was performed by a 22-23 gauge needle attached to a 10 or 20 ml syringe for superficial lesions and by a long spinal needle of same gauge for deep seated lesions. Multiple needle passes were made in each case to obtain adequate material. After aspirating under negative pressure, smears were prepared. Some smears were air dried while some were fixed in 95% ethyl alcohol and stained with Haematoxylin & Eosin (H & E) and Papanicolaou stains. Air dried smears were stained with Ziehl–Neelsen (ZN) stain whenever necessary, particularly to confirm tuberculosis. For Histopathological Examination (post-surgical), specimens were fixed in 10% formalin, appropriate sections were taken, processed in Yorco's automatic tissue processor, cut by microtome and slides were prepared. Slides were stained by routine H & Estain and mounted with DPX. Finally, FNAC and HP diagnosis were compared, analyzed and results were interpreted accordingly.

Results

We have performed USG guided fine needle aspirations from total 54 patients presenting with dull aching abdominal pain and showing retroperitoneal masses on USG. This study includes 30 males (55.6%) and 24 females (44.4%) in the age range of 3 to 84 years. The study was followed by Histopathological Examination (HPE) in 35 cases. USG guided FNAC were done from various retroperitoneal organs like Kidney, Lymphnode, Soft tissues, Adrenal, Pancreas and Gonads. Adequate material was aspirated and FNAC diagnosis was established in all 54 cases, among which, 36 were malignant and 18 were benign. Various parameters are displayed in Table 1.

Table 1: Various Parameters in USG Guided FNAC in Retroperitoneal Lesions

Parameters	Number of Cases	%
Total Cases	54	100
Male	30	55.6
Female	24	44.4
Cytological Diagnosis	**54**	**100**
Benign	18	33.3
Malignant	36	66.7
Histopathological Diagnosis Available	**35**	**64.8**
Benign	08	22.9
Malignant	27	77.1
Histopathology Diagnosis not available	**19**	35.2

Malignant lesions diagnosed were Renal cell carcinoma, Wilm'stumor, Metastatic carcinoma, Non-Hodgkin's lymphoma (NHL), Liposarcoma, Fibrosarcoma, Adrenocortical carcinoma, Neuroblastoma, Adenocarcinoma of pancreas and Seminoma.

Benign lesions were Angiomyolipoma, Lipoma, Schwanoma, Retroperitoneal teratoma, Pancreatic pseudocyst, Renal cyst, Tuberculosis, Pyonephrosis and Reactive lymphadenitis. Details of FNAC diagnosis in all retroperitoneal lesions with their histopathological correlation is tabulated in Table 2 and photomicrographs of some lesions are shown in Figures 1 to 4.

42 patients did not have any complications during and after the procedure, while 12 patients complained of pain which was relieved by symptomatic treatment. HP correlation was available in 35(64.8%) cases while not available in 19(35.2%) cases. Out of 35 cases, HP diagnosis was different from FNAC diagnosis in 2

Table 2: USG Guided FNAC Diagnosis in various Retroperitoneal Lesions with Histopathological Correlation

Site of FNAC	*Category of Lesions*	*Cytological Diagnosis*	*No. of Cases*	*%*	*Histopathological Diagnosis*		
					Cyto-Histo Concordant Cases	*Cyto-Histo Discordant Cases*	*Cyto-Histo Correlation Not Available*
KIDNEY (21cases)	Malignant (14)	Renal Cell Carcinoma (RCC)	9	16.7	6	0	3
		Wilm's tumor	5	9.3	4	0	1
	Benign (7)	Angiomyolipoma	1	1.8	0	0	1
		Tuberculosis	3	5.6	0	0	3
		Renal cyst	2	3.7	1	1(RCC)	0
		Pyonephrosis	1	1.8	1	0	0
LYMPHNODE (13cases)	Malignant (9)	Non-Hodgkin's Lymphoma(NHL)	7	13	5	0	2
		Metastatic Carcinoma	2	3.7	2	0	0
	Benign (4)	Tuberculosis	3	5.6	0	0	3
		Reactive Lymphadenitis	1	1.8	0	1(NHL)	0
SOFT TISSUE (9cases)	Malignant (4)	Liposarcoma	3	5.6	2	0	1
		Fibrosarcoma	1	1.8	0	0	1
	Benign (5)	Lipoma	3	5.6	3	0	0
		Schwanoma	2	3.7	1	0	1
ADRENAL (5cases)	Malignant (5)	Adrenocortical Carcinoma	3	5.6	2	0	1
		Neuroblastoma	2	3.7	1	0	1
	Benign (0)	---	0	0	0	0	0
PANCREAS (4cases)	Malignant (3)	Adenocarcinoma	3	5.6	3	0	0
	Benign (1)	Pancreatic Pseudocyst	1	1.8	1	0	0
GERM CELL TUMORS (2cases)	Malignant (1)	Seminoma	1	1.8	0	0	1
	Benign (1)	Retroperitoneal teratoma	1	1.8	1	0	0
	TOTAL CASES		**54**	**100**	**33**	**02**	**19**

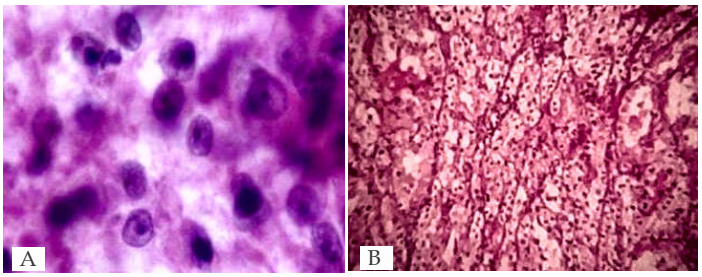

Fig. 1: Renal Cell Carcinoma. **A.** Cytology(H&E, × 400) **B.** HPE (H&E, × 100)

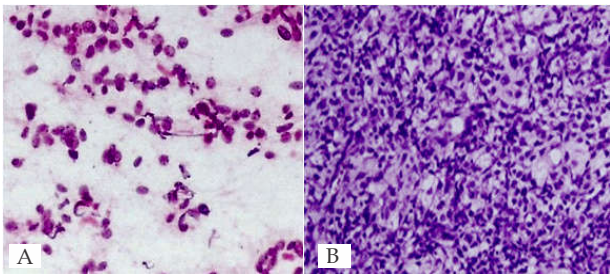

Fig. 2: Wilm's Tumor. **A.** Cytology (H&E,×200), **B.** HPE (H&E, × 100)

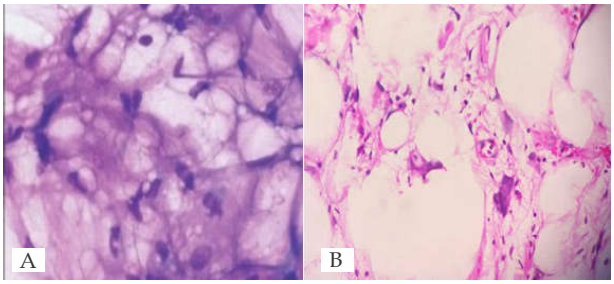

Fig. 3: Liposarcoma. **A.** Cytology (H&E,×200), **B.** HPE (H&E, × 100)

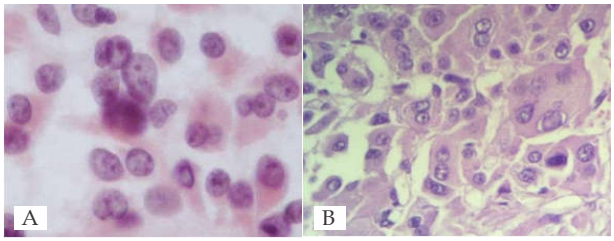

Fig. 4: Adrenocortical Carcinoma. **A.** Cytology (H&E, × 400), **B.** HPE (H&E, × 400)

(5.7%) cases; One from kidney and one from retroperitoneal lymphnode. Both were diagnosed as benign on FNAC (Renal cyst & Reactive lymphadenitis) while malignant on HPE (Renal cell carcinoma & Non-Hodgkin's lymphoma) respectively.

With regard to ***malignancy***, *a* comparative analysis was done between cytological and histopathological diagnosis as shown in Table 3 with following observations. True Positive (TP)-25 cases, True Negative (TN)-8 cases, False Positive (FP)- 0 cases and False Negative (FN)- 2 cases.

Table 3: Comparative Analysis between FNAC and Histopathology Diagnosis in Retroperitoneal Lesions

FNAC Diagnosis		HISTOPATHOLOGY Diagnosis		
		Available		Not Available
Cytological Diagnosis	**No. of Patients**	***Benign***	***Malignant***	**----**
Benign	18	08 (TN)	02 (FN)	08
Malignant	36	00 (FP)	25 (TP)	11
		08	27	
TOTAL	**54**	**35**		**19**

Table 4: Comparison of Sensitivity, Specificity and Diagnostic Accuracy of Present Study with other Studies [8, 12,15,16,18,23]

Studies	Year of Publication	No. of Cases	Sensitivity %	Specificity %	Accuracy %
Ahmad SS et al [8]	2007	50	100	100	100
Aziz et al[16]	2008	55	97.1	84.2	92.4
Mangal et al [12]	2009	85	94	100	96
Gangopadhyay et al [23]	2011	51	100	100	100
Mehdi et al [18]	2013	38	100	100	100
Chakrabarti et al [15]	2014	71	100	83	100
Present Study	---	54	92.6	100	94.3

So, following are the overall Accuracy, Sensitivity and Specificity measurements.

Accuracy: It measures the *degree of veracity* of diagnostic test on a condition

(Benign or Malignant).

= (TP+TN)÷ Total ×(100)

= (25+8) ÷ 35 × (100)

= **94.3** %

Sensitivity: The ability of a test to *detect* disease (here, Malignancy)when it is present.

= TP ÷ (TP+FN)×(100)

= 25 ÷ (25+2) × (100)

= **92.6** %

Specificity: The ability of a test to *exclude* disease (here, Malignancy) when it is not present.

= TN ÷ (TN+FP) × (100)

= 8 ÷ (8+0) × (100)

= **100** %

Discussion

The main purpose of this study is to know the sensitivity, specificity and diagnostic accuracy of USG Guided FNAC in various retroperitoneal lesions by correlating Cytological findings with Histopathological (HP) findings. USG guided aspirations were performed in 54 patients and yielded adequate material in all patients (Sample adequacy rate 100%). From total 36 malignant cases, maximum 14 malignant cases (26%) were reported from Kidney followed by 9 from Lymphnode (16.7%), 4 from Soft tissue (7.4%), 5 from Adrenal (9.3%), 3 from Pancreas (5.6%) and 1 Germ cell tumor (1.8%). The commonest malignancy reported in all retroperitoneal lesions was Renal cell carcinoma with 9 cases (16.7%) while the commonest benign lesion was Tuberculosis with 6 cases (11.2%). All above findings are correlative with various studies [8-24].

Among *malignant Kidney lesions,* Renal cell carcinoma was the commonest malignancy comprising 42.8% of cases (9/21) followed by Wilm'stumor with 23.8% cases (5/21). Patients with renal masses were between 3 years (Wilm's) and 76 years (RCC) of age, a finding similar to that by Mondal et al & Ahmed et al [7,8]. Diagnosis of renal mass in children is important as preoperative chemotherapy of Wilms' tumor can reduce the size and may prevent operative rupture and spillage as stated by Dey et al. & Hazarika et al [9,10]. Aspirates from renal cell carcinomas showed malignant cells with moderate amount of finely granular vacuolated cytoplasm and macronucleoli. These findings were correlative with the study done by Renshaw et al [11].

Among *benign Kidney lesions*, Tuberculosis (TB) was the commonest comprising of 42.9% of all benign kidney lesions (3/7). All TB cases were confirmed by

finding Acid Fast Bacilli (AFB) in ZN stain. Other benign lesions from kidney were Angiomyolipoma, Renal cyst and Pyonephrosis, similar to findings of Mangal et al [12]. Angiomyolipoma may sometimes clinically look like adenocarcinoma, but cytologicaly our smears show only smooth muscle cells and lipocytes without epithelial cells, thus excluding a diagnosis of adenocarcinoma, similar to the findings of Nguyen GK & Handa et al [13, 14].

Out of 13 *Lymphnode lesions*, Non-Hodgkin's lymphoma (NHL) was the most common malignancy (7/9) followed by Metastatic carcinoma (2/9) While among 4 benign lesions, 3 cases were of Tuberculosis and one case of Reactive lymphadenitis which later proved to be NHL on HPE. All cases of tuberculosis were managed medically preventing unnecessary surgery. All above findings are comparable to studies done by Chakrabarti et al, Aziz et al & Saikia et al [15,16,17].

Among 9 *Soft tissue lesions*, 4 were malignant comprising of Liposarcoma (3/4) and Firosarcoma (1/4), while 5 were benign comprising of Lipoma (3/5) and Schwanoma (2/5),findinds similar to found by Mehdi et al andTakahashi et al [18,19].

5 out of 5 *Adrenal lesions* are malignant, 3 being Adrenocortical carcinoma and 2 being Neuroblastoma. Neuroblastoma can cytologically mimic other small round cell tumors also. However, the location of the tumor and the presence of neuropil are very helpful in diagnosing Neuroblastoma on cytology as shown by Silverman et al [20].

Among 4 *Pancreatic lesions*, 3 were Adenocarcinoma and 1 was Pseudocyst; comparable to Fareeha et al study [21]. Occasionally, complications like pancreatitis and dislodgement of tumor cells into the peritoneal cavity by the needle can occur as stated by Paquin et al [22].

We also found 2 *Germ cell tumors*, the malignant one is Seminoma while the benign one is immature type of Retroperitoneal Teratoma which was also confirmed by HPE as Benign cystic teratoma. These findings corelate with studies done by Chakrabarti et al and Gangopadhyay et al [15,23].

HP correlation was available in 35 cases, while not available in 19 cases mainly because, some benign lesion like tuberculosis managed medically without surgery. In some malignant lesions, either the patients didn't come for follow up or they have been referred to higher center for advance treatment. Sometimes, surgery is not advised because some malignancies do well respond to chemotherapy or radiotherapy. Out of these 35 case, 33 HP diagnosis were concordant with FNAC diagnosis, while in 2 cases, HP diagnosis was different (False Negative) from the FNAC diagnosis. Among which, 1 cases from Kidney diagnosed as Renal cyst (Benign) on FNAC, later proved to be Renal cell carcinoma on HPE. The reason for this false negative diagnosis was attributed to cystic, necrotic and haemorrhagic component of the mass, which resulted in scanty tumour cell representation. This is correlative with findings of Khorsand D [24]. The other one from retroperitoneal lymph node, diagnosed as Reactive lymphadenitis (Benign) on FNAC due to technically suboptimal smears, proved to be Non-Hodgkin's lymphoma (Malignant) on HPE. The present study showed that the diagnostic accuracy of USG guided FNAC in retroperitoneal lesions was 94.3% with 92.6% sensitivity and 100% specificity which are comparable to other studies as shown in Table 4.

Conclusion

USG guided Fine Needle Aspiration Cytology is reliable, diagnostic and accurate in 94.3% of cases with 92.6% sensitivity and 100% specificity in present study. It plays an important role in diagnosing and differentiating various benign and malignant retroperitoneal lesions. It doesn't only provide a preoperative diagnosis to aid in surgical management of resectable tumours, but also helps in avoiding a purely diagnostic laparotomy in cases of advanced cancer or benign lesions. Thus reducing morbidity and mortality associated with surgery. Therefore, USG guided FNAC should be used as a first line diagnostic procedure in retroperitoneal lesions.

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