Original Article

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Pathology Section

Role of Image-Guided FNAC and Biopsy in Intra-abdominal and Pelvic Masses

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ABSTRACT

Introduction: Intra-abdominal masses present as a conundrum to clinicians. It is essential to determine their pathology before therapy can be instituted. The use of minimally invasive procedures like image-guided Fine Needle Aspiration Cytology (FNAC) and biopsy can help to avoid diagnostic laparotomy and is especially important for the diagnosis of impalpable and deep-seated lesions.

Aim: To find out the pathological spectrum of abdomino-pelvic masses with use of guided FNAC or biopsy.

Materials and Methods: This was a prospective study conducted over a period of January 2018 to June 2019 in a Tertiary Care Hospital in Greater Noida. In patients presenting with intra-abdominal or pelvic masses, detected clinically or radiologically, image-guided FNAC and/or biopsy was performed along with standard radiologic examination, and the slides were examined. Ultrasonography (USG) was used in 56 cases (96.6%) and Computed Tomography (CT) for the remaining 2 cases. The results were analysed using descriptive statistics.

Results: The 58 patients presenting with intra-abdomino-pelvic masses had a mean age of 49 years and consisted of 30 (51.7%) males. The most common site involved was liver (19 cases, 32.7%) followed by gastrointestinal tract (7 cases, 12.1%), urinary bladder (6 cases, 10.3%), gall bladder and ovary (5 cases, 8.6% each), kidney, prostate, uterus and lymph node (3 cases, 5.2% each) and miscellaneous abdomino-pelvic masses (4 cases, 6.9%). Malignant and premalignant lesions were detected in 50 (86.2%) patients, of which 29 cases (50%) were primary, 20 (34.5%) were metastatic and 1 (1.72%) was premalignant. Six benign (10.35%) and 2 non-neoplastic (3.45%) lesions were detected. Malignancies were found most commonly in the liver, comprising 31.0% of the study group. Adenocarcinoma was the most commonly detected primary (15 cases, 25.8%) as well as secondary metastatic malignancy (12 cases, 20.7%). Radio-pathological correlation was found to be 79.3% for the study and varied according to the site, from zero in prostatic lesions to 100% in renal and uterine lesions. Radiologic concordance was observed in 100% non-neoplastic, 66.7% benign and 72.4% malignant lesions.

Conclusion: Image-guided FNAC and biopsy are simple, rapid and inexpensive methods of arriving at a definite diagnosis, as radiology alone proves to be inadequate or erroneous in most of the cases.

Keywords: Abdominal mass, Fine needle aspiration cytology, Radiologically-guided

INTRODUCTION

Intra-abdominal masses have always posed a conundrum to clinicians. It is essential to determine their pathology before therapy can be instituted [1]. In most intra-abdominal and pelvic masses, the size, shape, extent and location of the lesion is not accurately determined by clinical examination alone, even if the mass is palpable. Moreover, such patients present with non-specific clinical findings like swelling or pain in the abdomen. Radiological examination often provides the first clue to their diagnosis and reveals masses in various intra-abdominal structures including liver, spleen, pancreas, stomach, gall bladder, intestines, omentum, mesentery, kidneys, adrenals, lymph nodes, soft tissues, uterus, ovary, urinary bladder and prostate [1-3].

In a majority of cases, USG and CT not only help to localise the lesion, but also act as pointers to the diagnosis. If they are used to simultaneously guide the pathologist towards the mass lesion, and ensure adequate sample collection, it proves to be a boon in resource-poor settings like India, by obviating the need for surgical procedures like diagnostic laparotomy. Image-guided FNAC and biopsy are especially important in deep-seated lesions, where diagnosis is postponed due to difficult access, leading to a delay in treatment. Most studies have shown that image-guided FNAC and biopsy are minimally invasive, safe and accurate diagnostic procedures with a low complication rate, with FNAC scoring higher on rapidity and cost-effectiveness [1-7] and biopsy on diagnostic accuracy and sensitivity [8-12].

Studies on image-guided FNAC and biopsy abound but are generally organ-specific. Studies involving the whole abdomino-pelvic region have been few, and none have focused on the radio-pathologic correlation and the extent to which these procedures have added to the radiologic diagnoses. This study was conducted to find out the pathological spectrum of abdomino-pelvic masses using radiologically guided FNAC or biopsy in patients attending a tertiary care hospital in north India and correlate the pathological features with radiological findings.

MATERIAL AND METHODS

This was a prospective study conducted in the Department of Pathology in collaboration with the Department of Radiodiagnosis in a Tertiary Care Centre in Greater Noida in north India from January 2018 to June 2019. A total of 58 patients presented with intra-abdominal and/or pelvic lumps, which were detected clinically or radiologically and they were included in this study. Permission for the study was obtained from Institutional Ethics Committee (IEC Number: SU/SMS&R/76-A/2018/86).

After complete history taking, clinical examination and investigations to rule out bleeding diatheses, informed consent was taken, and guided FNAC and/or biopsy was performed along with standard radiologic examination, the findings and diagnosis was noted. Regarding choice of the method of sample collection, efforts were made to procure specimens for both cytological and histological examination, with preference to biopsy where patient was unwilling

for both. FNAC alone was performed in cases where lesions were highly vascular or in cases where patients did not consent for biopsy. Both FNAC and biopsy procedures were performed in 6 cases (10.3%), biopsy alone in 44 cases (75.9%) and FNAC alone in 8 cases (13.8%). In most cases (56 cases, 96.6%), was done under ultrasonographic (USG) guidance, except in 2 cases where lesion was exceedingly small and inaccessible and CT was used.

FNAC was performed using a 10 mL syringe with 22-gauge needle in superficial lesions and spinal needle in deep lesions. Few smears were air-dried and few quickly fixed in 95% alcohol. The air-dried smears were stained with May Grünwald Geimsa stain and the wet-fixed smears with both Haematoxylin and Eosin (H&E) and Papanicolaou stains. Biopsy specimens were obtained using Biopsy gun, preserved in formal saline and histologic evaluation was performed by examining H&E-stained sections. Samples were described as either non-neoplastic or neoplastic, in which case they were classified as benign and malignant, the latter including premalignant lesions.

STATISTICAL ANALYSIS

Descriptive statistical analysis was done by using an Excel worksheet.

RESULTS

The age of the patients ranged from 16 to 76 years, with a mean age of 49 years. Male patients had a higher mean age compared to females (55.8 versus 44.8 years). All the patients above 50 years were found to have malignant lesions. There were 30 males (51.7%) and 28 females (48.3%) in the study group.

Malignant lesions predominated, accounting for 50 cases (86.2%), followed by benign and non-neoplastic lesions [Table/Fig-1]. Malignant lesions were commoner in males (96.7% versus 75%).

Site	Non-neo-plastic	Benign	Malignant	Number of cases	Percentage (%)
Liver	1	0	18	19	32.7
GIT	0	0	7	7	12.1
Urinary bladder	0	0	6	6	10.3
Gall bladder	0	0	5	5	8.6
Ovary	0	2	3	5	8.6
Kidney	1	0	2	3	5.2
Lymph node	0	0	3	3	5.2
Uterus	0	3	0	3	5.2
Prostate	0	0	3	3	5.2
Miscellaneous	0	1	3	4	6.9
Total	2	6	50	58	100
Percentage (%)	3.45	10.35	86.20	100	

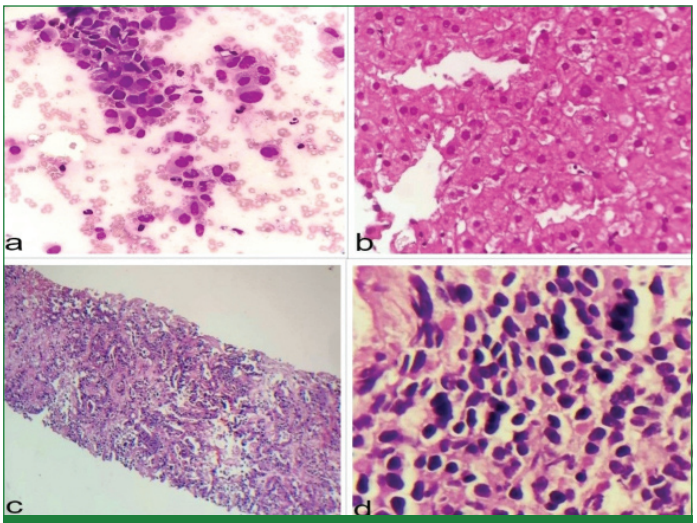
[Table/Fig-1]: Site-specific distribution of lesions.
GIT: Gastro-intestinal tract

Ten cases were diagnosed to be non-neoplastic inflammatory lesions on radiology, of which only 2 cases (3.4%) were found to be inflammatory on pathologic examination, namely hepatic abscess and chronic pyelonephritis. Thus, though radio-pathological correlation was absolute, a trend for overdiagnosis of non-neoplastic lesions is seen.

The study group included (6 cases, 10.35%) benign neoplasms, which comprised of uterine leiomyoma (3 cases, 5.2%), benign cystic neoplasms of ovary (2 cases, 3.4%) and pelvic spindle cell tumour (1.7%). Radiological concordance was observed in 4 (66.7%) cases.

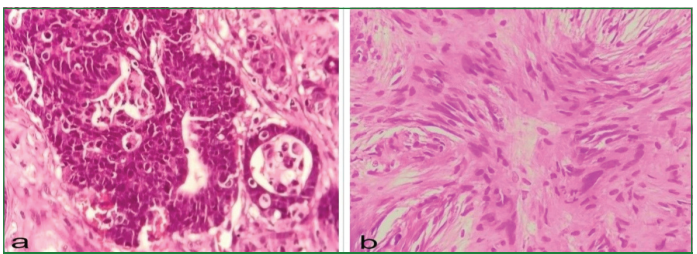
Malignant and premalignant lesions were detected in 50 (86.2%) patients, of which 29 cases (50%) were primary, 20 (34.5%) were metastatic and 1 case (1.72%) was premalignant. Malignancies were found most frequently in the liver, comprising 31.0% (18 cases) of the study group. The most commonly detected primary malignancy was adenocarcinoma (15 cases, 25.8%), chiefly found in the gastrointestinal tract (5 cases, 8.6%) and the commonest metastatic neoplasm was adenocarcinoma (12 cases, 20.7%), frequently metastasizing to the liver (8 cases, 13.8%). The histologic typing of malignancies could not be performed in six cases. The only premalignant lesion detected was prostatic intraepithelial neoplasia. Radiologic concordance was observed in 72.4% of the malignancies detected.

The most common site involved was the liver (19 cases, 32.8%) [Table/Fig-1]. Among the 19 hepatic lesions, 18 (94.7%) were malignant, 2 (10.5%) of which were diagnosed to be primary Hepatocellular Carcinoma (HCC) [Table/Fig-2a,b] and 16 (84.2%) as metastatic neoplasms. The metastatic neoplasms included 8 cases (42.1%) of adenocarcinoma [Table/Fig-2c], 3 cases (15.8%) of small cell carcinoma [Table/Fig-2d], 4 cases (21.1%) labelled as undifferentiated carcinoma, and 1 case (5.3%), which could not be characterised, and was labelled as malignant deposit. The single non-neoplastic lesion (5.3%) was an abscess, diagnosed both radiologically and cytologically. However, of the 18 malignant cases, radiological diagnosis was primary HCC in five cases metastasis in 11 cases, inconclusive in one case, and one case was erroneously diagnosed as an abscess. FNAC alone was performed in six cases, biopsy alone was performed in ten cases and both the modalities were used in three cases.



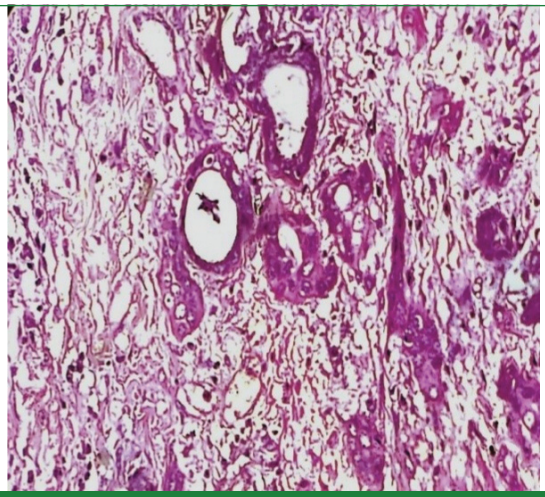
[Table/Fig-2]: Pathologic lesions of liver a) Cytology smears of hepatocellular carcinoma showing large polygonal cells with granular eosinophilic cytoplasm and pleomorphic nuclei (MGG, x400); b) Hepatocellular carcinoma showing large polygonal cells with granular eosinophilic cytoplasm and pleomorphic nuclei (H&E, x400); c) Metastatic adenocarcinoma in liver showing glands arranged in an acinar pattern (H&E, x100); d) Small cell carcinoma metastatic to liver showing small, round to oval cells with moulding, scant cytoplasm, hyperchromatic nuclei and finely dispersed granular chromatin (H&E, x400).

Gastrointestinal lesions comprised (7 cases, 12.1% of abdominal mass lesions and consisted of (1 case, 14.3%) gastric, duodenal (2 cases, 28.6%) and (4 cases, 57.1%) colonic lesions. All the cases were primary malignancies and included (5 cases, 71.4%) adenocarcinomas [Table/Fig-3a], 1 (14.3%) gastrointestinal stromal tumour [Table/Fig-3b] and 1 (14.3%) undifferentiated malignancy.



[Table/Fig-3]: Pathologic lesions of the gastrointestinal tract: a) Adenocarcinoma colon showing tumour cells disposed in acinar clusters and cribriform sheets. Individual cells have high N:C ratio, conspicuous nucleoli and abundant pale to eosinophilic cytoplasm. (H&E, x400); b) Gastrointestinal stromal tumour (GIST) stomach showing spindle cells arranged in whorls with anisonucleosis (H&E, x400).

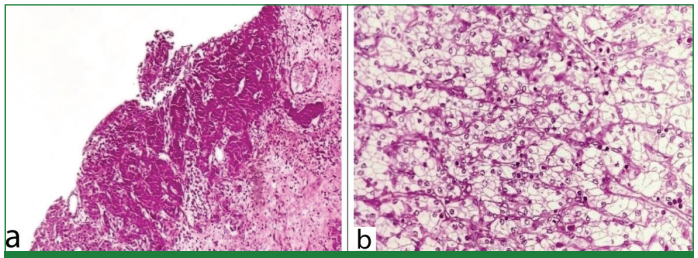
Gall bladder lesions were detected in 5 cases (8.6%), all of which were diagnosed as malignant on guided biopsy, which included 4 cases (80%) of adenocarcinoma [Table/Fig-4] and 1 case (20%) of cholangiocarcinoma. The female to male ratio was 1.5:1.



[Table/Fig-4]: Adenocarcinoma gall bladder showing well-formed glands with wide lumina and lined by atypical cuboidal cells (H&E, x400).

Ultrasound-guided biopsies were performed in all the six urinary bladder masses (10.3%) included in this study, five of which had been diagnosed as malignant radiologically, of which two could be categorised as urothelial carcinoma on radiology alone. Histopathology helped characterise them further into papillary urothelial carcinoma (2 cases, 33.3%) [Table/Fig-5a] urothelial carcinoma with squamous differentiation (2 cases, 33.3%), urothelial carcinoma with glandular differentiation (1 case, 16.7%) and adenocarcinoma (1 case, 16.7%).

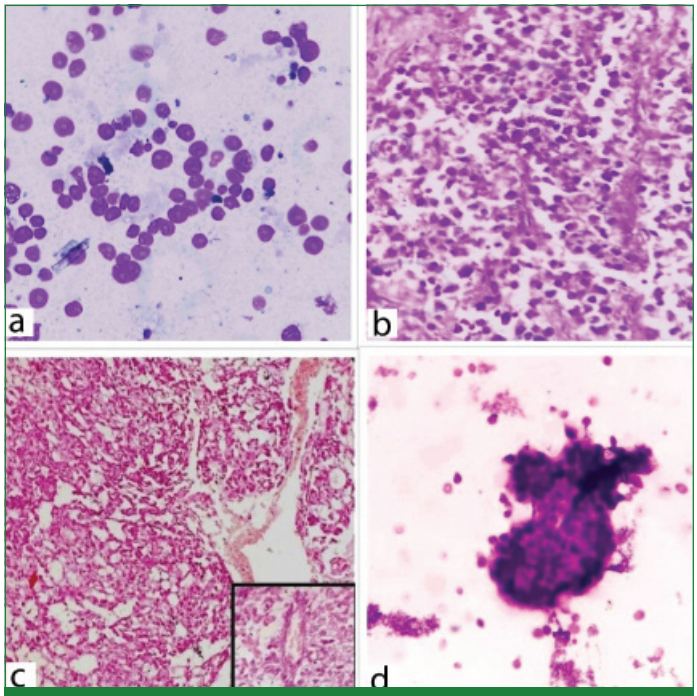
The 3 renal masses (5.2%) included in this study were diagnosed radiologically to be chronic pyelonephritis in 1 case (33.3%) and malignancy in 2 cases (66.7%), both of which were diagnosed to be renal cell carcinoma of the clear cell type by ultrasound-guided biopsy [Table/Fig-5b].



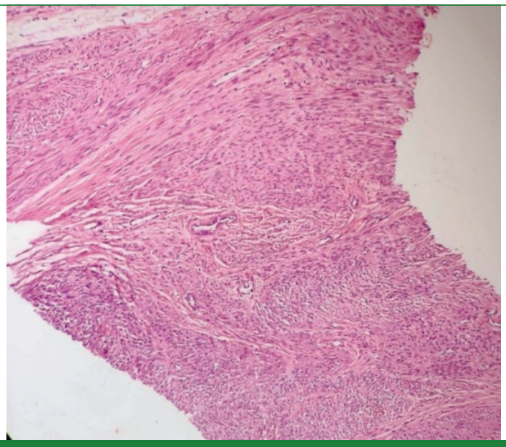
[Table/Fig-5]: a) High grade urothelial carcinoma showing fused, branching, and delicate papillae (H&E, x100); b) Clear cell renal cell carcinoma showing uniform cells with characteristic network of small, thin walled, "chicken wire" vasculature. Cells have clear cytoplasm uniform round nuclei (H&E, x400).

Five ovarian masses (8.6%) were included in this study. Radiology diagnosed one case as dermoid cyst, two cases as malignancy, (one of which was diagnosed as dysgerminoma on guided FNAC and mixed germ cell tumour on biopsy) [Table/Fig-6a-c] and was inconclusive in two cases, 1 (20%) of which was diagnosed as serous cystadenoma on guided FNAC [Table/Fig-6d], USG-guided FNAC provided a diagnosis in two of the 3 cases (66.7%) in which it was performed. USG-guided biopsies were performed in four cases; it confirmed the diagnoses of 1 case (20%) of dermoid cyst and diagnosed 1 case each (20%) of mixed malignant germ cell tumour, serous cystadenocarcinoma and mucinous cystadenocarcinoma. The study included 3 (5.2%) uterine mass lesion, all of which were correctly diagnosed as leiomyoma by USG and confirmed by guided biopsy [Table/Fig-7].

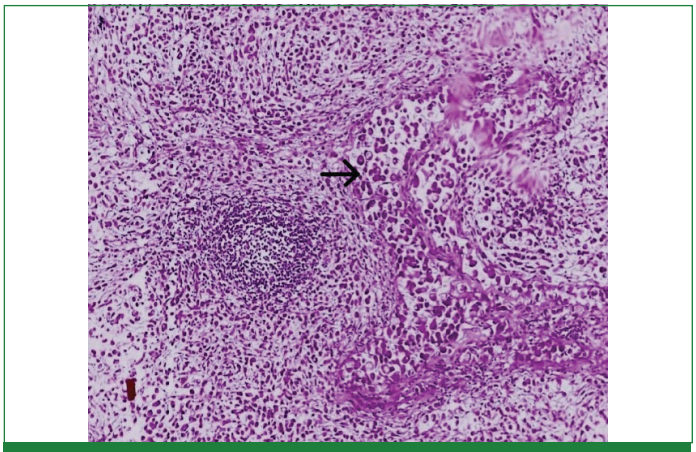
The 3 patients (5.2%) presenting with intra-abdominal lymphadenopathy were diagnosed by ultrasound-guided biopsy as one case of primary lymphoma and two cases of metastatic deposit, which were further characterised as metastatic adenocarcinoma and metastatic signet ring cell respectively [Table/Fig-8].



[Table/Fig-6]: Pathologic lesions of the ovary; a) Cytological smear of dysgerminoma ovary showing uniformly medium sized, round to oval and centrally located nuclei with vesicular or finely granular chromatin prominent single or multiple nucleoli. Nuclear membrane shows angulated, squared off borders (MGG, x400). b) Dysgerminoma component of mixed germ cell tumour of ovary showing nests of large, uniform polygonal cells with clear or eosinophilic cytoplasm and distinct squared off cell membranes. Tumour separated by fibrous septae containing lymphocytes (H&E, x400); c) Yolk sac tumour component of mixed germ cell tumour of ovary showing microcystic pattern; inset showing Schiller–Duval body (H&E, x100); d) Cytological smear of serous cystadenoma ovary showing papillary aggregates of the cuboidal or columnar epithelial cells showing bland nuclei in a background of foamy histiocytes and scattered inflammatory cells (MGG, x100).



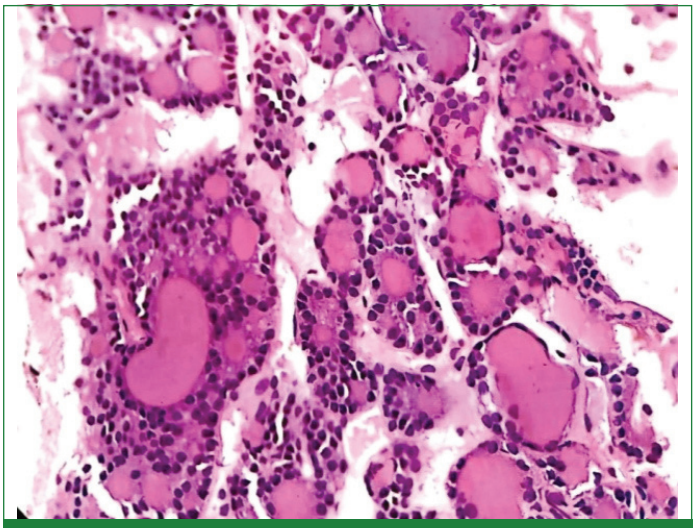
[Table/Fig-7]: Leiomyoma uterus showing whorled (fascicular) pattern of smooth muscle bundles (H&E, x100).



[Table/Fig-8]: Signet ring carcinoma (arrow) metastatic to lymph node (H&E, x100).

All the three radiologically diagnosed prostatomegaly cases (5.2%) turned out to be malignant on guided biopsy, two of which were reported as acinar adenocarcinoma and one as prostatic intraepithelial neoplasia.

The origin of 4 lesions (6.9%) could not be determined and were labelled as miscellaneous abdominopelvic masses. Of these, 3 cases (5.7%) were probably metastatic deposits [Table/Fig-9].



[Table/Fig-9]: Well-differentiated adenocarcinoma pelvis showing cells arranged in glandular pattern and filled with colloid like eosinophilic material lined by cuboidal epithelium (H&E, x400).

Of the six cases in which both FNAC and biopsy were performed, biopsy aided in diagnosis of two cases diagnosed as inconclusive and two cases erroneously diagnosed on FNAC, and contributed to histologic typing in the remaining two cases.

Radio-pathologic correlation varied greatly depending based on site, ranging from zero in prostatic lesions to 100% in renal and uterine lesions [Table/Fig-10]. Radio-pathologic concordance was noted in 46 cases, if the three broad categories were considered. Thus, overall correlation for this study was 79.3%. Radiology was inconclusive in 4 cases (6.9%) (one each in liver, ovary, urinary bladder, and abdominal mass), three of which turned out to be malignant and one a benign neoplasm. In the remaining, 8 cases (13.8%), radiological diagnosis was found to be erroneous, and lesions categorised as non-neoplastic on radiology (three cases diagnosed as prostatomegaly and one each as liver abscess, perforated gall bladder, pancreatic pseudocyst, inflammatory lymphadenopathy and peritoneal abscess) were diagnosed as malignant on guided FNAC/biopsy.

Site	Radio-pathologic correlation	
	Number of cases	Percentage (%)
Liver	17	89.5
Gastro-intestinal tract	6	85.7
Urinary bladder	5	83.3
Gall bladder	4	80
Ovary	3	60
Renal	3	100
Lymph node	2	66.7
Uterus	3	100
Prostate	0	0
Miscellaneous	3	75
Total	46	79.3

[Table/Fig-10]: Radio-pathologic correlation.

No postprocedure complications were observed in this study

DISCUSSION

Studies on image-guided biopsy abound, but those involving the whole abdomino-pelvic region have been few [8-10,12] and these have mainly focused on the technique from the interventional radiologists' point of view [9,12] or have tried to assess the safety of the method, focusing on complications [12]. Correlation between radiological and pathological diagnoses has sometimes been a by-product but never the aim of such studies [9,10]. The few studies based on image-guided FNAC in abdomino-pelvic region have tried to assess the diagnostic efficacy but none have focused on the extent to which these procedures have contributed to the final diagnoses [1-7].

In this study, the mean age of patients presenting with abdominal masses was 49 years, which correlated well with some studies [3,5] and was slightly lower than that of others [12]. The higher age of presentation in male patients has also been noted in other studies [12]. A male predominance has been noted in studies which have not included the female genital tract [4,12], whereas those that have included the ovary have generally shown a female preponderance [1-3]. The reverse phenomenon of male predominance in a study group that included female genital organs points to a lack of motivation of the gynaecologists for this simple and accurate diagnostic modality, and needs to be corrected.

Malignant lesions predominated, accounting for 84.5% cases, which correlated with, but was higher than the studies by by Sidhalingareddy and Andola SK, Hemalatha AL et al., Islam T et al, Sumana BS and Bharathi M, Schiavon LHO et al, which showed 64.6%, 64.5%, 52.6% 67.74% and 67.6% malignant cases respectively.[2-4,6,12] The higher prevalence of malignant lesions in males, similar to studies by Sidhalingareddy and Andola SK, can be explained by the higher average age in males [2].

The most commonly sampled organ was the liver, comprising 32.7% of the cases in this study, which corroborated with most other studies [1-4,6-8,10-13], though the exact proportion cannot be compared due to differing design and inclusion criteria of the various studies. It was the only organ in which both FNAC and biopsy were extensively performed under image-guidance. Malignant lesions predominated, comprising 94.7% cases, similar to other studies on mass lesions of the liver, where the proportion of malignancy varied from 40% [4] to 95.3% [14]. The majority of malignant lesions in this study were metastatic deposits, comprising 84.2% cases, while primary HCC comprised only 10.5% cases. This was similar to some studies [1], and differed from others, where HCC was the predominant lesion [1-3,13]. HCC was the only primary neoplasm diagnosed in this study, which differed from other studies, where other benign neoplasms like hepatic adenoma, bile duct adenoma, focal nodular hyperplasia and malignant ones like cholangiocarcinoma, hepatoblastoma were detected [4,13]. The commonest metastatic malignancy was adenocarcinoma, comprising 42.1% cases, similar to the study by Islam T et al., and Parahjuli S et al., [4,13]. The only non-neoplastic lesion diagnosed was one case of hepatic abscess, similar to another study [4].

Diagnostic accuracy of FNAC in hepatic lesions was 66% and of biopsy was 100% which was comparable to another study [14]. Many researchers have emphasise the increased diagnostic and subtyping accuracy of liver malignancies, if both FNAC and biopsy are used concomitantly [6,13,14]. The study noted the same, where histopathological examination helped in detection of malignancy in a case diagnosed as abscess on cytology, and helped in subtyping in two cases diagnosed as metastatic malignancy on cytology. Radio-pathological correlation was observed in 89.5% case of hepatic lesions, if broad categories are considered, but a lack of concordance in the subcategorisation of lesions was observed.

The predominance of malignant gastrointestinal neoplasms, chiefly adenocarcinoma, corresponded to other studies where percutaneous sampling was undertaken. However, other studies have also detected non-neoplastic lesions, like tuberculosis and appendicitis [1,13]. On the other hand, studies where endoscopic

ultra-sound guided sampling was undertaken showed the predominance of Gastrointestinal Stromal Tumours (GISTs) among malignant neoplasms and also numerous non-neoplastic lesions and benign neoplasms like leiomyoma, schwannoma and benign cystic teratoma [15,16]. This could be explained by the fact that percutaneous USG-guided biopsy is generally reserved for mass lesions where malignancy is suspected, while endoscopy is performed in others [15,16].

All the cases presenting as lesions of gall bladder and extrahepatic biliary tract were diagnosed through ultrasound-guided biopsy, similar to the study by Chojniak R et al., [11]. The present study demonstrated a female predominance in gall bladder cancers, which is a universal finding [17,18]. The commonest malignancy in the gall bladder has consistently been shown to be adenocarcinoma, which was reflected in this study [1-4,11,17,18]. The study have also diagnosed a case of cholangiocarcinoma, which presumably arose from the extrahepatic bile duct. Occasional cases of cholangiocarcinoma have similarly been diagnosed in other studies [6,16]. Mass lesions of the urinary bladder are absent in most studies involving the pelvic region, possibly because urinary bladder masses are routinely assessed by cystoscopic biopsy [3]. Similar to present study, in which all cases were malignant, malignancies dominated in the studies by Butros SR et al., [19]. However, in this study, metastatic lesions were detected, all the primary malignancies were urothelial carcinomas and 33.3% cases were benign, in contrast to this study, where secondary malignancies were not observed and a variety of primary malignancies were detected, 83.3% of them being urothelial carcinoma [19].

Renal masses, which comprised 5.2% cases of this study, have been observed in studies on image-guided FNAC/biopsies of the abdomen or retroperitoneum [1,2,4,6-12]. Similar to most studies conducted on renal masses, ultrasound-guided biopsies performed in this study demonstrated a predominance of malignant cases [20,21], the most common tumour being renal cell carcinoma [20,21]. However, the study did not detect any benign tumours and the only benign lesion was a case of chronic pyelonephritis [21], possibly because of the low sample size. Ovary, like the liver, is an organ in which both FNAC and biopsy were used, at times concomitantly and its lesions have been documented in many studies [1-3,13]. The study could diagnose a case of serous cystadenoma by guided-FNAC, although studies have shown that cystic tumours are difficult to diagnose by aspiration as compared to solid tumours [22]. The study demonstrates a pitfall of FNAC, the inability to sample and diagnose heterogenous tumours, which has been noted in other studies [22]. The predominance of malignancies (60%) differs from most studies [23,24], while that of epithelial neoplasms (60%) [22-24], chiefly serous tumours, is similar to other studies [22-24]. Image-guided FNAC and biopsy were able to contribute to the diagnosis in 80% cases and led to a change in management in 40% cases where radiology was inconclusive. Of the two modalities, biopsy was found to be more accurate in diagnosis as it could avoid the pitfalls due to tumour heterogeneity.

Studies on abdominal retroperitoneal, or pelvic masses have detected the presence of intra-abdominal lymph nodes through image-guided FNACs [1-4,6,7,13,25,26] and biopsies [10]. Many of these have documented a high proportion of malignant cases, similar to this study [25,26]. Most studies on lymph nodes have documented a higher proportion of non-hodgkin lymphomas [1,26], whereas some, like this study have documented metastatic carcinoma [25]. Inconsistencies, like the absence of inflammatory, especially tubercular lesions, found in most studies [1,25,26], can be explained on the basis of the small number of samples from lymph nodes in this study. It was observed that radiology was unable to detect malignant and premalignant lesions prostatic lesions, and diagnostic accuracy improved with the use of biopsy.

Occasional studies compare the diagnostic accuracy of image-guided biopsy and FNAC in abdominal masses [8,11]. Isler RJ et al., found cytology to be more sensitive but biopsy to be more specific [8]. The present study was refrained from deriving statistical data on cyto-histopathologic correlation due to the small number of cases in which both the procedures were performed. Image-guided FNAC and/or biopsy led to a drastic change in treatment in 22.4% cases. Biopsy contributes to the histological subtyping, which leads to accurate prognostication. However, the study is limited by its small sample size. In the absence of both FNAC and biopsy specimens in all patients, cyto-histopathologic correlation could not be evaluated. Further studies are required to explore the radio-cyto-histopathologic correlation of abdominal and pelvic lesions.

CONCLUSION(S)

Thus, the study conclude that guided FNAC and biopsy are simple, rapid and inexpensive methods of arriving at a definite diagnosis, as radiological examination alone proves inconclusive or leads to misdiagnosis in more than 20% cases. This provides help in guiding therapy and often leads to a complete change in the management protocol. Hence, image-guided FNA and biopsy should be advised for proper diagnosis and treatment.

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