



Original Article

Ultrasonographic guided Fine Needle Aspiration Cytology (FNAC) in the Diagnosis of Intra-abdominal Solid Mass in Children

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Abstract

Background: Ultrasound guided needle biopsy is rapidly growing and important diagnostic technique in radiology practices throughout the world. It has become an accurate, safe and widely accepted technique for confirmation of suspected malignant masses and characterization of many benign lesions in various intra-abdominal locations. It also decreases patient costs by obtaining the need for an operation, decreasing the duration of hospital stay, and decreasing the number of examinations necessary during a diagnostic evaluation.

Objectives of the study: To establish ultrasound guided FNAC as an accurate method of diagnosis of intra-abdominal solid mass and to find out the correlation between FNAC with histological findings.

Material and Methods: This was a prospective comparative study. The study has been carried out in the department of pediatric Surgery Sher-e-Bangla Medical College Hospital, Barisal and Radiology & Imaging Department, SBMCH. This study was conducted from November 2022 to January 2024 (15 months). Forty five cases, all undergone both FNAC and open biopsy. Among them 24 cases were male; 21 were females. Age ranges from 3 months to 14 years. Data, collected on predesigned data collection sheet for each individual case was compiled on a master chart from which data were analyzed using a computer based software,

Statistical Package for Social Science (SPSS) to arrive at definitive conclusion in respect to objective of this study. Prior to the commencement of this study, the thesis protocol was approved by the Thesis Committee, SBMCH.

Result: Out of 45 cases cytological diagnosis, 10 cases were found to be benign. Among them 4 cases non-neoplastic and 6 neoplastic (benign) and 33 malignant; 01 was found suspicious of malignancy and 01 was unsatisfactory for cytological examination. Comparison of cytological with histological diagnosis of all patients, 9 cases were benign and 36 cases were malignant. In the final histopathological diagnosis shows that out of 10 benign lesions diagnosed cytologically, 01 case was found malignant histologically (i.e. False negative 01). 33 malignant cases were diagnosed cytologically, all were confirmed histologically (i.e. no false positive). 01 suspicious case was reported cytologically, but found malignant histologically. 01 unsatisfactory case was proved malignant histologically.

Conclusion: Ultrasound imaging can easily and precisely visualize the intra-abdominal mass lesion and sonography aided fine needle aspiration cytology can be regarded as the investigation of choice for early confirmation and exclusion of neoplastic diseases in cases presenting with intra-abdominal masses. It allows morphological evaluation of all doubtful lesions without time consuming and costly surgery, but without impairing the diagnostic reliability.

Key Word: Ultrasonography, Cytology, Histopathology

Introduction:

Many diagnostic modalities are now available for the diagnosis of tumour in children. Diagnostic workup should be based on the clinical presentation and include only those modalities that will provide pertinent information and will occasion the least discomfort. These include imaging studies and Biopsies.¹

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The critical diagnostic step in any tumour is obtaining proof of its criteria. No logical treatment plan can be formulated until an accurate diagnosis is made and this often requires biopsy. The success of FNAC requires close cooperation between clinician and experienced cytopathologist. Diagnosis is based on a limited amount of material. Adequate materials must be obtained for a diagnosis.²

The filled of FNAC is relatively new in our country in the diagnosis of solid mass in pediatric age group. Recently it is getting popularity. A few reports have been published from our country to evaluate the role of FNAC in the diagnosis of various clinical conditions.³

The technique of fine needle aspiration (FNA) was developed at Memorial Hospital in New York City in the 1920. Aspiration needles vary in diameter from the skinny Chiba needle (0.9mm) to 1.2 to 1.8mm size needles.²

Ultrasound guided needle biopsy is rapidly growing and important diagnostic technique in radiology practices throughout the world. It has become an accurate, safe and widely accepted technique for confirmation of suspected malignant masses and characterization of many benign lesions in various intraabdominal locations. It also decreases patient costs by obtaining the need for an operation, decreasing the duration of hospital stay, and decreasing the number of examinations necessary during diagnostic evaluation.

Traditionally, ultrasound-guided needle biopsy has been used for the biopsy of large, superficial, and cystic masses. Currently, however, because of improvements in instrumentation and biopsy techniques, Small, deeply located, and solid masses can also undergo accurate biopsy. Studies have shown that a histological diagnosis can be made confidently in 90% of cases, even when the mass is 3 cm or smaller.⁴

Both ultrasonography and computed tomography (CT) can be used as guidance methods for percutaneous needle insertion. The choice of method depends on multiple factors, including lesion size and location, relative visibility of the lesion by the two imaging methods, and equipment availability. Biopsy of many masses can be done with easy under either ultrasound or CT guidance.

In this study I will evaluate the role of FNAC in the diagnosis of intra-abdominal solid mass in children. I will perform this study with USG guidance and compare them with clinical and histological findings after laparotomy.

Objectives of the study:

To establish ultrasound guided FNAC as an accurate method of diagnosis of intra-abdominal solid mass, its nature and find out the correlation between FNAC with histological findings.

Materials and methods:

This was a prospective comparative study. The study has been carried out in the department of pediatric Surgery, Sher-e-Bangla Medical College Hospital, Barisal and Radiology & Imaging Department, SBMCH. This study was conducted from November 2022 to January 2024 (15 months). Forty five cases, all undergone both FNAC and open biopsy.

Selection of patient: A total of 45 admitted patients with intra-abdominal masses during study period satisfying the inclusion and exclusion criteria of study were selected. After admission, thorough clinical examination were performed, ultra-sonographic examination in the department of Radiology & Imaging, Sher-E-Bangla Medical College Hospital; and those found to have mass were subjected to FNAC, among them 24 cases were male; 21 were females. Age ranges from 3 months to 14 years.

Inclusion criteria: All admitted patients 0-14 years old having intra- abdominal solid masses. Aspiration only was done which was diagnostic, and which obviated open biopsy was considered satisfactory. Only cases with clinical and/or histological confirmation by open biopsy with were included in this study Exclusion criteria: patient age above 14 years. Masses other than solid. USG not be done. Patient not consenting to the protocol.

Prior to the commencement of this study, the thesis protocol was approved by the Thesis Committee, SBMCH.

A routine investigations including complete blood count, bleeding profile done in each case. By taking of verbal informed consent of the patient's legal guardian, FNAC was performed aseptic technique with sedation and local anesthesia, by using 21-23 gauze needle attached with disposable 10 ml syringe under ultra-sonographic guidance. Slide was made and sent

to department of pathology for cytological examination. Biopsy taken during laparotomy in pediatric surgery OT in SBMCH and sent for histopathological examination in department of pathology in Sher-E-Bangla medical college. Data collected on predesigned data collection sheet for each individual case was compiled on a master chart from which data were analysed using a computer based software, Statistical Package for Social Science (SPSS) to arrive at definitive conclusion in respect to objective of this study.

Results:

The present study was under taken to evaluate the effectiveness of fine needle aspiration cytology in the diagnosis of intra-abdominal solid mass in pediatric age surgical practice and compare the results of FNAC with those of excision biopsy. A total of 45 cases were selected having intra-abdominal solid masses or pain in abdomen and ultrasonography examination revealed masses in various abdominal sites. Age of the patients ranged from 03 months to 14years. All the patients were admitted in the department of pediatric surgery, Sher-E-Bangla Medical College Hospital, during the period of November 2022 to January 2024. US guided FNAC and laparotomy followed by excision biopsies performed in all cases.

Table I : Age distribution of the patient. (n=45)

Age group	No. of patients	Percentage
3 m-1 year	13	28.9
2-5 year	11	24.4
6- 10 year	11	24.4
11- 14 year	10	22.2

Table I: shows, the maximum incidence in age group 3 m to 1yr. 13(28.9%), and in age group 2 to 5 yrs. (24.4%), 6 to 10 yrs. (24.4%) are same and the second incidence.

Table II: Sex distribution of patient (n= 45)

Sex	No. patients	Percentage
Male	24	53.3
Female	21	46.6

This table shows a slight predominance of male over female in the ratio of 14: 1

Table III: Cytological diagnosis (n=45)

Cytological diagnosis	No. of cases	Percentages
Non Neoplastic	4	8.9
Neoplastic(Benign)	6	13.3
Malignancy	33	73.3
Suspicious of Malignancy	1	2.2
Unsatisfactory	1	2.2

Table III: shows cytological diagnosis. Out of 45 cases, 10 cases were found to be benign. Among them

4 cases non-neoplastic and 6neoplastic (benign) and 33 malignant; 01 was found suspicious of malignancy and 01 was unsatisfactory for cytological examination.

Table IV: Histological Diagnosis (n = 45)

Histological Diagnosis	No. of cases	Percentage
Non Neoplastic and Neoplastic (Benign)	9	20
Malignant	36	80

Table IV: shows histological diagnosis of all patients Histologically 9 cases were benign and 36 cases were malignant.

Table V: Comparison of cytological and histological diagnosis (n=45)

Cytological Diagnosis	Diagnosis		Histological No, of cases	Diagnosis Percentage
	No, of cases	Percentage		
Benign	10	22.2	9	20
Malignant	33	73.3	36	80
Suspicious of Malignancy	01	2.2		
Unsatisfactory	01	2.2		

Comparison of cytological with the final histopathological diagnosis shows that out of 10 benign lesions diagnosed cytologically, 01 case was found malignant histologically (i.e. false negative 01). 33 malignant cases were diagnosed cytologically, all were confirmed histologically (i.e. no false positive). 01 suspicious case was reported cytologically, but found malignant histologically. 01 unsatisfactory case was proved malignant histologically.

Among forty five cases in this study minor discomfort and mild pain have been complained by two patients, but significant hematoma and no other complications have resulted. So FNAC is a safe procedure with minimum of no complication. Among 45 cases, 1 case was unsatisfactory and 1 case was suspicious of malignancy in cytological examination. So, 43 cases were considered to evaluate the accuracy of FNAC.

Table VI: Histological pattern of mass in patients by age (n=45)

Age in years	No. of cases	Pattern of tumour	Percentage
3m-1yr	13	5-Wilm' tumour	11.1
		2-Germ cell tumour	4.4
		(1 Yolk sac tumour 1 Malignant Teratoma)	2.2
		2-Inflammatory pseudocyst	2.2
		2-Neuroblastoma	4.4
		1-Non-Hodgkins	4.4
		Lymphoma	2.2
		1-Poly Cystic kidney	2.2
2-5yr	11	5-Wilm' tumour	11.1
		2-Germ cell tumour (1 Yolk sac tumour)	4.4
		1-Hodgkin's Lymphoma	2.2
		1-Non-Hodgkins Lymphoma	2.2
		1-Fibrosarcoma	2.2
		1-Neuroblastoma	2.2
		1-Rhabdomyo-sarcoma	2.2
6-10yr	11	5-Non-Hodgkin's Lymphoma (1-Ovarian Lymphoma)	11.1
		2-Hodgkin's Lymphoma	4.4
		2-Serous cyst adenoma of ovary	4.4
		1-Yolk sac tumour (Adenocarcinoma)	2.2
		1-Neurofibroma	2.2
11-14yr	10	2-Non-Hodgkin's Lymphoma	4.4
		2-Rhabdomyo-sarcoma (1-Embryonal Rhabdomyosarcoma)	4.4
		2-Germ cell tumour (Yolk sac tumour)	4.4
		1-Adenocarcinoma of caecum	2.2
		1-Mucinous cyst adenoma of 2.2 ovary	2.2
		1-Intestinal Tuberculosis	2.2

Table VI: shows Non-Hodgkin's Lymphoma was the commonest and 5 in Number within 6-10 years age group children.

Table VII : Comparison of diagnostic accuracy of FNAC with histopathological Findings between present study and Name of author other studies:

Name of author	Sensitivity	Specificity	Positive predictive value	Negative predictive value	Overall value
Robert et al 1983 ⁵	100%	100%			100%
Tailor.SR.et al 1984 ⁶	76%	100%			
Obers.et al 1991 ⁷	100%	100%			100%
Smith. 1993 ⁸		99.7%			
Duesenbery.et al 1995 ⁹	90%	90%			
Stasi.1998 ¹⁰	87%	100%			91%
Lioe. et al 1999 ¹¹	85.4%	100%			94.4%
Lopez. etal.2002 ¹²	97%	100%	100%	90%	98%
Ahmed. et al.2006 ¹³	94.11%	100%			95.7%
Baksi. et al 2006 ¹⁴	95%	100%	100%	92.3%	96.9%
Anand. et al 2007 ¹⁵	92%	98%	97%		
Present study 2024	97.06%	100%	100%	90%	97.67%

Discussion:

Intra-abdominal mass is an important clinical condition in which fine needle aspiration cytology (FNAC) is extremely useful diagnostic technique. Results of this series have also shown a high diagnostic accuracy. Sever all contemporary reports in the literature support this conclusion.

A total of 45 admitted patients with intra-abdominal masses during study period satisfying the inclusion criteria of study were selected in this study. This study performed in the Department of pediatric Surgery, Sher-E-Bangla Medical College Hospital. Age ranges from 3 months to 14 years with a mean age of 5.58 + 4.42 years. Peak incidence was 6 to 10 years (33.3%). In this study the number of male patients was 24 (53.3%) and female patients were 21 (46.7%), with a male female ratio of 1.14:1 The male predominance was low in this study in comparison with other study (Smith.et al 1993⁸ showed 1.74:1; Taylor. et al 1983⁶, 1.32: 1; Robert.et al1982⁵, 1.67:1; Annand. et al 2004¹⁵, 1.6: 1;)

Site distribution of solid masses in this study was lymphoid tissue (Nodal, extra nodal-gut, ovary etc.) 12 (26.67%) which was the highest incidence and consistent with other studies (Robert et al 1982⁵ 43.75%; Higher incidence Suzannf.et al 1983 21.05%.); Renal (22.2%), Germen/ Ovary(22.2%), Retroperitoneal tissue (8.9%), Urinary bladder/smooth

muscle(6.7%), Intestine (4.4%), Fibrous tissue of lower abdomen (2.2%),and others (Inflammatory pseudocyst, Neuro fibroma)(6.7%).Lymphoid tissue originated mass show highest incidence followed by Renal (22.2%) and Germ cell/Ovary(22.2%) in this study which is also higher in other studies (Annand. et al 2004¹⁵, 49.59%; Robert. CT al 1982⁵, 43.75%)

Patients with intra-abdominal solid mass undergone FNAC and the cytological reports were categorized into four groups: a) Benign, b) for malignancy and d) Malignant, c) Suspicious Unsatisfactory/Inadequate. In the present study satisfactory materials for cytological examinations were obtained from 44 cases and 1 case showed unsatisfactory smear. The unsatisfactory smear was found inadequate for diagnosis because of scarcity of cellular element. Cytological assessment showed (22.2%) benign, (73.3%) malignant. Out of 10 benign lesions 1(2.22%) lesion was found malignant histologically (i.e. false negative=01). All (33) malignant cases were confirmed histologically (i.e.no false positive). 01(2.229%) suspicious case reported cytologically, malignant histologically. 01 unsatisfactory case was malignant proved by histologically.

The case suspicious for malignancy diagnosed as Rhabdomyosarcoma, benign chronic non-specific lymphadenitis (False negative) and unsatisfactory case both were diagnosed non-Hodgkin's lymphoma,

The 9 benign (6neoplastic 3 inflammatory) lesions were serous cystadenoma 2, mucinous cyst adenoma 1, Retro-peritoneal lipoma 1, Neurofibroma 1, Polycystic kidney 1, and Inflammatory pseudocyst 2, Intestinal tuberculosis 1. and 36 malignant tumours were NHL 9, HL 3, Wilms tumour 9, Germ cell tumour 7, Neuroblastoma 3, Rhabdomyosarcoma 3, Adenocarcinoma of caecum 1, Fibrosarcoma 1. In this study the incidence of malignant tumour was higher than benign tumour and the highest incidence of malignant tumour was the lymphoma, peak incidence of NHL in age group 6 to 10 years, male child's were more affected than female which is consistent with other studies (Higher incidence in Das. et al 1990). The second most common tumour in child was wilms tumour and peak incidence in age group 0 to 1 year. Male child was more affected than female.

The third one was the Germ cell tumour and female children's were more affected than male considering the definitive diagnosis of benign and malignant, the sensitivity of this study is 97.06% for the malignancy and specificity is 100% for the absence of malignancy. The positive predictive negative predictive value and overall diagnostic accuracy in this series are 100%, 90% and 97.67% respectively. These findings are roughly Consistent with other studies.

The number of suspicious. False positive and false negative results and unsatisfactory Smears were consistent with the previous studies. The scan be reduced with increasing experience and practice.

FNAC was a 1q performed with sedation and local anesthesia. Among 45 cases no patient showed unacceptability to FNAC in this series.

In this study morbidity of FNAC showed negligible. Only two patients did complain minor discomfort and mild pain at the site of aspiration. So, this study shows FNAC is a safe procedure with minimal complications.

Conclusion:

Ultrasound imaging can easily and precisely visualize the intra-abdominal mass lesion and sonography aided fine needle aspiration cytology can be regarded as the investigation of choice for early confirmation and exclusion of neoplastic diseases in cases presenting with intra-abdominal masses. It allows morphological evaluation of all doubtful lesions without time consuming and costly surgery, but without impairing the diagnostic reliability.

Overall, US guided FNAC is a highly accurate, minimally invasive, safe, inexpensive and rapid definitive diagnostic procedure in intra-abdominal solid mass diagnosis in children. So, it will be the first line of investigation in the evaluation of intra-abdominal solid mass in pediatric surgical practice.

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