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Original Article

Pathology Section

Clinicopathological Correlation of Abdominal Lesions for Assessment of Diagnostic Efficacy of Minimally Invasive Techniques

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ABSTRACT

Introduction: Evaluation of abdominal masses may pose difficulty in surgical practice. Distinction between malignant, benign and inflammatory lesions is vital for patient's management. Hence, use of minimally invasive techniques under radiological guidance with pathological correlation is gaining popularity as a means of diagnosing abdominal lesions.

Aim: To assess the pathological spectrum of abdominal lesions and to determine the diagnostic efficacy of minimally invasive techniques.

Materials and Methods: Total 102 consecutive patients with clinically or radiologically diagnosed abdominal lesions excluding pelvic masses were evaluated by minimal invasive techniques like direct or guided Fine Needle Aspiration Cytology (FNAC) by 22-24 gauge needle and Tru-cut biopsy (TCB) by Geotex automated gun with 18 gauge needle. Statistical analysis was done by 2x2 contingency table by comparing the test diagnosis with the gold standard diagnosis.

Results: Majority (n=32) of lesions were from liver (31.3%) among which metastatic carcinomas were most common followed by primary, next in frequency belonged to gall bladder 17 (16.6%). Among all abdominal lesions, maximum cases were malignant followed by benign and inflammatory. sensitivity, specificity, positive predictive value, negative predictive value and overall diagnostic accuracy of FNAC and TCB were 100% each and 90%, 100%, 100%, 83.3%, 93.3% respectively. No serious complications were observed after these procedures.

Conclusion: Minimally invasive techniques are simple, safe and efficient procedures for making an accurate diagnosis in abdominal lesions and helps in choosing the appropriate management.

Keywords: Fine Needle Aspiration Cytology (FNAC), Radiologically guided, Space occupying lesions (SOL) ,Tru-cut biopsy (TCB)

INTRODUCTION

Intra-abdominal lesions are a challenge in surgical practice. Diagnosis is dependent upon the use of ancillary tools like percutaneous sampling and advanced radiological imaging that have enabled the detection and localisation of lesions in sites not easily accessible to surgical biopsies [1].

Currently, Fine Needle Aspiration Cytology (FNAC) using 20-25 gauge needles and Fine Needle Core Biopsy (FNCB) using wide bore 18 gauge needle or Tru-cut biopsy needle are commonly accepted methods for obtaining diagnostic material under radiological guidance. Both techniques are safe, simple, rapid and efficacious diagnostic modalities in providing cytological and histological diagnosis in various space occupying lesions of abdomen [2].

Fine needle Tru-cut biopsies (TCB) provide better sample quality and lower insufficient sampling rate without an increase in the complication rate. Biopsies in addition have an advantage of preservation of tissue architecture necessary for diagnosing and sub typing of tumours. Further histochemical and immunohistochemical techniques can be applied wherever required [2,3].

Complications like haemorrhage, septicaemia, peritonitis, pneumothorax and tumour seedlings after FNAC though rare are reported in literature [4].

Cytological and histological examinations are complementary in assessment of abdominal lesions. However, there are conflicting data in literature regarding the accuracy and usefulness of these techniques. Few clinicians prefer FNAC and recommend biopsy in diagnostically challenging cases, while others recommend core biopsy alone. These discrepancies may be due to variations in the type and location of lesion being aspirated or biopsied [2].

A multi-modal approach with good clinical, radiological and cyto-histological approach is recommended to improve diagnostic accuracy. Thus, the present study was undertaken to assess the pathological spectrum of abdominal lesions with clinico-pathological correlation and to determine the diagnostic efficacy of minimally invasive techniques in abdominal lesions.

MATERIALS AND METHODS

A retrospective and prospective study was conducted in Department of Pathology, Subharti Medical College and the associated CSS Hospital over a period of 3 years (September 2012 to August 2013). Patients with normal coagulation profiles were included. Lesions having high vascularity or close proximity to major vessels, inadequate material for diagnosis or FNAC/TCB of pelvic organs were excluded.

For retrospective study, cases in which minimally invasive techniques like FNA cytology and / or Tru-cut biopsy (TCB) had been done were retrieved from the archives of Department of Pathology. Relevant history and radiological findings were obtained from the Medical Record Department (MRD). For prospective study, consent was taken before FNAC/ TCB procedure. Relevant clinical history and physical examination findings were recorded. Radiological examinations-Ultrasonography (USG) or Computerized Tomography (CT-scan) was performed to assess the origin of abdominal mass and its relationship to adjacent organs. Taking aseptic precautions percutaneous FNAC was done with 22-24 gauge needle while for deep seated lesions 22 gauge lumbar puncture needle was used. On an average depending on size and consistency of lesion 2-3 needle passes were made in each case to obtain adequate material. Air dried smears and wet fixed smears in 95% alcohol were prepared. Air dried smears were stained with Leishman-Geimsa (L-G) stain and wet fixed smears were stained by Hematoxylin-Eosin (H&E) and Papanicolaou (Pap) stain.

Tru-cut biopsy was done by Geotex Tru-cut automated gun with an 18 gauge needle under radiological guidance. The biopsies were fixed in 10% formalin, Grossing was done and tissue processed by conventional histo processing in automated tissue processor Shandon Citadel 2000. The paraffin embedded blocks were cut at 4µ, serial sections taken and stained by routine H&E staining technique in automatic Thermo Scientific Varistain Gemini ES.

The cases were analysed based on cytological and histological features. The final diagnosis was provided with clinico-radiological correlation. Statistical analysis for sensitivity, specificity, positive predictive value, negative predictive value and overall diagnostic accuracy was done by 2x2 contingency table by comparing the test diagnosis with the gold standard histopathological diagnosis.

RESULTS

The present study included material obtained from minimally invasive techniques in 102 cases during the study period, which included FNAC from 95 patients and Tru-cut biopsies from 20 patients. Among these, in 10 cases both FNAC and TCB were done. Excised specimen was available in 24/102 cases, including 19/95 FNAC and 15/20 TCB cases. Patient age ranged between 2 - 82 years, with a mean age of 45. Of these 57 (55.88%) were males and 45 (44.11%) were females with a sex ratio of 1.2:1. These patients presented with various clinical symptoms, most common was abdominal pain followed by lump, fever, vomiting, icterus, haematuria, oliguria and constipation.

Analysis of organ/site wise distribution of abdominal lesions were done and majority of cases were from liver 32(31.3%) followed by gall bladder 17(16.6%) [Table/Fig-1]. Clinico-radiological discordance was seen in 13/95(13.68%) cases of FNAC of which excised specimen were available in 4 cases [Table/Fig-2] and 7/20(35%) of TCB of which excised tissue was there in 5 cases [Table/Fig-3]. IHC was recommended in metastatic and unclassifiable tumours.

Of total 102 cases, FNAC was done in 95 cases of which excised tissue was available in 19 cases. Sensitivity, specificity, positive predictive value, negative predictive value and overall accuracy of FNAC were 100 % each. TCB was done in 20 cases of which excised tissue was available in 15 cases. Sensitivity, specificity, positive predictive value, negative predictive value and overall accuracy of TCB were 90 %, 100%, 100 %, 83.3% and 93.3% respectively.

Except mild pain and discomfort in few cases no serious complications were observed after both the procedures in our study.

DISCUSSION

Evaluation of abdominal masses may pose difficulty in surgical practice. Distinction between malignant and non-malignant lesions and particularly inflammatory is vital for patient's management [5].

Clinical presentation associated with malignancy can be misleading at times. Use of imaging techniques alone may fail to allow distinction between benign and malignant lesions on the basis of morphological features. Hence, radiologically guided minimally invasive techniques are gaining popularity as a means of diagnosing abdominal lesions with high sensitivity and low complication rates.

A clinicopathological correlation of abdominal lesions was done in 102 patients to assess the diagnostic efficacy of minimally invasive techniques.In our study, M:F ratio of 1.2:1 was observed which was consistent with studies done by Tuladhar AS et al., [6]. Sensitivity, specificity, diagnostic

Organ/ Site	Diagnosis on Minimally Invasive Techniques	No. of Cases		Percentage%	
		FNA	TCB	Overall	Sitewise
Liver (N=32)	Metastatic carcinomas	21	01	20.58	65.62
	Primary tumours	07	-	6.86	21.87
	Cirrhotic changes	-	02	1.96	3.12
	Abscess	02	-	1.96	3.12
Gall Bladder (N=17)	Adenocarcinoma	12	01	12.74	76.47
	Unclassifiable malignant tumour	04	-	3.92	23.52
GIT (N=07)					
1.Colonic Mass	Signet ring cell adenocarcinoma	01	-	0.98	14.28
	Chronic enterocolitis	01	-	0.98	14.28
	Chronic abscess with extensive fibrosis	01	01	0.98	14.28
2.Rectosigmoid	Adenocarcinoma	02	01	1.96	28.57
3.Stomach+ Omental Nodule	Adenocarcinoma with omental deposits	01	-	0.98	14.28
4.Jejunum	Adenocarcinoma	01	-	0.98	14.28
Kidney (N=09)	Renal cell carcinoma (RCC)	02	02*	1.96	22.22
	Transitional cell carcinoma (TCC)	02	02	1.96	22.22
	Nephroblastoma	-	01	0.98	11.11
	Chronic pyelonephritis	02	02	1.96	22.22
	Suppurative inflammation-Abscess	01		0.98	11.11
Iliac Mass (N=09)	Neoplastic	06		5.88	66.66
	Non neoplastic	03		2.94	33.33
Retropritoneal Mass (N=04)	*Paraganglioma (on FNAC)/ Small round cell tumour (on TCB)	01	01	0.98	25
	Metastatic small cell type of malignant tumour	01	-	0.98	25
	Neoplastic- could be lymphoma	01	-	0.98	25
	*Mesenchymal tumour (on FNAC) / Neurofibroma (on TCB)	01	01	0.98	25
Abdominal Scar & Subcutaneous Nodule (N=04)	Metastatic Adenocarcinoma	02	-	1.96	50
	Benign skin adnexal tumour	01	-	0.98	25
	Necrotizing tubercular inflammation	01	-	0.98	25
Omental Mass (N=03)	Sarcoma/metastatic anaplastic tumour	01	-	0.98	33.33
	Necrotizing tubercular inflammation	02	-	1.96	50
Mesentric Mass (N=02)	Small round cell tumour - endocrinal type	-	01	0.98	50
	Chronic inflammation	01	01	0.98	50
Abdominal Mass Lesions from Different Regions of Abdomen (N = 13)					
Anterior Abdominal Lump (N=04)	Endocrinal type of tumour	01	01	0.98	7.69
	*Mesenchymal tumour (FNAC) / Desmoid tumour (TCB)	01	01	0.98	7.69
	Benign mesenchymal cells	01	-	0.98	7.69
	Hemorrhagic lesion	01	-	0.98	7.69
Peri-Umbilical (N= 04)	Metastatic poorly differentiated carcinoma	01	-	0.98	7.69
	Metastatic germ cell tumour	01	-	0.98	7.69
	Epidermal inclusion cyst	01	-	0.98	7.69
	Chronic granulomatous inflammation	01	-	0.98	7.69
Epigastric (N=02)	Poorly differentiated malignant tumour	01	-	0.98	7.69
	Malignant giant cell tumour	01	-	0.98	7.69

Hypogastric(n=0)	Acute suppurative inflammation	01	-	0.98	7.69
Hypochondrium (N=1)	Necrotising lesion	01	-	0.98	7.69
Lumbar (n=01)	Paracytic cyst	01	-	0.98	7.69
Spleen (n=01)	Chronic splenic congestion	-	01	0.98	0.98
Peritoneal Deposit (n=01)	Chronic granulamatous inflammation	01	-	0.98	0.98
Total	-	95	20	100	-

[Table/Fig-1]: Pathological spectrum of abdominal lesions on the basis of FNAC and TCB
*In four cases, diagnosis on FNAC and TCB were different.

S. No	Clinico- Radiological Diagnosis (Site)	FNAC Diagnosis	Excised Specimen Histopathological Diagnosis
1	Tubercular lymphadenitis	Highly Anaplastic poorly differentiated tumour could be pleomorphic sarcoma	Pleomorphic sarcoma
2	Carcinoma Caecum	Suggestive of suppurative lesion	Pericaecal organized chronic abscess with extensive fibrosis
3	? Neurofibromatosis (Retroperitoneum)	Suggestive of mesenchymal tumour	Malignant peripheral nerve sheath tumour (MPNST)
4	? Malignancy (Colonic mass)	Chronic enterocolitis	Hypertrophic type of tubercular enterocolitis with lymphadenitis and peritonitis

[Table/Fig-2]: Non-concurrent cases on FNAC, Clinico-radiological diagnosis, and excised tissue diagnosis.

S. No	Clinico Radiological Diagnosis	Tru-Cut Biopsy Diagnosis	Excised Tissue Diagnosis
1	Paraganglioma (Retroperitoneum)	Small round cell tumour	Paraganglioma
2	Neurofibromatosis (Retroperitoneum)	Suggestive of Neurofibroma	Malignant peripheral nerve sheath tumour (MPNST)
3	Mesentric cyst	Chronic non specific lymphadenitis	Caseating granulomatous inflammation consistent with tubercular (TB) etiology
4	Malignancy- mesenteric mass of tranverse colon	Small round cell tumour appears to be endocrinal type	Paraganglioma
5	Carcinoma caecum	Suggestive of chronic abscess with extensive fibrosis	Pericaecal organized chronic abscess with extensive fibrosis
6	Malignancy liver	Cirrhotic change secondary to viral etiology	-
7	Carcinoma lung with liver metastasis	Lobular disarray suggesting cirrhotic changes	-

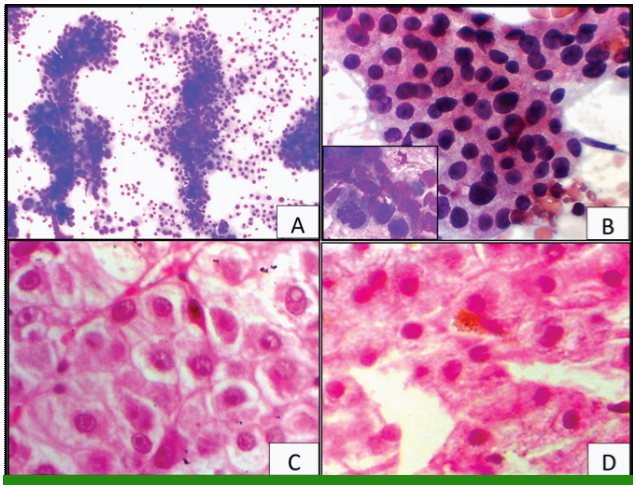
[Table/Fig-3]: Non con-current cases on TCB and Clinico-radiological diagnosis and excised tissue diagnosis where available.

accuracy, positive predictive value and negative predictive value of FNACand TCB correlated with other studies [3,7,8]. Also it is noted that sample size can affect the statistical values.

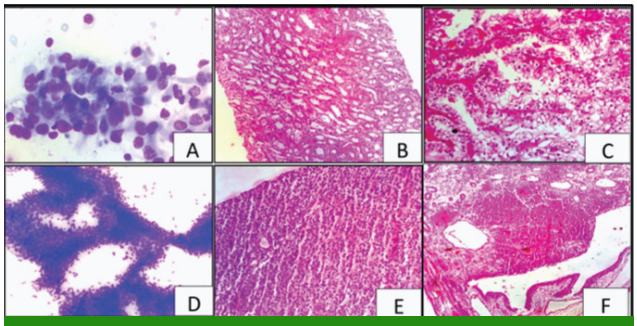
Liver (31.3%) was the most common organ followed by gall bladder (16.6%), kidney (8.82%) and least were stomach and jejunum (0.92%) each, from which FNAC/TCB were done. In liver, metastatic carcinoma (20.58%) was most common in our series followed by primary tumours. These correlated with Shobha R et al., [3] and Adhikari RC et al., [9]. In contrast, Sidhalingreddy et al., [7] found hepatocellular carcinoma (HCC) to be more common. This could be due to high prevalence of Hepatitis B infection and consumption of ground nuts chutney frequently contaminated with afla toxins in that geographical region.

Among metastatic carcinomas to liver, adenocarcinoma from gall bladder was the most common, in the present study. In contrast, Soyuer I et al., [10] observed that lung, GIT and breast were common sites. Among five unclassified cases of metastatic carcinoma one was poorly differentiated large cell type carcinoma [Table/Fig-4a-b], four unclassifiable malignant tumours on FNAC. IHC was recommended to differentiate between primary and metastatic carcinomas. Cytological examination alone may not differentiate between primary and secondary hepatic malignancies. Therefore, histopathological examination, cell blocks and correlation with serum αfetoprotein (AFP) levels are helpful [11,12].

Two cases clinico-radiologically suspicious of malignancy revealed cirrhotic changes on TCB [Table/Fig-4c-d]. Hepatitis, focal nodular hyperplasia (FNH) and active cirrhosis



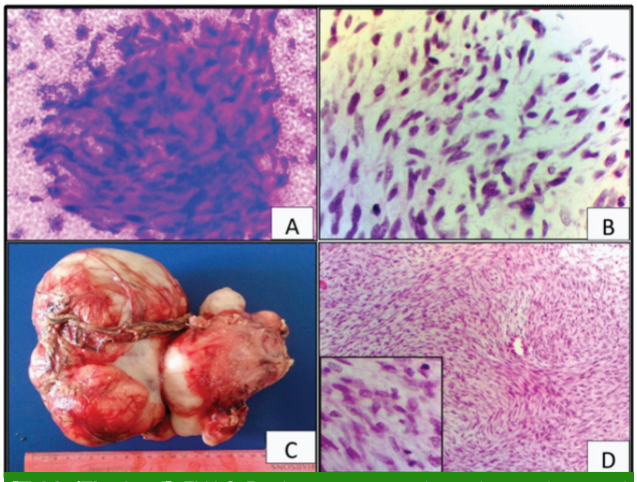
[Table/Fig-4a-d]: Liver FNAC: Large cell poorly differentiated carcinoma. (a) Tumour cells admixed with normal hepatocytes (LG, X4); (b) Highly pleomorphic cells (Pap, X 400) Inset shows mitotic figure (LG, X 400).
c&d-TCB -Liver Cirrhosis. (c), Ballooning degeneration & Intranuclear inclusions (d) Biliary stasis (H&E, X400).



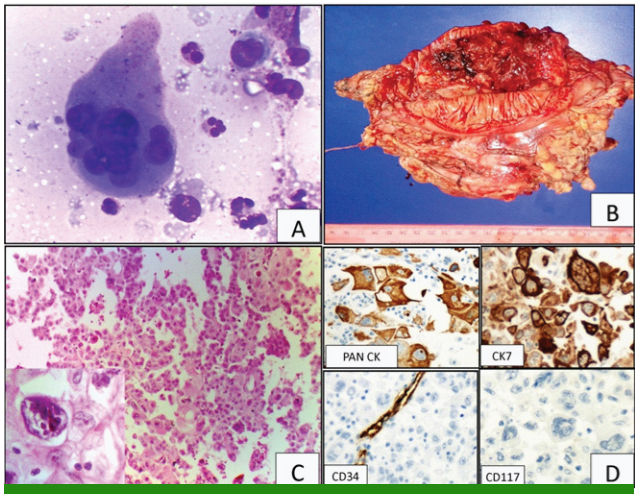
[Table/Fig-5a-f]: Renal Cell Carcinoma. (a) FNAC – Loosely cohesive cluster of moderately pleomorphic tumour cells(L& G, X 100); (b) TCB was false negative shows normal portion of kidney, no tumor seen; (c) Nephrectomy specimen reveal Renal cell carcinoma-clear cellvariant (H & E, X 400);
d-f Transitional cell carcinoma (d) FNACtumour cells in papillary arrangement (L & G, X 400); (e) TCB (H& E, X 100) and (f) Nephrectomy shows tumor involving renal pelvic area (H&E, X100).

may mimic HCC2 cases were reported as abscess and correlated clinicoradiologically. Some authors also suggested there is some overlap between the USG and CT features of liver abscess with HCC and metastatic carcinoma. So, a thorough clinical, radiological and pathological examination is recommended to make a diagnosis of liver abscess.

Seventeen cases of gall bladder were reported on FNAC in our series among which 13 were adenocarcinoma and four unclassifiable malignant tumours. All the cases correlated clinico-radiologically. Our study showed concurrence with the studies done by Tuladhar AS et al., [6] and Ahmad S et al., [13]. However, a negative result should be interpreted with caution when clinical suspicion is high and a repeat FNAC should be carried out to make a diagnosis.



[Table/Fig-6a-d]: FNAC-Benign mesencymal neoplasm : elongated spindle shaped cells with pink myxoid stroma (L & G, x 400). (b), TCB – Neurofibroma (H&E, x 400) (c). Gross specimen- Retroperitoneal mass. (d). MPNST. Tumor cells in interlacing fascicles and storiform pattern (H & E, x 100). Inset shows increased mitotic activity. (H & E, x 400).



[Table/Fig-7a-d]: Diagnostic Concordance - Poorly differentiated primary gastric carcinoma. (a) FNAC Bizarre giant cells (L&G, X400); (b) Gross- resected part of stomach with transverse colon and omentum; (c) Histopathology (H&E, X100) Inset: bizarre tumour giant cells (H&E,x400); (d) IHC negative for CD 117, CD 34 and positive for Pancytoketatin and CK 7.

Among seven cases of GIT reported in our study, 3 were from colon, 2 from rectosigmoid junction, 1 each from serosal aspect of stomach and jejunum. All cases were clinico-radiologically diagnosed as malignancy. Of these seven cases excised specimens were available in 5 cases. Diagnostic accuracy was 100% on FNAC. Similar findings were observed in study done by Shobha R et al., [3] two cases showed clinic-radiological discordance. Both were suspicious of malignancy, However, one was reported non-neoplastic chronic entero-colitis on FNAC and Tubercular enterocolitis on histopathology specimen. Another case was

chronic abscess with extensive fibrosis on both FNAC/TCB and histopathology specimen.

Mohammad A et al., [14] reported that aberrant remodeling lead to marked mural thickening owing to proliferation process of smooth muscle cells in muscularls propria and post inflammatory fibrosis which may produce an indurated mass mimicking tumour. Advances like Endoscopic ultrasound (EUS) guided FNA in evaluating lesions adjacent to GIT wall are there but due to high complication rates USG guided FNA is still preferred [15].

Nine cases were from kidney of which excised specimen were available in 7 and FNAC/TCB diagnosis was confirmed in 6 cases. One case clinicoradiologically suggestive of malignancy was false negative on TCB and histotopathological examination of nephrectomy specimen confirmed the diagnosis of RCC-clear cell type [Table/Fig-5a-c].Two were renal cell carcinoma (RCC), 2 Transitional cell carcinoma (TCC) [Table/Fig-5d-f] and one each of nephroblastoma, chronic pyelonephritis and abscess. Rest all cases correlated clinico-radiologically. Shobha R et al., [3] emphasized that cytology and radiology complement each other in diagnosing renal lesions.

Four retroperitoneal masses were reported in our study. TCB and excised histopathological specimen were available in 2 cases. All four were reported neoplastic. In contrast, study conducted by various authors concluded that metastatic carcinomas are more common in retropritoneum than primary. One case was diagnosed on both FNAC and TCB as benign mesenchymal tumour and neurofibroma respectively turned out to be MPNST on excised histopathological specimen [Table/Fig-6a-6d]. The presence of essentially any mitotic activity in neurofibroma (especially in deep seated tumours with areas of increased cellularity and nuclear atypia) warrants the diagnosis of MPNST [16].

Among four cases of abdominal scar and subcutaneous nodules, two had history of laproscopic cholecystectomy for gall bladder adenocarcinoma following which these lesions appeared. Therefore, scar related abdominal nodules should be biopsied/aspirated carefully to rule out tumour deposits. This observation correlated with the study done by Marwah N et al., [17]. Other two nodules were reported as necrotizing tubercular inflammation and benign skin adnexal tumour.

Two cases from mesentery mass were reported as chronic inflammation and paraganglioma respectively. Many authors have suggested that paraganglioma arising from mesentery is extremely rare and occasional reports have been published and explain that they occur due to abnormal ventral migration of paraganglionic cells from the root of superior and inferior mesenteric arteries and form collections of paraganglionic tissue [18,19].

Among nine cases of iliac region presented as mass in iliac fossa, neoplastic lesions were observed in six cases and non neoplastic in three cases [20].

Three cases of omental mass diagnosed as sarcoma/ metastatic anaplastic tumour, Necrotizing tubercular inflammation and chronic granulomatous inflammation. Dhiman DS et al., [21] stated that primary tumours of omentum are rare, also omental TB is rare and occurs as a part of tubercular peritonitis termed as “fibrotic fixed” type.

One case of peritoneal deposit was reported as chronic granulomatous inflammation which was clinically suspected as ovarian carcinoma. In young females there are conditions which can mimic advanced ovarian malignancies of which extra pulmonary pelvic peritoneal tuberculosis is the most common [22,23].

Thirteen cases presented with abdominal lumps without any clue of their origin. Nine cases correlated clinicoradiologically. One case was diagnosed as Gastrointestinal stromal tumour on radiological examination. On FNAC, TCB and excised tissue it was diagnosed as malignant giant cell tumour probably arising from stomach. IHC analysis was done and found to be immune negative for CK20/CEA,DOG1/CD117/ CD34 and immune positive for CK 7 [Table/Fig 7a-7d]. Final diagnosis was poorly differentiated carcinoma consistent with primary gastric carcinoma. Similar findings were observed by Albores SJ et al., [24] who described anaplastic spindle and giant cell carcinoma usually contain a fewer number of osteoclastic giant cells and their mononuclear cells show variation in shape and size with marked atypia and numerous mitotic activity. Also, adequacy depends upon size, location, consistency of lesion, histologic type, number of blood vessels and amount of necrosis present within the lesion. Hence, a thorough clinical, radiological correlation is recommended with cytohistological correlation to make a definitive diagnosis in such cases [25].

As, the excised histopathological tissue was available in some cases only, statistical analysis may not be actual reflection of exact scenario. Also loss of patients for follow-up was a limitation faced in our study.

CONCLUSION

FNAC and TCB are safe, quick, reliable and easily available OPD based procedures which can be performed in patients of almost any extreme age group and can also be done in patients with deteoriated general conditions with less number of complications for diagnosis of abdominal lesions. In our study, FNAC was preferred over TCB in terms of cost as patient’s affordability was poor for TCB. They can be considered as standard technique of pre-operative evaluation and guides clinicians to plan an appropriate management.

REFERENCES

[1] Hemalatha AL, Sindhuram S, Sushma S, Suma JK, Varna I, Aditya A. Ultrasound guided FNAC of abdominal-Pelvic masses-The pathologist's perspective. *JCDR*. 2013;7(2): 273-77.

[2] Stewart CJR, Coldewey J, Stewart IS. Comparison of fine needle aspiration cytology and needle core biopsy in diagnosis of radiologically detected abdominal lesions. *J ClinPathol*. 2002; 55: 93-97.

[3] Shobha RG, Faheem K, Prasad SB, Reddy S. Efficacy of ultrasound guided aspiration cytology in deep seated lesions- a diagnostic evaluation. *Int J Med Health Sci*. 2012; 1(1): 2-12.

[4] Parajuli S, Tuladhar A, Basnet RB. Ultrasound and computed tomography guided fine needle aspiration cytology in diagnosing intra abdominal and intra thoracic lesions. *Journal of Pathology of Nepal*. 2011;1:17-21.

[5] Islam T, Hossain F, Rumpa AP, SikderNH, BhuiyanMA, Karim E, et al. Ultrasound guided fine needle aspiration cytology: a sensitive diagnostic tool for diagnosis of intra-abdominal lesions. *Bangladesh Med Res Counc Bull*. 2013;39:14-17.

[6] Tuladhar AS, Adhikari RC, Shrestha S, Sharma SK, Pradhan S, et al. Role of USG guided FNAC in diagnsosis of abdominal and thorasic lesions. *Nepal Med Coll J*. 2012; 14(4): 271-74.

[7] Sidhalingreddy, Andola SK. Fine needle aspiration cytology of intra abdominal lesions. *J Clic Diag Res.* 2011; 5(3) 551-58.

[8] Connell AM, Keeling F, Given M, Logan M, Lee MJ. Fine needle Tru-cut biopsy versus fine needle aspiration cytology with ultrasound guidance in the abdomen. *J Med Imaging Radiat Oncol*. 2008; 52(3): 231-36.

[9] Adhikari RC, Tulandhar A, Shrestha S, Sharma SK. Deep seated thoracic and abdominal lesions: usefulness of ultrasound guided fine needle aspiration cytology. A 3 year experience. *Nepal Med Coll J*. 2010; 12(1): 20-25.

[10] Soyuer I, Ekinci C, Kaya M, Bahar K. The value of fine needle aspiration biopsy in diagnosis of metastatic liver tumors. *Turk J Gastroenterol*. 2002; 13(2): 78-82

[11] Rasania A, Pandey CL, Joshi N. Evaluation of FNAC in diagnosis of hepatic lesion. *Journal of Cytology*. 2007; 24(1): 51-54.

[12] Goel S, Hemrajani D, Sharma M. Ultrasound guided fine needle aspiration cytology in diagnosis of space occupying lesions of liver. *J of Evolution of Med and Dent Sci.* 2014; 3(27):7480-86.

[13] Ahmad S, Akthar K, Akthar S, Abrari A, Khalid M, Mansoor T. Ultrasound guided fine needle aspiration biopsy of abdominal masses. *JK Science*. 2006; 8(4): 200-04.

[14] Mohammed A, Victoria A, Samuel J. All that glitters is not gold; Cancer mimicking lesion in cancer survivor. *Community Oncology*. 2010; 7: 175-77.

[15] Ahmad SS, Akthar K, Akthar SS, Arif SH, Nasir A, Khalid M, Mansoor T. Ultrasound guided fine needle aspiration biopsy of gastrointestinal masses. *Journal of cytology*. 2007; 24(4): 173-77.

[16] Rosai J. Soft tissue tumors. IN: Rosai and Akerman's surgical pathology. Elsevier Limited. 10th Ed. 2011: 2 : 2137.

[17] Marwah N, Rana S, Jain P, Gupta S, Marwah S, Sen R. A fine needle aspiration study of abdominal cutaneous and sub cutaneous nodules. *Iranian Journal of pathology*. 2013; 8(2): 97-103.

[18] Svajdler M, Bohus P, Zavacky P, Volanska M, Repovsky A. Paraganglioma of mesentry: a case report. *Cesslov Pathol*. 2007;43(4):153-56.

[19] Suhail M, Saira F, Siddiqi, M, Kayani N, Pervez S, Raja A. Mesentric paraganglioma. *Can J Surg*. 2002; 45(6): 459-60.

[20] Radka H, Stanislav R, Zdenek V, Marcela K, Petr D, Jan B. Pitfalls of palpable mass in right iliac fossa. *Folia Gastro enterol Hepatol*. 2005; 3(3): 99-103.

[21] Dhiman DS, Goyal D, Prakash S, Negi A, Sharma S. Omental tuberculosis. *Indian J Radiol Imaging*. 2004;14:191-92.

[22] Imtiaz S, Siddiqui N, Ahmad M, Jahan A. Pelvic-peritoneal tuberculosis mimicking ovarian cancer. *J Coll Physicians Surg Pak*. 2012;22(2):113-15.

[23] Hakan A, Durmusoglu F. Case report of a pelvic-peritoneal tuberculosis presenting as an adnexal mass mimicking ovarian cancer and a review of literature. *Infect Dis Obsetet Gyanecol*. 2004;12: 87-89.

[24] Albores SJ, Grider DJ, Wu J, Henson DE, Goodman ZD. Giant cell tumor of extrahepatic biliary tree: A clinicopathologic study of 4 cases and comparison with anaplastic spindle and giant cell carcinoma with osteoclastic like giant cell. *AJSP*. 2006;30(4): 495-500.

[25] Orell SR, Sterrett GF, Whitaker. The Technique of FNA cytology In: Fine Needle Aspiration Cytology. 5th ed. India: Elsevier Limited. 2012; 8-27.

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