Original Article

Fine Needle Aspiration Cytology of Intra-Abdominal Lesions

Pathology Section

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ABSTRACT

Background: Intra-abdominal masses always remain as an enigma in surgical practice. A documentary evidence of the nature of the pathology before the institution of therapy and for the prognosis is mandatory. FNAC is a substitute for surgical procedures like diagnostic laparotomy.

Aims: To assess the utility of FNAC in the diagnosis of intra-abdominal lesions.

Objectives: To study the cytomorphological features, age and sex distribution of intra-abdominal lesions and to categorize them organwise and as inflammatory, benign and malignant lesions. To classify the malignant lesions according to their cell type. To evaluate the sensitivity, specificity and diagnostic accuracy.

Materials and Methods: The study included 245 intra-abdominal lesions which were detected clinically or radiologically. The lesions were divided clinically into palpable and non-palpable lumps. USG or CT were used for all the non-palpable lesions and for a few palpable lesions and direct in selected palpable lesions. Giemsa's and Papanicolaou's stains were used.

Results: The mean age was 45.16 years, with M:F of 1:1.3. The diagnostic yield was 92.1% in USG guided, 100% in CT guided and 95% in direct aspiration. There were 148 (60.3%) malignant, 55 (22.4%) benign, 25 (10.2%) inflammatory and one (0.6%) suspicious lesions and 16 (6.5%) unsatisfactory smears. The liver and the ovary were the most common sites . Adenocarcinomas and hepatocellular carcinomas were the most common malignant lesions. This study showed 94.1% sensitivity, 100% specificity, 100% positive predictive value, 92.3% negative predictive value and 96.5% diagnostic accuracy .

Conclusion: Intra-abdominal FNA is a simple, economical and a safe procedure with high sensitivity, specificity and diagnostic accuracy and it can be utilized as a pre-operative procedure for the management of intra-abdominal lesions.

Key Words: Intra-abdominal, FNA

INTRODUCTION

Intra-abdominal masses always remain as an enigma in surgical practice. A documentary evidence of the nature of the pathology before the institution of therapy and also for prognosis is mandatory. In a majority of cases, the diagnosis which is obtained by FNAC, is the substitute for surgical procedures like diagnostic laparotomy [1,2]. Most of the intra abdominal masses are non – palpable and even if they are palpable, the idea of their size and shape and the extent of the lesion is not possible. Therefore, various imaging modalities like fluoroscopy, CT and USG are used as a guide for fine needle aspiration [2]. Most studies have shown it as a highly sensitive, highly specific, accurate and a cost effective diagnostic procedure with a negligible complication rate [2-16]. Uncorrectable severe coagulopathy is an absolute contraindication [17].

The FNA cytology was shown to be 100% specific for the diagnosis of malignancy [4,8]. The non –availability of CT, coupled with the higher incidence of advanced malignancy due to public awareness and overburdened surgical units with meagre resources require the USG – guided FNAC procedure for cancer management in developing countries like India [6,18]. The aim of our study was to assess its usefulness as a pre-operative diagnostic procedure in management of intra-abdominal lesions. Our objectives were to assess the cytomorphological features, age and sex distribution of the patients with intra abdominal lesions, to classify the malignant lesions according to their cell type and to evaluate the sensitivity, specificity and the diagnostic accuracy in different lesions wherever possible.

MATERIALS AND METHODS

This study was carried out in the Department of Pathology for a period of three years (36 months) from June–2005 to May 2008. Patients with intra-abdominal lesions which were detected clinically or under radiological guidance, presented to the Department of Cytology.

Intra-abdominal organs including the liver, spleen, pancreas, stomach, gallbladder, the small and large intestines, the omentum, mesentery, the retroperitoneum, kidney, adrenals, lymph nodes, soft tissues and the ovary were included in the study. Parietal swellings arising from the skin and the abdominal wall, the uterus, the cervix, the prostate and the bone were excluded from the study.

After a thorough clinical examination, consent was obtained from the patients after explaining the procedure to them. The cases were divided clinically into palpable and non palpable lumps. The selected palpable lesions were subjected to direct aspiration and USG guidance in case of on palpable and deep seated lesions and in case of a few selected palpable lesions. The puncture site was marked. Under aseptic precautions, a 22–23G needle for superficial lumps and a lumbar puncture needle of the same thickness for deep seated lumps, which was fitted with a 10ml syringe, was introduced immediately under radiological guidance and the aspiration was done under negative pressure. On an

Age	Inflammatory		Benign		Malignant		Suspicious		Unsatisfactory		Total	%
	M	F	M	F	M	F	M	F	M	F		
1–10	–	1	2	–	2	5	–	–	1	–	11	4.8
11–20	4	1	2	6	5	5	–	–	–	–	23	9.4
21–30	3	1	–	7	6	4	–	–	1	1	23	9.4
31–40	1	1	0	14	5	14	–	–	–	2	37	15.1
41–50	2	5	0	10	19	16	–	–	1	1	54	22
51–60	1	2	2	8	17	19	–	–	3	3	55	22.4
61–70	–	1	2	1	12	9	–	–	1	2	28	11.3
71–80	1	1	–	1	6	–	–	–	–	–	9	3.6
81–90	–	–	–	–	4	–	1	–	–	–	5	2
Total	12	13	8	47	76	72	1	0	7	9	245	
%	4.9	5.3	3.3	19.2	31	29.4	0.4	0	2.8	3.7		100
Total (%)	25 (10.2%)		55(22.5%)		148(60.4%)		1(0.4%)		16(6.5%)		245 (100%)	

[Table/Fig-1]: Age and Sex distribution of Intra-abdominal Lesions

average, two to three needle passes were made in each case to obtain adequate material. The sample was expelled onto slides, air-dried and stained with Giemsa or it was fixed in 95% ethanol and stained with Papanicolaou's stain. Special stains were used wherever required.

The cases were analyzed, based on the cytological features. The final diagnosis was arrived at in corroboration with the clinical and the radiological features. The smears were classified as inflammatory, benign, malignant, suspicious of malignancy and unsatisfactory for interpretation.

RESULTS

During the study period, 2624 fine needle aspirations were performed, of which 234 cases were intra abdominal lesions, accounting for 8.9% of the total cases. There were 245 lesions in 234 patients. There were 147 palpable and 98 non-palpable lesions. Histopathological correlation and confirmation was available in 29 cases.

Out of the 234 cases, there were 101 males and 133 females with a male to female ratio of 1:1.3. The youngest patient in the study was 20 days old and the oldest was 88 years old. A majority of the patients i.e. 146 (59.6%) were in the age group of 30-60 years, out of 245 lesions. The mean age was 45.16 years (Standard deviation – 18.48). Among 104 lesions in the male patients, a majority were malignant, accounting for 76 (73.1%) lesions and 12 (11.5%) lesions were inflammatory lesions, eight (7.7%) lesions were benign and one (0.9%) was suspicious for malignancy. In seven (6.8%) cases, the smears were unsatisfactory for evaluation. Among the 141 lesions in the female patients, 72 (51.1%) were malignant, 47 (33.3%) were benign and 13 (9.2%) were inflammatory. In nine (6.4%) cases, the smears were unsatisfactory for evaluation. Out of 245 lesions in the 234 patients, 148 (60.3%) were malignant, 55 (22.4%) were benign, 25 (10.2%) were inflammatory and one (0.6%) was a suspicious lesion. There were about 16 (6.5%) unsatisfactory smears. The benign lesions were more common in females than in males, whereas the malignant lesions had a slight male preponderance. The incidence of the lesions increased in both the sexes after 30 years [Table/Fig-1].

Out of 245 lesions, 164 were aspirated under ultrasonographical guidance and one was aspirated under computed tomographic guidance. Of the 80 cases which were properly selected, the palpable cases were aspirated directly without any guidance. The diagnostic yield of USG was 92.7% i.e. out of 163 USG guided procedures and adequate material was obtained in 152 cases. In the CT guided procedure, the diagnostic yield was 100%. It was 95% in the direct unguided procedure, which was higher than that of the USG guided procedure. Overall, the diagnostic yield was 93.5% in the 245 lesions [Table/Fig-2].

In the present study, most of the aspirates were cellular (41.6%) and haemorrhagic cellular (28.6%). It was a fluid aspirate in 11.8% lesions, followed by a necrotic aspirate in 6.5% lesions, a purulent aspirate in 2.9% lesions and a cellular haemorrhagic aspirate in 8.6% lesions. Out of the 21 haemorrhagic and acellular haemorrhagic aspirates, most were (16 cases) unsatisfactory for evaluation and five were interpreted as hemangiomas. Of the 245 lesions, the aspirate was satisfactory in 229 (93.5%) lesions. Unsatisfactory aspirates were obtained in 16 (6.5%) lesions [Table/Fig-3].

A majority of the lesions were located in the liver and most of them were malignant lesions. The most common malignant lesion in the liver was hepatocellular carcinoma (HCC) (34), followed by metastatic carcinoma (25). In seven cases, we could not

Method	No. of Cases	Diagnostic yield	
		No. of Cases	Percentage
USG	164	152	92.7
CT	1	1	100
Unguided	80	76	95
Total	245	229	93.5

[Table/Fig-2]: Type of Radiological Guidance and Diagnostic Yield

Organs	Inflam-matory	Benign	Suspicious	Malig-nant	Total	%
Liver	11	8	1	67	87	38
Gallbladder	–	–	–	6	6	2.6
Stomach	–	–	–	2	2	0.9
Large bowel	1	–	–	2	3	1.3
Pancreas	–	2	–	5	7	3
Spleen	–	1	–	2	3	1.3
Kidney	–	–	–	12	12	5.2
Adrenal	–	1	–	2	3	1.3
Ovary	2	33	–	13	48	21.1
Soft tissue	–	1	–	8	9	3.9
Omentum	–	–	–	4	4	1.8
Mesentery	–	1	–	–	1	0.4
Lymphnodes	9	–	–	9	18	7.9
Unclassified	2	8	–	16	26	11.3
Total	25	55	1	148	229	100

[Table/Fig-3]: Organ Distribution of Lesions

Malignant Lesions	0–10		11–20		21–40		41–60		61–80		> 80		Total	%
	M	F	M	F	M	F	M	F	M	F	M	F		
Hepatocellular carcinoma	–	–	–	1	2	1	14	6	8	1	1	–	34	23
Adenocarcinoma	–	–	–	–	1	6	9	16	4	1	2	–	39	26.3
Renal cell carcinoma	–	–	–	–	1	2	2	1	1	–	–	–	7	4.7
Adreno cortical carcinoma	–	–	–	–	–	–	1	–	–	–	–	–	1	0.7
Pheochromocytoma	–	–	–	–	–	1	–	–	–	–	–	–	1	0.7
Serous cystadeno carcinoma	–	–	–	–	–	1	–	4	–	2	–	–	7	4.7
Malignant granulosa cell tumor	–	–	–	–	–	–	–	1	–	–	–	–	1	0.7
Malignant germ cell tumor	–	–	–	1	–	–	–	–	–	–	–	–	1	0.7
Dysgerminoma/ Seminoma	–	–	–	1	1	–	–	–	–	–	–	–	2	1.35
Cholangio carcinoma	–	–	–	–	–	–	–	1	–	–	–	–	1	0.7
Hodgkin's lymphoma	–	–	2	–	–	–	–	–	–	–	–	–	2	1.35
Non–Hodgkin lymphoma	–	–	–	–	–	1	–	–	1	–	–	–	2	1.35
Nephroblastoma	1	1	2	–	–	–	–	–	–	–	–	–	4	2.7
Rhabdomyo sarcoma	–	1	–	–	1	–	–	–	–	–	–	–	2	1.35
Malignant round cell tumor	–	–	2	–	1	–	–	–	–	–	–	–	3	2
Squamous cell carcinoma	–	–	–	–	–	1	–	–	–	–	–	–	1	0.7
Small cell carcinoma (metastatic to liver)	–	–	–	–	–	–	–	–	2	1	–	–	3	2
Anaplastic carcinoma (Metastatic)	–	–	–	–	–	2	–	–	–	–	–	–	2	1.35
Poorly differentiated carcinoma	–	–	–	1	3	4	11	5	1	4	–	–	29	19.6
Pleomorphic sarcoma	–	1	–	–	–	–	1	1	–	1	–	–	4	2.7
Malignant undifferentiated tumor	–	1	–	–	–	–	–	–	–	–	–	–	1	0.7
Ganglioneuroblastoma I	–	1	–	–	–	–	–	–	–	–	–	–	1	0.7
Total	1	5	6	4	10	19	38	35	17	10	3	0	148	
Total	6		10		29		73		27		3		148	
%	0.7	3.4	4	2.7	6.8	12.8	25.7	23.6	11.5	6.8	2	0		
%	4.1		6.7		19.6		49.3		18.3		2			100

[Table/Fig-4]: Age and Sex Distribution of Malignant Lesions According to Cell Type

differentiate between primary HCC and the metastatic lesions and these were labeled as poorly differentiated carcinoma. One case was diagnosed as cholangiocarcinoma [Table/Fig-2] in a 50 years old female. The next most common site was the ovary (48), where most of the lesions were benign lesions (33). Other common organs which were involved were the lymph nodes (18), kidney (12), the gallbladder (6) and pancreas (6). There were two cystic lesions in the pancreas and four adenocarcinomas of the pancreas. In the gall bladder, all the lesions were adenocarcinomas.

Abscess constituted the most common inflammatory lesion. Out of eight abscesses, six were located in liver, one in lymph nodes and one in the appendix. There were five tubercular lymphadenitis [Table/Fig-3] and three reactive lymphadenitis cases. Four cases of diffuse parenchymal lesions of the liver were seen.

Most of the benign lesions i.e., 33 lesions were located in the ovary and most of them (11) were diagnosed as cystadenomas. Among the remaining benign lesions, nine (16.5%) lesions were diagnosed as cyst contents, six (10.9%) as serous cystadenomas, three (5.4%) as mucinous cystadenomas, one as a simple serous cyst, one as a twisted ovarian cyst, three (5.4%) as benign teratomas, one as an ovarian fibroma and one as a benign, mixed epithelial stromal tumour [Table/Fig-4]. Two cystic lesions were in the pancreas and one was in the liver (calcified cyst content). There were five hemangiomas, all of which were located in the liver, out of 55 cases i.e. 9.1% of the benign lesions. There was one angiomyolipoma, one adrenal cortical adenoma, one benign trophoblastic lesion and one mucinous cyst of the mesentery and the colon each [Table/Fig-5].

Adenocarcinomas [Table/Fig-6] were the most common malignant lesions, followed by hepatocellular carcinomas. Adenocarcinomas were more common in females (23) than in males (16). Hepatocellular carcinomas were more common in males (25) than in females (nine). Lymphomas [Table/Fig-7], renal cell carcinomas [Table/Fig-8], nephroblastomas [Table/Fig-9] and small cell carcinomas were more common in males than in females. Pleomorphic sarcomas were more common in females (three) than in the males (one). Serous cystadenocarcinoma (seven) was the most common malignant lesion in the ovary, followed by one malignant granulosa cell tumour [Table/Fig-10] and one dysgerminoma [Table/Fig-11]

Organ	Biradar et al 14 1994 (%)	Zawar MP et al 6 2007 (%)	Present Study (%)
Liver	36	45	38
Gallbladder	–	2.5	2.6
Stomach	10	5	0.9
Large Bowel	20	17.5	1.3
Pancreas	4	2.5	3
Spleen	–	5	1.3
Kidney	6	20	5.2
Adrenal	–	–	1.3
Ovary	–	–	21.1
Soft Tissue	–	–	3.9
Omentum	–	–	1.8
Mesentery	–	–	0.4
Lymphnodes	6	2.5	7.9
Unclassified	8	–	11.3

[Table/Fig-5]: Organ distribution of Intra-Abdominal Malignancy – Comparative Analysis.

Type of Lesion	Biradar et al 14 1994 (%)	Aftab A. Khan et al 4 1995 (%)	Shamshad et al 17 2006 (%)	Present study (%)
Inflammatory	32	6	30.5	10.2
Benign	2	0		22.4
Malignant	52	88	57.5	60.3
Suspicious	0	0	5.5	0.6
Unsatisfactory	14	6	6.5	6.5

[Table/Fig-6]: Distribution of Intra-Abdominal Lesions – Comparative Analysis.

Study	No. of FNACs	Sensitivity %	Specificity %	Diagnostic Accuracy %
Sundaram et al 75 1982	204	96.3	100	97
Lees et al 76 1985	454	77	100	83.95
Civardi et al 77 1988	–	95.6	100	97.6
Govind Krishna et al 13 1993	500	71.4	55.6	77.5
Joao Nobrega et al 7 1994	236	87	100	100
Aftab A. Khan et al 4 1995	50	94	100	94
Nautiyal S et al 5 2004	72	–	–	87.5
Shamshad et al 17 2006	200	94.11	100	95.7
Zawar MP et al 6 2007	40	–	–	90
Present study 2008	245	94.1	100	96.5

[Table/Fig-7]: Statistical Results – Comparative Analysis

and the remaining were metastatic adenocarcinomas. A majority of the adenocarcinomas (25) and the hepatocellular carcinomas (20) were seen in the age group of 41-60 years. The youngest patient who was affected by HCC was an 18 years old female and the oldest one was an 85 years old male. Adenocarcinomas constituted the most common metastatic lesions in the liver, followed by small cell carcinomas (three). All nephroblastomas, one malignant small round cell tumour and one rhabdomyosarcoma were seen below the 20 years age group. One rhabdomyosarcoma was seen in a 40 years old male [Table/Fig-5].

The HbsAg test was done in nine of the 32 hepatocellular carcinoma cases, of which six were positive and three were negative. 66.7% of HbsAg positivity was seen in hepatocellular carcinomas.

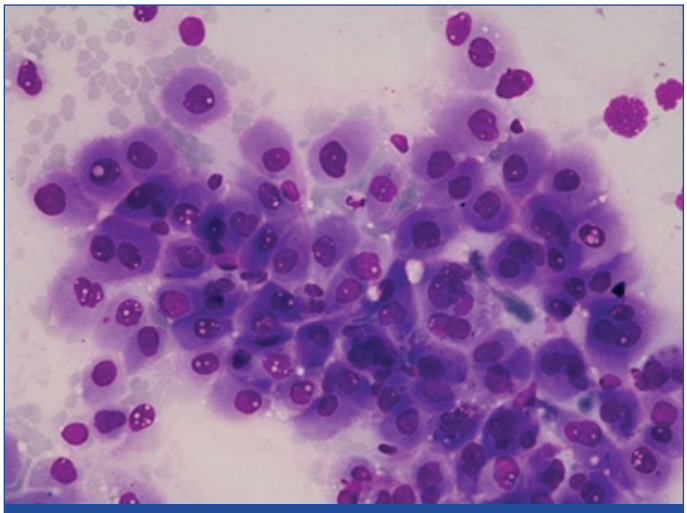
Histopathological correlation and confirmation was available in 29 cases. Out of the 13 benign cases, seven were confirmed by histopathological examination. All mucinous and serous cystadenomas which were diagnosed cytologically were confirmed histopathologically, except one mucinous cystadenoma which was diagnosed as papillary cystadenofibroma. One serous cystadenoma turned out to be serous cystadenocarcinoma by histopathological examination. The benign, mixed epithelial stromal tumour turned out to be a Brenner tumour of the ovary by histopathological examination. One twisted ovarian cyst and one ovarian fibroma were confirmed histologically. One cystadenoma with haemorrhage and one spindle cell tumour turned out to be a twisted ovarian cyst and a leiomyoma of the retroperitoneum respectively.

11 cases were confirmed histologically out of the 16 malignant cases. All serous cystadenocarcinomas of the ovary, one malignant granulosa cell tumour, one clear cell carcinoma of the kidney, two nephroblastomas, one gallbladder adenocarcinoma, one large intestine adenocarcinoma, two adenocarcinomas of the ovary and one ganglioneuroblastoma [Table/Fig: 8-13] were confirmed histologically. One case of clear cell carcinoma of the kidney turned out to be adrenocortical carcinoma by histopathological examination. One case of malignant undifferentiated tumour turned out to be malignant, mixed epithelial cell tumour with dysgerminoma and embryonal carcinoma and one case of carcinoma with tuberculosis turned out to be a metastatic adenocarcinoma of the ovary by histopathological examination. One case who presented with a suprapubic abdominal mass was diagnosed to have adenocarcinoma, cytologically. But the histological diagnosis of the cervical biopsy was squamous cell carcinoma. One case of metastatic seminoma of the lymphnodes which was diagnosed cytologically, turned out to be teratocarcinoma by the histopathological examination of the orchidectomy specimen.

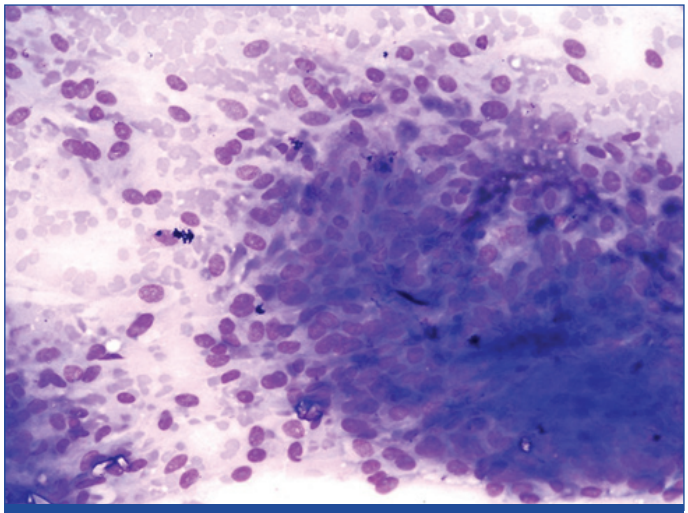
DISCUSSION

FNAC is a proven technique for the diagnostic evaluation of intra-abdominal lesions. The diagnostic yield which was obtained by USG was 92.7%, by CT it was 100% and for direct aspiration it was 95%. Overall, the diagnostic yield was 93.5%. Nautiyal S., Mishra RK., and Sharma SP,2 in 2004, found a diagnostic yield of 64.81% with direct aspiration of the palpable lumps and a diagnostic yield of 93.06% with USG guided FNAC which was done for both palpable and non-palpable lesions. Nyman et al,[12] in 1995, found a diagnostic yield of 64% with USG guided FNAC. In comparison with previous studies, the present study was found to have more diagnostic yield, irrespective of whether it was direct or guided. In the present study, the diagnostic yield was more with direct aspiration than with USG guided FNAC. This could be due to the careful and proper selection of the cases for direct aspiration and as most of the lesions were superficial and easily palpable. A 100% diagnostic yield which was obtained with CT-guided FNAC, was comparable to that which was obtained by Joseph T. et al [8].

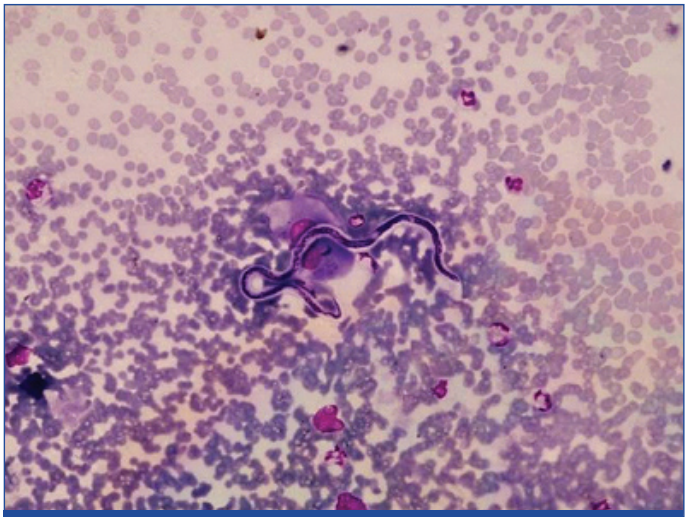
The age incidence in the present study ranged from 20 days to 88 years with a majority of the cases being in the age group of 30-60



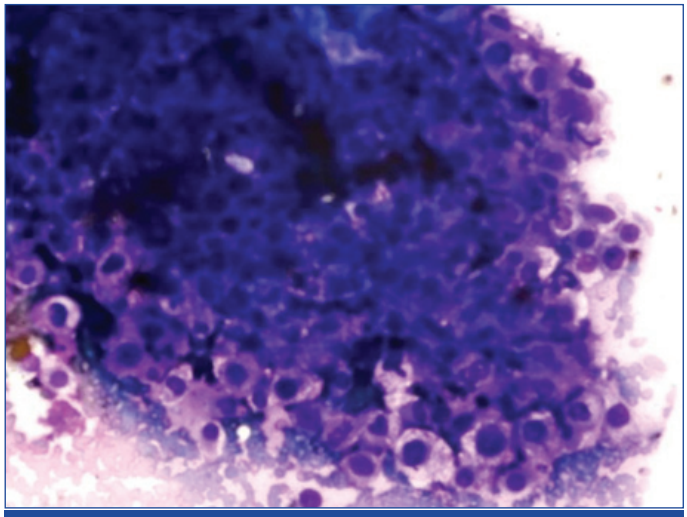
[Table/Fig-8]: Hepatocellular carcinoma



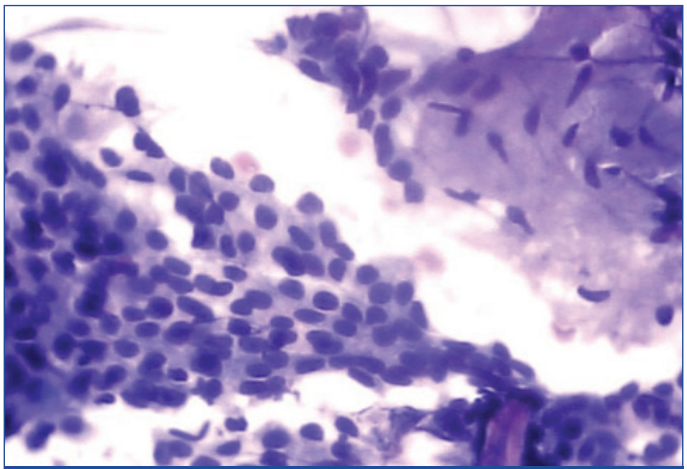
[Table/Fig-11]: Tubercular granuloma



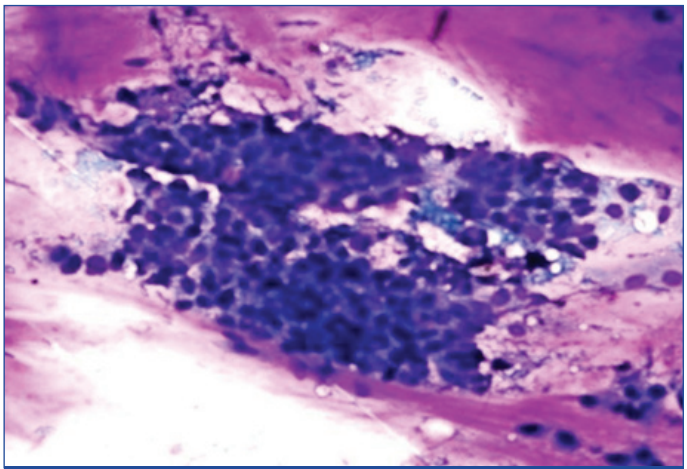
[Table/Fig-9]: Hepatocellular carcinoma with incidental filarial parasite



[Table/Fig-12]: Brenner tumor



[Table/Fig-10]: Cholangiocarcinoma [Giemsa, x400]

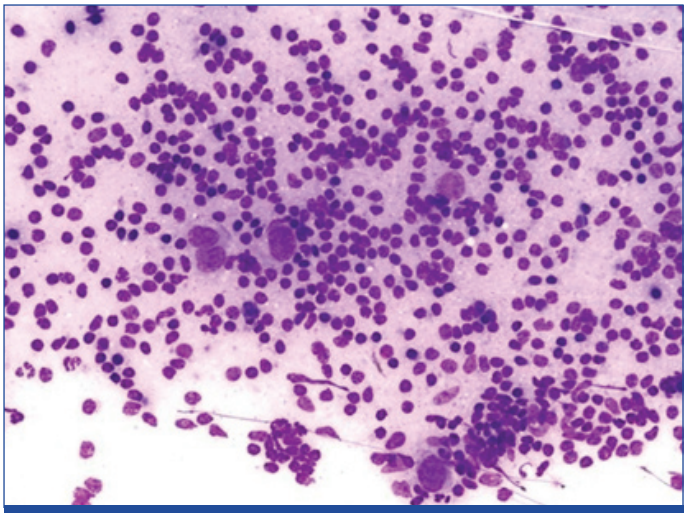


[Table/Fig-13]: Mucinous adenocarcinoma

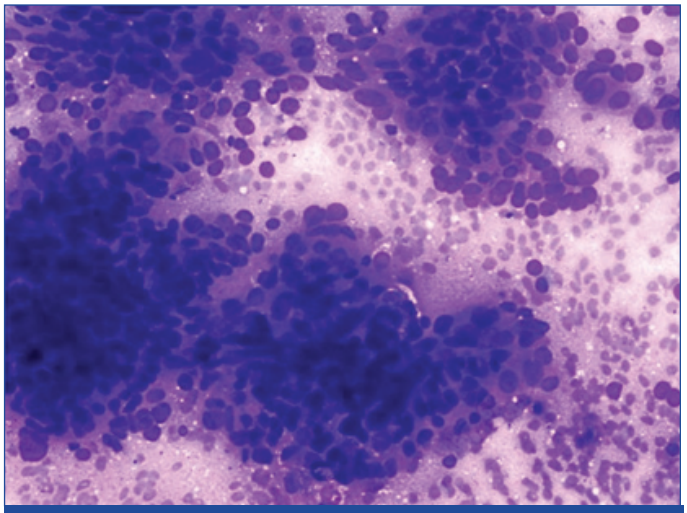
years (59.6%). The incidence of malignancy increased after the age of 40 years in males and after the age of 30 years in females with a peak incidence between the ages of 40-60 years, which was comparable to the results which were obtained by Zawar MP., et al,[3]and Shamshad et al [14].

The male to female ratio of 1:1.3 was in accordance with the observations which were made by Shamshad et al [14], and Joao Nobrega et al [4]. But the observations which were made in the studies by Zawar MP et al [3] , Govind Krishna et al [10], Aftab A Khan et al [1], and Ennis and Mac Erlean, [6] showed a male preponderance. This could be due to the inclusion of the ovary in this study, as done by Shamshad et al [14].

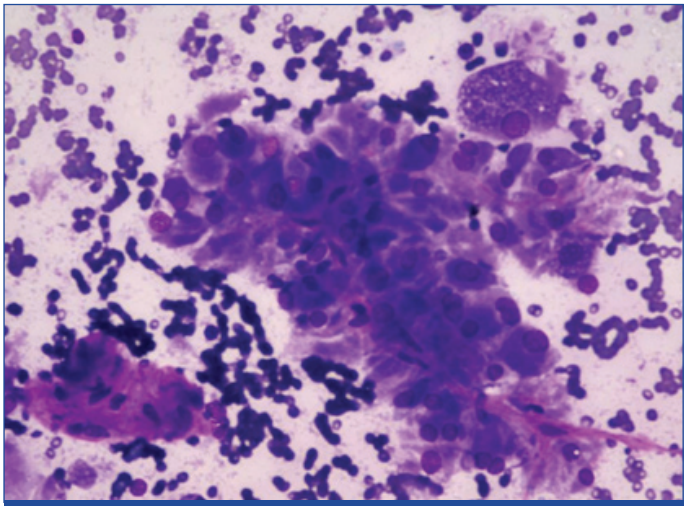
The most common organ which was involved in the present study was the liver an observation which was similar to the one made by Zawar M.P. et al [3], and Biradar et al [11]. The next most common site in the present study was the ovary. But the ovary was not included in the studies which were done by Zawar M.P. et al [3], and Biradar et al [11]. In their studies, the



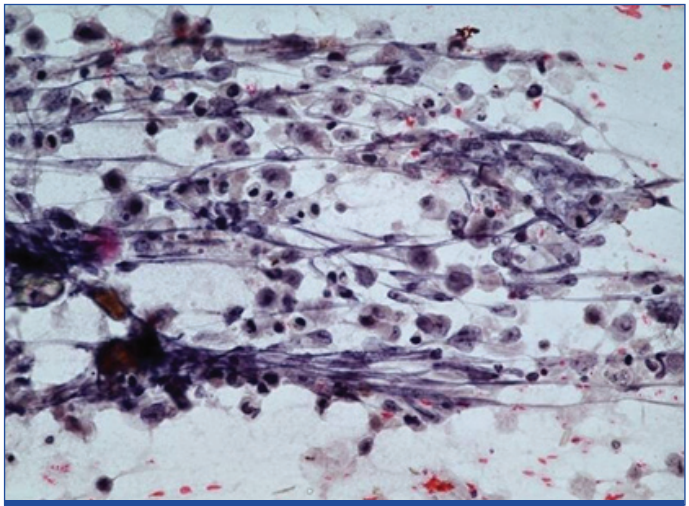
[Table/Fig-14]: Hodgkin's Lymphoma



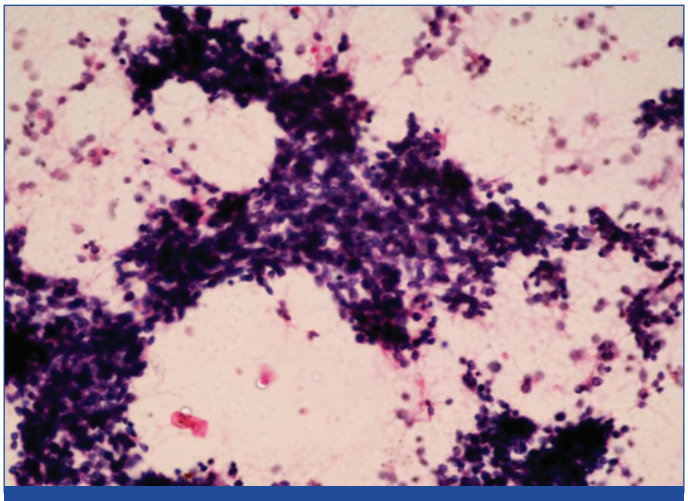
[Table/Fig-17]: Granulosa cell tumor



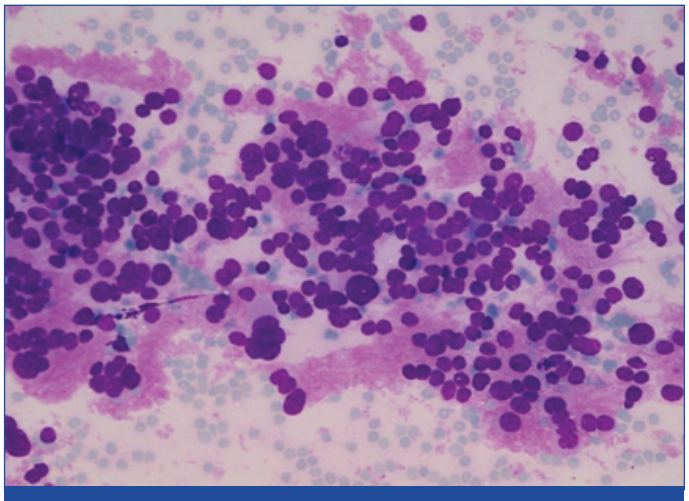
[Table/Fig-15]: Renal cell carcinoma



[Table/Fig-18]: Germ cell tumor



[Table/Fig-16]: Nephroblastoma



[Table/Fig-19]: Ganglioneuroblastoma

next most common site was the large intestine. Biradar et al [14], had included the gallbladder, spleen, adrenal, soft tissue, omentum and the mesentery in the unclassified category [Table/Fig-5].

In the present study, malignant lesions constituted the most common diagnostic category, which was in accordance with the observations which were made by Biradar et al [11], Aftab A. Khan et al [1], and Shamshad et al [14] [Table/Fig-14].

In the present study, we observed 6.5% unsatisfactory smears, which was similar to the observations which were made by Shamshad et al [14], and Aftab A. Khan et al [1], who observed 6.5% and 6% unsatisfactory smears. Biradar et al [11], had observed more unsatisfactory smears (14%) as compared to those in our study [Table/Fig-14].

Benign lesions showed a high female preponderance in the present study, because cystic lesions of the ovary were most commonly

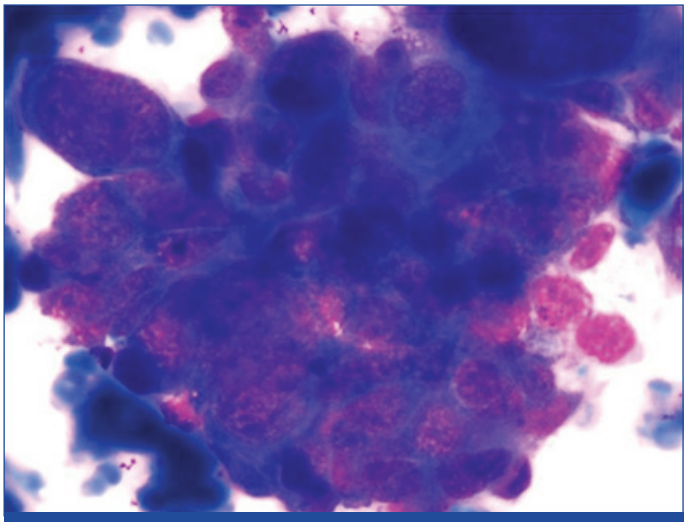
seen as benign lesions. There was no age or sex predilection for inflammatory lesions in the present study.

In the present study, adenocarcinomas were the most common malignant cell type (26.3%), followed by hepatocellular carcinoma (23%), renal cell carcinoma (4.7%), serous cystadenocarcinoma (4.7%) and nephroblastoma (2.7%). Poorly differentiated carcinomas constituted 19.6% of the lesions in the present study. This was in accordance with the observations which were made by Shamshad et al [14], and Aftab A. Khan et al [1], who observed 87.1% and 34% poorly differentiated carcinomas respectively. The second most common malignant type in these studies was hepatocellular carcinoma. In the liver, the most common malignant lesion was hepatocellular carcinoma (34), followed by metastatic carcinoma (25). In the western literature, the most common hepatic malignancy was metastasic carcinoma [4,6,18,19,20]. This could be because of the high prevalence of Hepatitis B infection and the consumption of chutney which was made up of groundnuts, which was frequently contaminated with aflatoxins, in this geographical region. The observations of the present study were similar to those of Indian studies, where hepatocellular carcinoma constituted the most common hepatic malignancy [3]. Two studies which were conducted in Kashmir showed observations which were similar to that of the western literature [1,14].

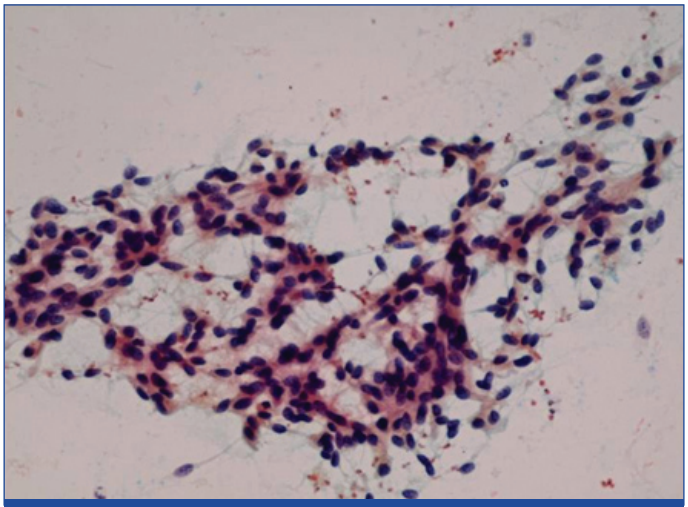
The liver constituted the major site for the malignant lesions, as observed by Aftab A. Khan et al [1], Stewart et al [5], Zawar MP et al [3], Nyman et al [12], Ennis and MacErlean [6], Joao Nobrega et al [4], and Nautiyal et al [2]. But in an observation which was made by Shamshad et al [14], and Joseph et al [8], the most common organ sites for the malignant lesions were the gallbladder and the pancreas respectively. Hepatocellular carcinoma was most commonly seen in males, in accordance with previous literature reports [3,20]. Hepatocellular carcinomas and adenocarcinomas had a peak incidence in the age group between 40-60 years, in accordance with the observations made by Shamshad et al [14], and Zawar MP et al [3]. Malignant tumours which were seen before 20 years of age, were nephroblastomas and other round cell tumours, Hodgkin's lymphoma, dysgerminoma and ganglioneuroblastoma. This observation was comparable to that of the previous literature reports [18,20].

Although few studies have reported complications like mild local pain, bleeding and tumour seeding of the needle tract, a vast amount of literature supports the safety of FNAC. There was no report on complications as a result of FNAC in the 20 papers which amounted to around 20,000 patients, including those of the present study.

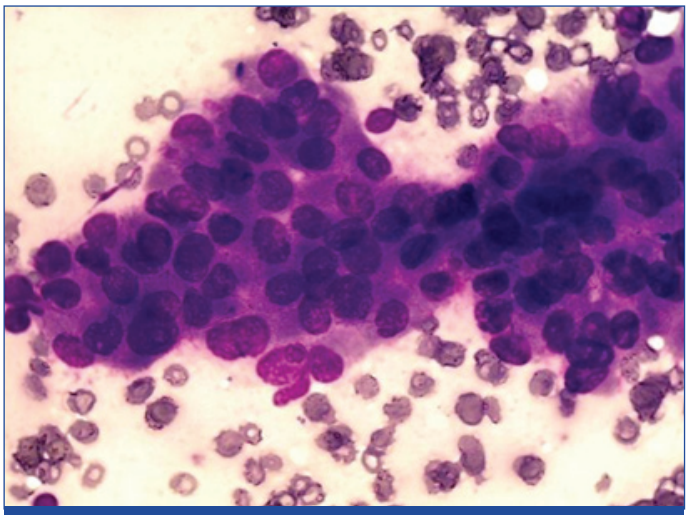
The sensitivity of USG guided FNAC ranged from 71.4% to 96.3%. In the present study, it was 94.1%, which was comparable to that of most of the studies. All the studies observed 100% specificity, as was found in the present study also. The diagnostic accuracy in various studies ranged from 83.9% to 100%. The present study found a diagnostic accuracy of 96.5%, which was comparable to that of most of the studies [Table/Fig-15-22].



[Table/Fig-20]: Adrenocortical Carcinoma



[Table/Fig-21]: Gastrointestinal Stromal Tumor



[Table/Fig-22]: Pheochromocytoma

CONCLUSION

Intra-abdominal FNA is a relatively simple, economical, quick and safe procedure for the diagnosis of intra-abdominal lesions. It not only helps in differentiating between inflammatory, benign and malignant lesions, but also in categorizing different malignant lesions. Intra-abdominal FNA is a reliable, sensitive and specific method with a high diagnostic accuracy for the diagnosis of malignant lesions. It can be utilized as a pre-operative procedure for the management of all intra-abdominal lesions.

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DECLARATION ON COMPETING INTERESTS:
No competing Interests.

Date of Submission: **Jan 04, 2011**
Date of Peer Review: **Apr 12, 2011**
Date of Acceptance: **Apr 15, 2011**
Date of Publishing: **Aug 08, 2011**