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Primary Retroperitoneal Mass--- A CT Overview with FNAC /Histopathological Correlation

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Abstract
Describe and characterize specific CT imaging finding in varieties of Primary Retroperitoneal masses.
To confirm the diagnosis of CT by FNAC / histopathological correlation.
Material & Method: *A hospital based cross sectional study was conducted over a period of 1 year between 1st July 2012 to June 0th 2013 on 67 patients in the deptt. of Radio-Diagnosis, Assam Medical College and Hospital, Dibrugarh. Approved was obtained from the Institutional ethics review committees.*
All the patients CT on of abdomen are done both initial unenhanced CT followed by contrast CT scan by giving parenterily Iodinated low osmolar non ionic contrast media. Delayed scan were also obtain wherever necessary. Based on the findings observed on the CT Scan, a probable diagnosis was given, which was confirmed by Fine Needle Aspiration Cytology (FNAC) or by Histopathological examination (HPE) of the operative specimens.
Result: *Primary Retroperitoneal tumours accounted for 40.3% of the masses and secondary retroperitoneal masses (arising from retroperitoneal organs) accounted for 59.7% in this studies. Most of the primary retroperitoneal neoplasm were malignant accounting 78%. 22% of the masses were benign. Among the primary retroperitoneal masses lymphoma accounted 38% followed by liposarcoma 19% and leiomyosarcoma 14.%. nodes (100%). Among the retroperitoneal soft tissue sarcomas, liposarcoma 33.4% was commonest followed by leiomyosarcoma 25% and malignant fibrous Histiocytoma (16.7%).*
Conclusion: *CT with its fast scanning times and good spatial resolution and multiplanar reconstruction capability is a better imaging modality for characterizing retroperitoneal masses and detecting the organ of origin. Most of the CT diagnoses were correlated with FNAC/HPE diagnosis.*
Key words: *CT, Retroperitoneal masses, FNAC, HPE.*

INTRODUCTION

The retroperitoneum is the compartmentalized space located external to and predominantly posterior to the posterior parietal peritoneum. About half a century ago, the retroperitoneum was described as a "veritable jungle of strange things" and as a hinterland of straggling mesenchyme, with vascular and nervous plexus, weird embryonic rests and shadowy fascial boundaries.[1] The mass lesions in retroperitoneal space may present with clinical features like vague pain in the lumbar region, abdominal lump and deep vein thrombosis of lower limbs. Of the primary retroperitoneal neoplasms, 70-80% are malignant

in nature, and these account for 0.1-02% of all malignancies in the body. Because the treatment options very, it is useful to be able to noninvasively distinguish these masses.[3]

Because of its usual abundant fat relatively uncomplicated cross-sectional anatomy, the retroperitoneal space is especially suitable for examinations by Computed Tomography (CT).[4]

Contrast Enhanced Computed Tomography (CECT) is considered the best imaging modality for the retroperitoneal masses. CT is the most widely used cross sectional imaging modality to assess the retroperitoneum.[1] Although CT findings will not always yield a definitive diagnosis attention to these finding provides a road map to guide image interpretation.[6] CT- guided Fine Needle Aspiration Cytology (FNAC) allows visualization of entire abdomen and retroperitoneum, and allows accurate planning of a biopsy for deep seated lesions such as retroperitoneal lymphadenopathy and it avoids damage to important organs and major vessels.[7]

MATERIALS AND METHODS

THE STUDY GROUP

A hospital based cross sectional study was conducted over a period of 1 year between July 1st 2012 to June 30th 2013 on 67 patients in the department of Radiodiagnosis, Assam Medical College and Hospital, Dibrugarh, Approval was obtained from the Institution ethics review committee.

INCLUSION CRITERIA

1. Clinically suspected patients presenting with symptoms of involvement of retroperitoneal structures, in all age groups.
2. Involvement of retroperitoneal organs detected incidentally by routine Ultrasonography of the abdomen / referred patients.

EXCLUSION CRITERIA

1. Patients with traumatic, congenital and inflammatory masses.
2. Retroperitoneal metastases from primary in another organ.
3. Primary bowel masses.
4. FNAC was not done in patients with history of bleeding diathesis and in those not giving consent.

PATIENT PREPARATION

Patients were kept nil per oral for 6-8 hours preceding the examination except plain water. Dilute oral contrast agent (20% Urograffin) was administered 45 minutes before the study. Risks of contrast administration were explained to the patient and informed consent was taken prior to the administration of i. v. contrast medium.

TECHNIQUE OF THE STUDY

The CT scanner used in this was SIEMENS Somatom Spirit Dual Slice Ct Scanner. Patients were scanned in a supine position. Initial unenhanced scans were obtained in all patients. Contrast studies were performed by manually injecting Iodinated low osmolar non ionic monomer given as a single bolus injection at a maximum dose of 2 ml/kg body weight. Scanning parameters used were spiral mode with slice thickness of 6mn and collimation 6 x 2.5 mm, pitch: 1.4; kVp: 130; mAs: 80. Field of view from top of diaphragm till symphysis pubis. Delayed scans were obtained with the same parameters wherever necessary.

Based on the findings observed on CT scan, probable diagnosis was given, which was confirmed either by Fine Needle Aspiration Cytology(FNAC) or by Histopathologic Examination (HPE) of the operative specimen, which was considered as the Gold standard. The areas of interest in the study were organ of origin, presence of fat, myxoid stroma, necrosis/cystic changes, calcification, post contrast enhancement, extension of mass and invasion into adjacent

structures, vessel infiltration, nodal status and distant metastases.

FINDINGS ON CT

Each patient was evaluated on CT as per the protocol mentioned below:

- Location and organ of origin : Primary retroperitoneal/ kidney/ Adrenal gland/ pancreas.
- Appearance of the mass: fat, myxoid, necrosis/ cystic changes, hemorrhage, calcification, etc.
- Post contrast enhancement : none/ mild/ moderate/ intense
- Infiltration into vessels and adjacent structures :
- Nodal and distant metastases :
- Presence of Ascites :
- Other Routine Investigations:
- FNAC/HPE results:

TECHNIQUE OF FNAC

After taking informed consent from the patient, following skin cleansing with Betadine (Povidone-Iodine) solution, USG/CT- guided FNAC was done using 20 G 88mm Lumbar-Puncture needle fitted to 20-mL disposable syringe. Aspiration was performed by back-and-forth movements of the needle under continuous negative pressure. Immediately after FNAC, the percutaneous site was sealed using Betadine swab. All patients were observed for at least thirty minutes. If no complications were observed, the patient was allowed to leave.

Cytologic stains used were May-Grunwald-Giemsa (MGG), Papanicolaou (PAP) stain and other stains, whichever applicable. And for histology, Hematoxylin and Eosin (H & E) stains were used. 4 to 8 smears including air dried and alcohol fixed smears were prepared in each case from the aspirated material. Alcohol fixed smears were stained with PAP stain, while air-dried smears were stained with MGG.

Statistical Analysis

The diagnosis accuracy was determined using the following formula:

$$\text{Diagnostic Accuracy} = \frac{\text{True Positive + True Negative}}{\text{Total Number of Cases}} \times 100$$

Discussion

Many comprehensive studies have been carried out regarding the imaging features of retroperitoneal masses. We evaluated 67 cases of Retroperitoneal masses for a period of one year using Computer Tomography, the characteristics of which are discussed below.

PRIMARY RETROPERITONEAL TUMOURS

In the present study, we had 27 patients with primary RTPs, of which 11 (41%) were males and 16 (59%) were females, with a Male: Female (M: F) ratio of 0.69, showing a female predominance. Age at presentation ranged from 18 days to 76 years with a mean age of 43.8 years. 42% of the Retroperitoneal Soft Tissue Sarcomas (RSTS) occurred in males and 58% in female with a M: F ratio of 0.72. Our study correlated well with the study conducted by **Thijs van Dalen, et al (2001)**[25] which showed a M: F ratio of 0.73 for RSTS.

In the present study, 21 (78%) of the primary RPTs were malignant and 6 (22%) were benign. Lymphoma was the most common (38%; n=8) primary malignant retroperitoneal tumour, followed by other RSTS. Liposarcoma 4 (33.4%) was the most common RSTS, followed by Leiomyosarcoma 3 (25%), MFH 2 (16.7%), Angiosarcoma 1 (8.3%), Chondrosarcoma 1 (8.3%) and Synovial cell sarcoma 1 (8.3%).

It correlated well with the study conducted by Neville A, et al (2004)[24] in which 70%-80% of RPTs were malignant in nature and Lymphoma was the most common (33%) Liposarcoma (33%) was the most common RSTS, followed by Leiomyosarcoma (28%) and MFH (19%).

Thijs van Dalen, et al (2001) [25] studies 706 patients with primary RPTs of which 80% were malignant and 20% were benign.

Our study also correlated well with the study conducted by **Ingo Alldinger, et al (2006)**[23] in which they studies 117 patients with RSTS of which Liposarcoma (26.5%) was the most common, followed by Leiomyosarcoma (19.6%) and MFH (15.4%) other histological entities were rare.

In the present study, we had 6 (22%) benign retroperitoneal tumours. 2 teratomas, 1 FIF, 1 schwannoma, 1 Ganglioneuroblastoma and 1 paraganglioma. Hayasaka K, et al (1994) [26] studies 21 primary benign RPTs including 9 teratomas, 6 schwannomas, 3 leiomyoma, 1 lymphangioma and 1 neurofibroma.

The present study comprised 14 paediatric RPTs, among which Neuroblastoma 5 (35.7%) was the most common, followed by Wilms' tumour 4 (28.6%) and teratoma 2 (14.3%). We had 1 case each of Clear cell sarcoma, Ganglioneuroblastoma and FIF. However it was in sharp contrast to the study conducted by **Muhammad Sharif, et al (2007)** [22] which showed Wilms' tumours (50%) as the most common, followed by Neuroblastoma (26.6%) and Teratoma (16.6%)

Lymphoma

In the present study, we had 8 cases of Lymphoma, and all of them were Non Hodgkin's type. CT could diagnose all the 8 cases with 100% accuracy. Lymphoma accounted for 38% of the primary malignant retroperitoneal tumours in our study. The age group ranged from 42 to 70 years with a mean age of 56.62 years. Our study showed a male predominance with a M: F ratio of 1.66. On CT scan, most of them presented with enlarged, rounded, conglomerate low attenuation lymphadenopathy predominantly involving the lower para-aortic, celiac, mesenteric and iliac lymph nodes, typically encasing the blood vessels without obvious infiltration. Most of them showed only mild homogenous enhancement on post contrast study. Only in 1 case, there was associated vessel infiltration and moderate heterogeneous enhancement on contrast studies. Ascites was noted in 4 (50%) cases, necrosis in 3 (37%), liver involvement in 2 and bowel involvement in 1 patient. Our study correlated well with the study conducted by **Joseph k. T. Lee, et al (1978)**[30] **and Zhi-gang Yang, et al (1999)**[29] both of which reported a predominance of lower para-aortic group of lymphadenopathy involvement with bulky low attenuating homogenous enhancing pattern of lymph nodes**. Joseph k. T. Lee, et al (1978)**[30] reported an accuracy of 90% of CT in staging lymphoma patients.

Liposarcoma

In the present study, we had 4 cases of liposarcoma accounting for 33.4% of all soft tissue sarcomas, and all 4 were diagnosed by CT with 100% accuracy. The age group ranged from 39 to 70 years with a mean age of 56.2 years. We saw a female predominance with a M: F ratio of 1: 3. Two of them were well differentiated (50%), 1 myxoid (25%) and 1 dedifferentiated (25%) type. On CT scan, the well differentiated types revealed large lobulated predominant fat tissue attenuation mass in the retroperitineum with very minimal soft tissue component, and showed minimal post contrast enhancement. The myxoid variety showed mixed areas of fat, soft tissue and myxoid components, with coarse calcifications. The dedifferentiated type showed areas fat attenuation and enhancing soft tissue components with secondary infiltration of kidney.

Our study correlated well with the study conducted **by Dieckmann C, et al (1997)**[34] in which the highest percentage of fat and the biggest tumours were seen with well-differentiated liposarcomas, whereas myxoid ones showed the sharpest margins. Round-cell and pleomorphic types showed mainly soft-tissue attenuation.

Sun Hwa Hong, et al (2010)[33] retrospectively studied 15 patients with histological verified retroperitoneal dedifferentiated liposarcoma in

which CT showed well-circumscribed, large round, or lobulated retroperitoneal mass with various spectra of imaging findings.

Leiomyosarcoma

The present study included 3 cases of leiomyosarcoma, accounting for 25% of soft tissue sarcomas. Two of them were males aged 70 and 76 years and a female patient aged 45 years. Two of them were completely extravascular (66.6%) and one was both intra and extravascular (33.3%). On CT, they showed large lobulated retroperitoneal muscle density masses with large non enhancing areas of necrosis. They had ill defined margins with infiltration of the adjacent structures. None of them showed fat or calcifications, however myxoid components was seen in two of them. Distant metastases were noted to the liver in 1 case and to the lungs in another.

We had a case of inferior vena caval Leiomyosarcoma in a 76 year old male patient, which involve intra-hepatic and supra-renal IVC and had imaging pattern similar to the other cases of extra-vascular leiomyosarcoma.

Our study correlated well with **David S. Hartmen, et al (1992),**[35] in which 62% cases were completely extravascular, 33% both extra- and intraluminal and 5% completely intraluminal. On CT, it is usually solid with large conspicuous cystic zones corresponding to areas of necrosis.

McLeod AJ, et al. (1984). [34] The tumour masses were often quite large with extensive necrotic or cystic changes. Calcification was not observed. The liver was the most common site of metastasis.

Malignant Fibrous Histocytoma

The present study included 2 cases of MFH, accounting to 16.7% of soft tissue sarcomas, one of them a 49 year old male and the other a 35 year female patient; the former was wrongly diagnosed as myxoid variety of Liposarcoma on CT scan, but on HPE turned out to be Pleomorphic Malignant Fibrous Histocytoma. CT scan revealed large soft tissue masses in the retroperitoneum, with predominat low attenuation myxoid components and showed moderate post contrast enhancement. Out of them contained areas of fat attenuation, but neither of them showed necrosis of calcifications.

Our study correlated well with **Bivek Karki, et al (2012).**[40] Primary retroperitoneal MFHs are generally hugs soft tissue masses containing areas of low attenuation and mild to moderate contrast enhancement.

Sympathetic plexus Neuroblastoma

The present study include a case of Sympathetic plexus neuroblastoma in a 2 year female child. CT scan revealed a large ill defined prevertebral low attenuation hypo-enhancing soft tissue mass with areas of coarse calcifications and necrosis, which encased the aorta, celiac, mesenteric and renal vessels without definite infiltration.

It correlated well with the study of **Ruppert David, et al (1989).**[45] Neuroblastoma is a common tumour in childhood. It arises in the Adrenal gland or in various extra-adrenal primary sites of the sympathetic chain. Calcification is seen in 85% of cases. Most lesions are homogeneous on CT, with attenuation similar to or less than that of muscle.

Ganglioneuroblastoma

The present study included a case of Ganglioneuroblastoma in a 3 year male child. CT scan revealed an ill defined heterogeneously enhancing prevertebral soft tissue mass with areas of coarse calcifications within. Post operative HPE revealed Ganglioneuroblastoma.

It correlated well with **Sung Eun Rha, et al (2003).**[44] Ganglioneuroblastoma is most often seen in patients 2-4 years old. It also correlated well with **KK Sabharwal, et al (2006).**[43] CT examination revealed a large lobulated heterogeneously enhancing mass with smooth margins, Enhancing septae and amorphous calcific foci were also seen within the mass. Trucut biopsy revealed Ganglioneuroblastoma .

Retroperitoneal paraganglioma

The present study included a case of retroperitoneal paraganglima in a 48 year female patient who presented with hypertension. CT showed a large is to slightly hyperdense mass lesion in the right upper retroperitoneal along the lower abdominal aorta with central cystic changes, displacing the IVC posteriorly. Moderate to intense enhancement was noted on post contrast study.

In correlated well with the study conducted by W S Hayes, et al (1990).47 Average age was 37 years. 80% had hypertension. Extra-adrenal retroperitoneal paraganliomas are functionally active more often and they are readily detected by CT as soft-tissue masses closely associated with the entire length of the abdominal aorta.

Retroperitoneal Schwannoma

A 35 year female patient presented with vague lump in right iliac fossa. CT scan revealed a large, well circumscribed hypodense mild heterogeneously enhancing SOL in the right lower retroperitoneum with a focus of calcification, causing antero-medial displacement of the ureter and common iliac vein . A diagnosis of benign peripheral nerve sheath tumour was given and post operative HPE revealed benign schwannoma.

It correlated well **with Ali Kamalati, et al (2013)**[48] who reported a case of benign schwannoma in a 26-year-old woman. On CT scan, it was hypodense and showed heterogeneous enhancement following contrast injection.

Li Qiang, et al (2007)[49] analysed 82 patients with retroperitoneal schwannoma. 46% were men and 54% were women. Only in 13 patients (15.9%) a correct preoperative diagnosis was made either by USG, CT or MRI. Pathological result showed 98.8% were benign and 1.2% malignant.

Primary Germ Cell Tumours

The present study had 2 cases of mature teratomas. Both were female aged 6 years and 15 years. On CT, both cases showed huge retroperitoneal masses with large cystic spaces, areas of fat attenuation and coarse calcifications, one of them had multiple tooth within. Both of them did not show any enhancement on post contrast scans.

Our findings correlated well with **Davidson AJ, et al (1989),**[51] .

Retroperitoneal Angiosarcoma

The present study had 1 case of Retroperitoneal Angiosarcoma in a 45 year female patient. CT revealed a large mass in the right anterior pararenal space with variable soft tissue components, necrosis, hemorrhage and coarse calcifications. The lesion was infiltrating into the adjacent liver segments. On post contrast scans, it showed moderate to intense enhancement.

Our finding correlated with Changhoom Yoo, et al (2009).[52] **Retroperitoneal Chondrosarcoma :**

The present study included a case of Retroperitoneal Chondrosarcoma in a 65 year old female patient. CT scan revealed a large relatively well defined soft tissue mass in the retroperitoneal space with extensive linear and arc-like streaks of calcifications. The mass showed only mild enhancement on post contrast study. FNAC suggested Extra skeletal Mesenchymal Chondrosarcoma.

Our finding correlated well with **K Taori, et al (2007).**[53]

Retroperitoneal Synovial cell sarcoma

A 50 year male patient presented with painless lump in the right lumbar region. CT scan revealed a large ill defined mass in the right side of retroperitoneal with infiltration of IVC and compression of right ureter. There were large areas of cystic changes, necrosis and few calcifications within, with mild to moderate heterogeneous enhancement on post contrast study. A CT diagnosis of Leiomyosarcoma was given. However, FNAC revealed it as synovial cell sarcoma.

A.R Alhazzani, et al (2010)[54] described Primary retroperitoneal synovial sarcoma as extremely rare and has poor prognosis.

Retroperitoneal fetus-in-fetu:

An 18 day old girl child had one malformed fetus in her abdomen. A CT scan of the abdomen showed a large well-defined round retroperitoneal soft-tissue mass with relatively well-formed bony components resembling those of a small fetus with a well-defined peripheral cystic covering. Elective laparotomy anencephalic fetus was found.

Akhtar Murtaza, **et al (2010)**[56] described a case of FIF in a 30 year female. CT scan of the abdomen showed a cystic lesion with solid component of varying densities which was initially diagnosed as retroperitoneal dermoid.

Primary retroperitoneal masses are generally clinically occult until they assume a large size and invade surrounding structures. CT with its fast scanning times and good spatial resolution and multiplanar reconstruction capabilities is a better imaging modality for characterizing retroperitoneal masses and detecting the organ of origin. In this study, we came across a wide variety of retroperitoneal masses both benign and malignant with few very rare cases such as fetus-in-fetu, most of which were correctly diagnosed on CT. Most of the CT diagnoses were correlated with FNAC/HPE diagnosis. Thus this study helped in showing the importance of CT as a clinical and evaluatory tool in the characterization and diagnosis of retroperitoneal masses and helped in better management of the patients.

RESULT

TABLE 1: SEX DISTRIBUTION OF CASES

SEX	NUMBER (n)	PERCENTAGE (%)	RATIO (M:F)
Male (M)	34	50.75	50.75
Female (F)	33	49.25	49.25
TOTAL	67	100.00	1.03:1

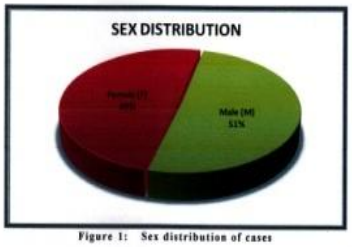

Figure 1: Sex distribution of cases

In the present study, 51% of the affected population were males and 49% were females.

TABLE :2 AGE AND SEX DISTRIBUTION OF PRIMARY RP TUMOURS

AGE (yrs)	MALE	%	FEMALE	%	TOTAL	%
<10	1	9.1	3	18.7	4	14.8
11—20	0	0.0	1	6.3	1	3.7
21—30	0	0.0	0	0.0	0	0.0
31—40	0	0.0	3	18.7	3	11.1
41—50	3	27.3	4	25.0	7	25.9
51—60	1	9.1	3	18.7	4	14.8
61—70	5	45.4	2	12.5	7	25.9
71—80	1	9.1	0	0.0	1	3.7
TOTAL	11	100	16	100	27	100

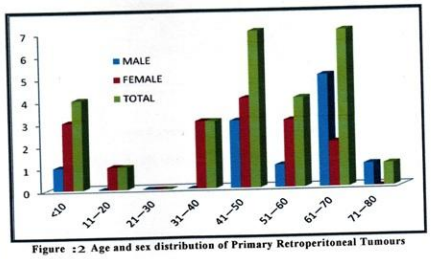

Figure :2 Age and sex distribution of Primary Retroperitoneal Tumours

TABLE :3 SEX DISTRIBUTION OF PRIMARY RP TUMOURS

SEX	NUMBER (n)	PERCENTAGE (%)	RATIO (M:F)
Male (M)	11	40.74	40.74
Female (F)	16	59.26	59.26
TOTAL	27	100.00	0.69:1

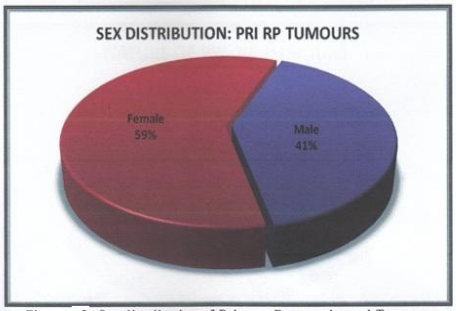

Figure :3 Sex distribution of Primary Retroperitoneal Tumours

TABLE :4 DISTRIBUTION OF PRIMARY RETROPERITONEAL TUMOURS ACCORDING TO NATURE OF MASS

NATURE	NUMBER (n)	PERCENTAGE (%)
Benign	6	22.2
Malignant	21	77.8
TOTAL	27	100.00

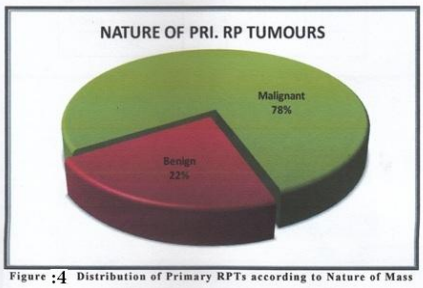

Figure :4 Distribution of Primary RPTs according to Nature of Mass

TABLE :5 DISTRIBUTION OF PRIMARY MALIGNANT RETROPERITONEAL TUMOURS

TUMOUR	NUMBER	PERCENTAGE
Lymphoma	8	38.0
Liposarcoma	4	19.1
Leiomyosarcoma	3	14.3
MFH	2	9.5
Others	4	19.1
TOTAL	21	100

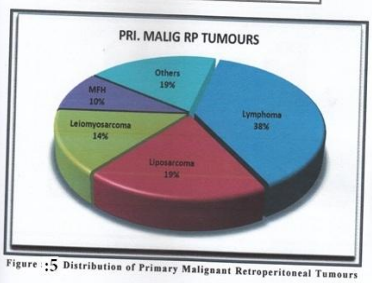

Figure :5 Distribution of Primary Malignant Retroperitoneal Tumours

TABLE :6 IMAGING SPECTRUM OF LYMPHOMA

CHARACTERISTIC	NUMBER (n)	PERCENTAGE
Necrosis	3	37.5
Enhancement	8	100.0
Vessel infiltration	1	12.5
Ascites	4	50.0
Lymph nodes	8	100.0
Sec. organ involv	3	37.5
TOTAL	8	100.00

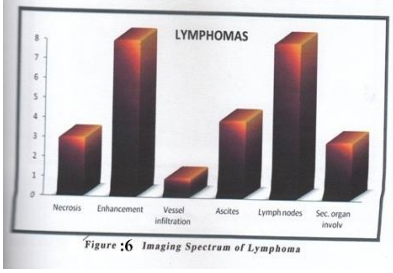

Figure :6 Imaging Spectrum of Lymphoma

TABLE :7 DISTRIBUTION OF RETROPERITONEAL SOFT TISSUE SARCOMAS

TUMOUR	NUMBER (n)	PERCENTAGE (%)
Liposarcoma	4	33.4
Leiomyosarcoma	3	25.0
MFH	2	16.7
Angiosarcoma	1	8.3
Chondrosarcoma	1	8.3
Synovial cell sarcoma	1	8.3
TOTAL	12	100.00

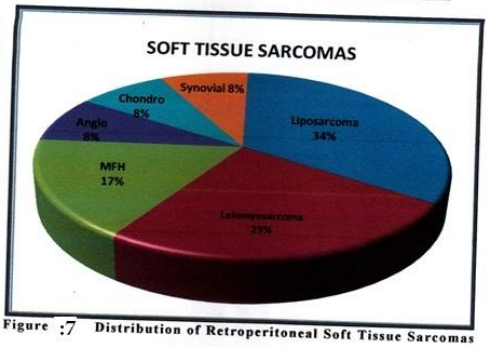

Figure :7 Distribution of Retroperitoneal Soft Tissue Sarcomas

TABLE :8 IMAGING SPECTRUM OF SOFT TISSUE SARCOMAS

TUMOUR CHARACTERISTIC	NUMBER (n)	PERCENTAGE
Fat	5	41.6
Myxoid	5	41.6
Necrosis	7	58.3
Hemorrhage	1	8.3
Calcification	5	41.6
Contrast Enhancement	11	91.6
Infiltr into adj. str.	6	50.0
Vessel infiltration	4	33.3
Ascites	2	16.6
Lymph nodes	1	8.3
Distant metastases	2	16.6
TOTAL	12	100.00

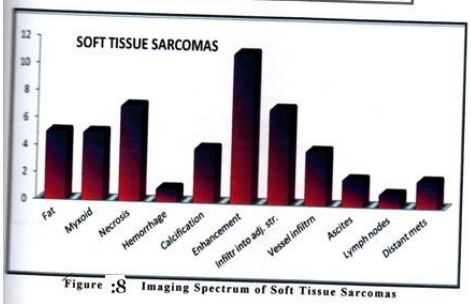

Figure :8 Imaging Spectrum of Soft Tissue Sarcomas

LYMPHOMA WITH MULTI-ORGAN INVOLVEMENT

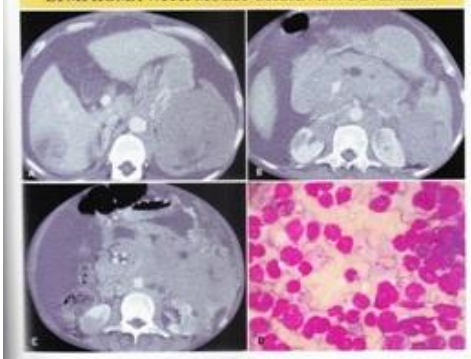

Figure 1. (A,B,C) Axial CECT images show homogenously enhancing lymph nodal masses in retroperitoneum encasing the major vessels along with multiple hypodense masses in liver, spleen, pancreas and bilateral kidneys.
(D) FNAC image (MGG stain; 100x) shows picture of Non-Hodgkin's Lymphoma.

RETROPERITONEAL LIPOSARCOMA

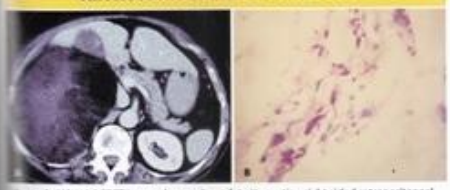

Figure 2. (A) Axial CECT image shows a large fat attenuating right sided retroperitoneal mass with few enhancing intervening soft tissue components.
(B) HPE image (H&E stain; 40x) shows picture of well differentiated liposarcoma.

INFERIOR VENA CAVAL LEIOMYOSARCOMA

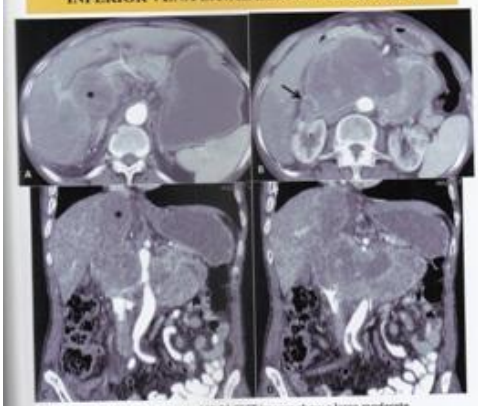

Figure 3. Axial (A, B) and Coronal (C,D) CECT images show a large moderate heterogenously enhancing soft tissue mass in right side of retroperitoneum arising from intrahepatic and suprarenal parts of IVC (asterisk) and extending into right renal vein (arrow).

MALIGNANT FIBROUS HISTIOCYTOMA

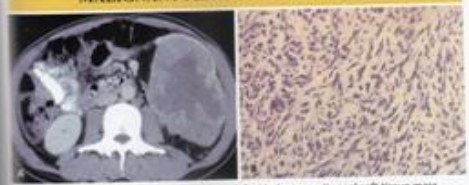

Figure 4. (A) Axial CECT image shows a large left sided retroperitoneal soft tissue mass with central myxoid components and irregular peripheral enhancing soft tissue components. (B) HPE (H&E stain; 40x) shows picture of Malignant fibrous histiocytoma.

RETROPERITONEAL SYNOVIAL CELL SARCOMA

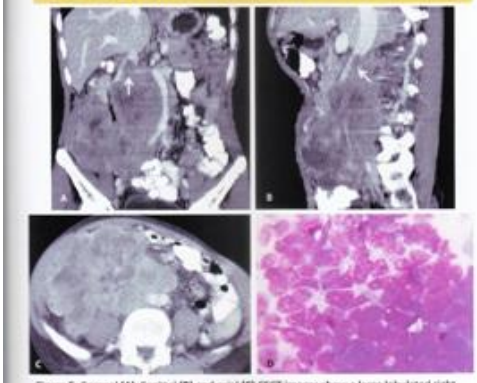

Figure 5. Coronal (A), Sagittal (B) and axial (C) CECT images show a large lobulated right sided retroperitoneal soft tissue mass with areas of central necrosis, nearby vascular compression and infiltration into infra-hepatic IVC (arrows).
(D) FNAC image (MGG stain; 100x) shows picture of Synovial cell sarcoma.

REPLACEMENT LIPOMATOSIS OF KIDNEY

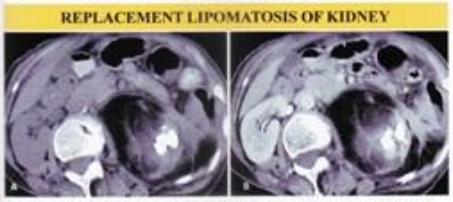

Figure 6. Axial NECT (A) and CECT (B) images show a large irregular fat attenuating mass with few enhancing fibrous septations replacing an irregular calculus bearing left kidney.

RETROPERITONEAL PARAGANGLIOMA

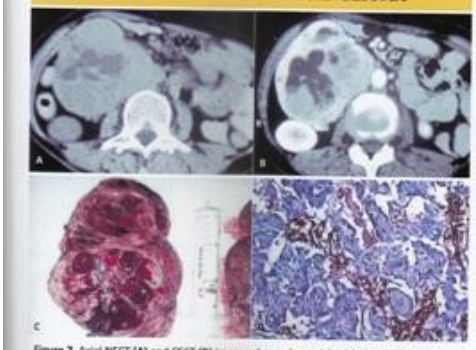

Figure 7. Axial NECT (A) and CECT (B) images show a large right sided retroperitoneal mass with central cystic changes and peripheral intensely enhancing solid components along right side of aorta; C: Gross cut section of the post operative specimen.
D: HPE image (H&E stain; 10x) shows picture of paraganglioma.

SYMPATHETIC PLEXUS NEUROBLASTOMA

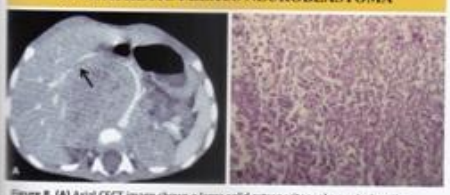

Figure 8. (A) Axial CECT image shows a large solid retroperitoneal mass insinuating along nearby vasculature with antero-superior displacement of hepatic artery (arrow).
(B) HPE image (H&E stain; 10x) shows picture of Neuroblastoma.

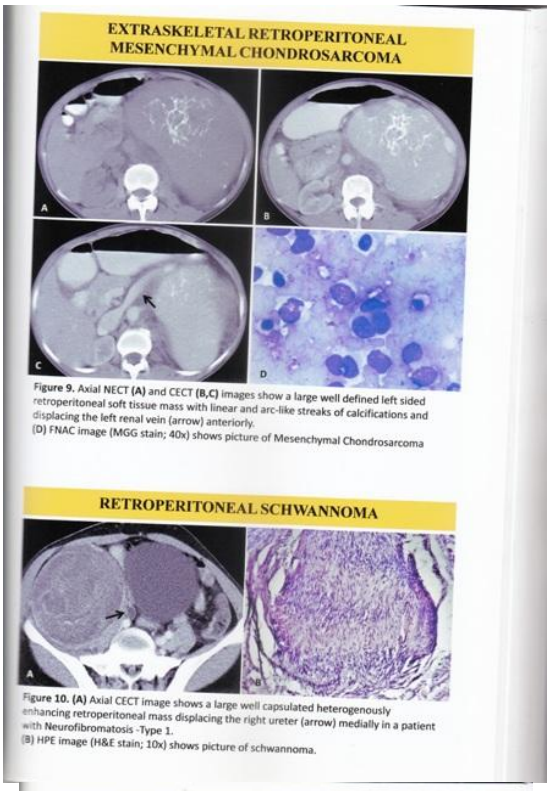

Figure 9. Axial NECT **(A)** and CECT **(B,C)** images show a large well defined left sided retroperitoneal soft tissue mass with linear and arc-like streaks of calcifications and displacing the left renal vein (arrow) anteriorly.
(D) FNAC image (MGG stain; 40x) shows picture of Mesenchymal Chondrosarcoma

Figure 10. (A) Axial CECT image shows a large well capsulated heterogenously enhancing retroperitoneal mass displacing the right ureter (arrow) medially in a patient with Neurofibromatosis -Type 1.
(B) HPE image (H&E stain; 10x) shows picture of schwannoma.

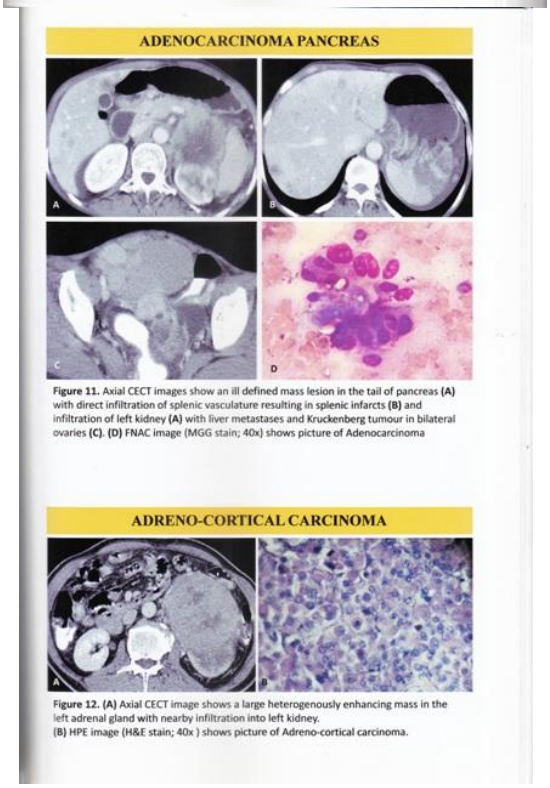

Figure 11. Axial CECT images show an ill defined mass lesion in the tail of pancreas **(A)** with direct infiltration of splenic vasculature resulting in splenic infarcts **(B)** and infiltration of left kidney **(A)** with liver metastases and Kruckenberg tumour in bilateral ovaries **(C)**. **(D)** FNAC image (MGG stain; 40x) shows picture of Adenocarcinoma

Figure 12. (A) Axial CECT image shows a large heterogenously enhancing mass in the left adrenal gland with nearby infiltration into left kidney.
(B) HPE image (H&E stain; 40x) shows picture of Adreno-cortical carcinoma.

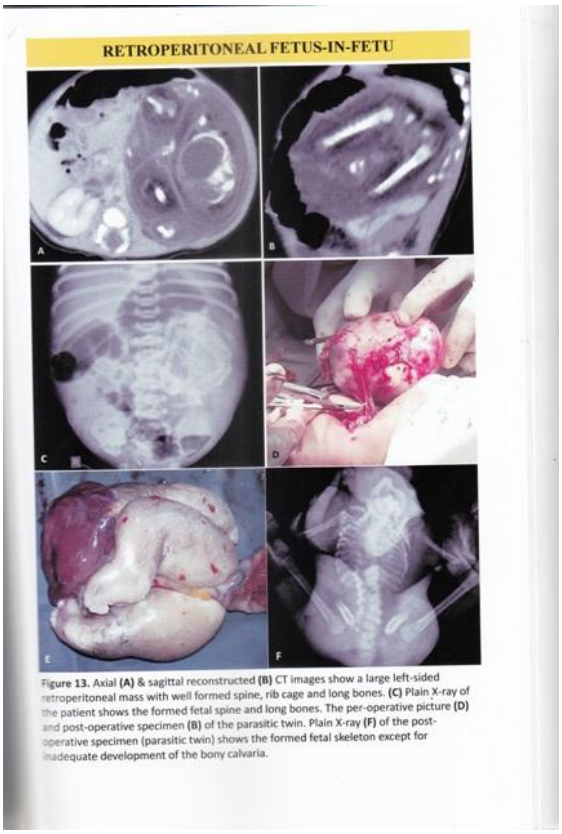

Figure 13. Axial **(A)** & sagittal reconstructed **(B)** CT images show a large left-sided retroperitoneal mass with well formed spine, rib cage and long bones. **(C)** Plain X-ray of the patient shows the formed fetal spine and long bones. The per-operative picture **(D)** and post-operative specimen **(B)** of the parasitic twin. Plain X-ray **(F)** of the post-operative specimen (parasitic twin) shows the formed fetal skeleton except for inadequate development of the bony calvaria.

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