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Assessment of Contrast Enhanced Multidetector Computed Tomography in Diagnosis of Retroperitoneal Lesions

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Abstract **Original Research Article**

Aim: To assess the Contrast Enhanced Multidetector Computed Tomography in Diagnosis of Retroperitoneal Lesions. ***Objectives:*** 1. To assess the spectrum and recognize the characteristic imaging features of solid and cystic retroperitoneal lesions using contrast enhanced computed Tomography. 2. To associate the contrast enhanced computed Tomographic diagnosis with histopathology / therapeutic response in the diagnosis of retroperitoneal lesions. ***Methods:*** This was a prospective, cross-sectional study. The study included 25 patients clinically suspected case of retroperitoneal lesion and were subjected to Contrast Enhanced MDCT examination. ***Results:*** The most common affected age group was of 40-60 years (32%). The 77.7 % of primary retroperitoneal lesions were found malignant. The most common primary retroperitoneal lesion was lymphoma 66.6 % and second commonest liposarcoma 22.2%. Most of the lesion were found related to pancreas (22.86%). ***Conclusion:*** Contrast Enhanced Multidetector computed tomography is a useful modality in assessment of various imaging features and diagnosis of retroperitoneal lesions.

Keywords: Contrast Enhanced MDCT (Multi Detector Computed Tomography), Retroperitoneal lesions.

INTRODUCTION

Retroperitoneal space may be defined as the area between the peritoneum and posterior wall of the abdominal cavity. It is bounded above by the diaphragm below by the pelvic brim, laterally it extends to the tips of the twelfth ribs [1].

Retroperitoneal masses constitute a heterogeneous group of lesions, originating in the retroperitoneal spaces [2]. The majority of tumours that arise in the retroperitoneal compartment derive from the major retroperitoneal organs like pancreas, kidneys and adrenals. Other tumours may be lymphoma, sarcoma, rhabdomyosarcoma as well as those arising from connective tissue, fat, fascia and metastases [3].

Primary retroperitoneal masses, which originate in the retroperitoneum but outside the major retroperitoneal organs, are rare and can be divided into solid and cystic masses, each of which can be further subdivided into neoplastic and non-neoplastic masses. Of the primary retroperitoneal neoplasms, 70%–80% are malignant in nature, and these account for 0.1%–0.2% of all malignancies in the body [4]. Though they can affect any age, such tumours are commonly prevalent in adults [5].

Retroperitoneal masses can be classified as primary, when they are originated from tissues other than organs such as the kidneys, adrenal glands, pancreas, or bowel loops [6]. They can be further categorized as solid or cystic, based on their appearance on imaging [7]. Depending on the origin, solid tumours can be divided into four groups mesenchymal, neural, germ cell and lymphoproliferative [8].

Among the cystic tumours, the commonest are lymphangioma and cystic mesothelioma [8-10]. There are also non-neoplastic lesions, primarily retroperitoneal fibrosis, non-Langerhans histiocytosis, and extramedullary hemato-poiesis. With the advent and advances in the field of radiological and imaging techniques, the diagnosis of retroperitoneal mass can be made with greater accuracy than previous years. The better diagnostic facilities like ultrasonography, computed tomography (CT) scan and magnetic resonance imaging (MRI) shows mass lesions directly in their entirety [11].

The advent of CT scan had made it possible to assess the relation of any neoplasm to its neighbouring structures, as well as lymph node metastases [12]. CT scan has proved the most useful and most widely accepted newer imaging techniques, since it provides an accurate diagnosis in all but tiniest of adrenal ours. CT is excellent for diagnosing pheochromocytoma. For neuroblastoma, will not only delineate the tumour but may also yield information about invasion adjacent tissue or organs [13].

In the investigation of renal mass the main advantage of CT scanning are ability to demonstrate direct extra renal extension and venous involvement, it can demonstrate small masses and in particular, anterior and posterior subcapsular masses when the urogram is normal, ability to demonstrate metastatic deposits in the lymph glands liver and lungs, in cystic diseases, ability to demonstrate the presence of associated cystic diseases of liver, pancreas and it has better resolution than USG and is less dependent on the skill of the operator [14].

Carcinoma of the head of pancreas or body of pancreas is commonly identified by CT scan as a localised hypodense mass of variable attenuation distorting the local anatomy. Tumour extension beyond the confines of pancreas to encase adjacent vascular structures can be assessed with intravenous contrast infusion. The only reliable evidence of malignancy in the presents of a pancreatic mass is the detection of focal intrahepatic lesions and enlarge lymph nodes [15].

Demonstration of the extent and location of pseudocyst in relation to adjacent viscera is valuable preoperative nformation [16].

CT scan gives a very accurate anatomic definition of the size and position of the retroperitoneal tumours e.g. lymph node metastasis, lymphomas fibrosarcoma, rhabdomyosarcoma, leiomyoma. CT scan can give the exact extent and adjacent organ involvement for retroperitoneal tumours [11].

In our study we aim to evaluate the spectrum and recognize the characteristic imaging features of various solid and cystic retroperitoneal masses using Contrast Enhanced Computed Tomography and correlate with histopathology /therapeutic response and it was also helps in arriving at an accurate diagnosis in guiding further management.

MATERIALS AND METHOD

Prospective Cross- sectional study was carried out from 1st April 2021 to 30th September 2022 in the department of Radiodiagnosis, SAMC & PG Institute, Indore. Patients with clinical presentation of pain in abdomen and vague symptom of retroperitoneal mass referred from various department of our institute to the department of Radio diagnosis, were subjected to CECT examination after taking written informed consent and data were recorded. The final study population of our study was 25.

Inclusion Criteria

Patients with clinical suspicious cases of retroperitoneal mass referred for CECT abdomen study with in the study duration.

Exclusion Criteria

The following patients will be excluded from the study -

1. Patients who are not willing to give consent.
2. Pregnant female.
3. Elevated serum creatinine level >1.5 mg/dl.
4. Patients with sensitivity to contrast agent (Allergic reactions).

Patients was recruited in the study on pro-data basis and all the patients participating in the study were explained clearly about the purpose and nature of the study in the language they can understand and written informed consent was taken before including them in the study. Patients with clinical suspicion of having retroperitoneal masses were further evaluated with CT scan. The CT scan examinations were performed using a SIEMENS 64 slice multidetector CT scanner (somatom definition AS).

CECT was perform after injecting maximum of 100 mL of non-ionic iodinated contrast medium: Omniscan/Iohexol (iodine concentration, 300 mg/mL) through an 18-20-gauge intravenous cannula at a rate of 3 mL/sec followed by a 20 ml saline flush at a rate of 2 ml/sec. Scanning in the arterial phase (scan time 20.5 sec.) After 60 sec from the contrast given, venous phase scanning (scan time 20.5 sec.) was done.

Coronal and sagittal reformation of the images was obtained with use of maximal intensity projection (MIP), Multiplanar Reformation (MPR) and volume rendering technique (VRT). The axial as well as reformatted coronal and sagittal images was evaluated.

The findings were recorded on pre-structured proforma for the study and descriptive statistics were carry out for identification of characteristics of the collected data.

RESULT

The present study “Assessment of Contrast Enhanced Multidetector Computed Tomography in Diagnosis of Retroperitoneal Masses” was carried out in the department of Radiodiagnosis, SAMC & PG Institute, Indore for a period of 18 months. Our study population comprised of 25 patients fulfilling our inclusion and exclusion criteria which were included in the study after taking written informed consent. All the

patients referred to our department with clinical suspicion of having retroperitoneal masses formed our study population. All patients were subjected to contrast enhanced MDCT abdomen and the data collected was meticulously analyzed to characterized and following observations were made in our study.

During the study period, a total of 25 patients, who fulfilled the selection criteria, were included in the present study. The age distribution was from 1-75 years and this followed a normal distribution curve. The most common affected age group was of 40-60 years (8, 32%) followed by >60 years (7, 28%), and others (Table 1). The group studied included 16 males and 19 females making 64.00% and 36.00%, respectively.

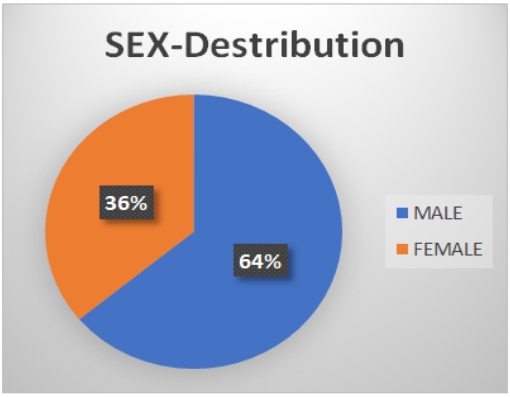

Figure 1: Distribution of the patients based on gender (n=25)

Table-1: Age and Sex Distribution

S. No	AGE range	Frequency (in male)	Frequency (in female)	Total
1.	<20	3	1	4
2.	20-40	4	2	6
3.	40-60	5	3	8
4.	>60	4	3	7

Table-2: Primary Retroperitoneal mass spectrum

S. No	Retroperitoneal mass	Number of cases
1.	Lymphoma	03
2.	Schwannoma	01
3.	Paraganglioma	01
4.	Liposarcoma	02
5.	Teratoma	01
6.	Hematoma	01
	Total	09

Out of 25 cases, 64% were secondary retroperitoneal masses and remaining 36% were primary retroperitoneal masses. Among the primary retroperitoneal masses, Lymphoma accounted for 33.3% and formed the majority.

Table-3: Primary Retroperitoneal mass: neoplastic vs non-neoplastic lesion

Neoplastic lesions	Non-Neoplastic lesions	Total
07	02	09

Among the primary retroperitoneal masses, Neoplastic lesions accounted for the majority of 77.7% of the total.

Table-4: Secondary retroperitoneal masses – organ of origin

Organ of origin of retroperitoneal masses	Frequency
Adrenal	3
Renal	5
Pancreatic	7
Aorta	1
Total	16

In this study, among the 16 cases of secondary retroperitoneal masses, 7 were of pancreatic origin, 5 were of renal origin, 3were of adrenal origin and 1 case of aortic origin.

Table-5: Cystic Retroperitoneal masses

Cystic Retroperitoneal masses	Number of cases
Psoas Hematoma	1
Teratoma	1
Pancreatic pseudocyst	3
Serous cystadenoma pancreas	1
Mucinous cystadenoma pancreas	1
Adrenal hematoma	1
Total	8

In this study, 8 cases (32%) were cystic masses with lesions of pancreatic origin being more common.

Table-6: Components of the computed tomography examined lesions

S. No	Component	Frequency	Percentage
1	Fat	04	16%
2	Necrosis	06	24%
3	Calcification	04	16%
4	Haemorrhage	01	4%

DISCUSSION

Contrast Enhanced MDCT scan has proved the most useful and most widely accepted imaging techniques. Diagnosis of a retroperitoneal mass may be made if its location is confirmed as within the retroperitoneum and after conformation of origin from retroperitoneal organ. Although Contrast Enhanced MDCT imaging can demonstrate most of the important features of these tumors, diagnosis is often challenging for radiologists. Diagnostic challenges include precise localization and organ of origin of the lesion, determination of the extent of involvement.

In this present study, 25 patients were subjected to contrast enhanced MDCT of abdomen. Patients with suspected retroperitoneal lesions were grouped under age, gender and contrast enhanced MDCT imaging patterns. In present study most were in the age group of 40-60 yrs. Male preponderance was observed in our study 64 % being male and 36 % being females.

Out of the 25 patients who were evaluated in our study, 9 cases (36%) were found to be primary retroperitoneal masses. The rest 16 cases (64%) were masses arising from retroperitoneal organs. Among the 9 cases of primary retroperitoneal mass lesions, 77.7 were found to be neoplastic and 22.3 were non-neoplastic lesions.

In the present study lymphomas accounted for 33.3% and formed the majority among the primary retroperitoneal mass lesions which was consistent with findings of the study by Chaudhari *et al*., [8].

In our study, we found that out of the 3 cases of lymphomas, all 3 had well defined lobulated margins, and majority of 66.6 % of them showed the classical floating aorta sign and vascular encasement. On post contrast study, 3 showed mild homogeneous enhancement. No one cases showed necrosis. which was consistent with findings of the study by Rajiah *et al*., [17].

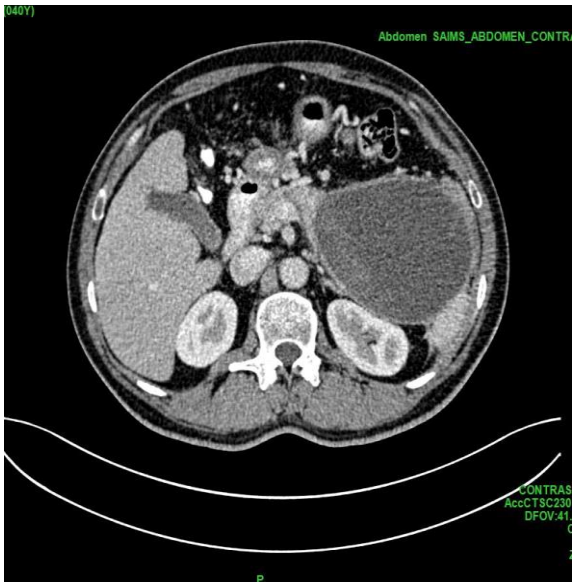

Figure 2: Axial contrast-enhanced computed tomography scan of a 41-year-old male patient with retroperitoneal large pancreatic pseudocyst, well defined thin enhancing walled cystic lesion with few areas of hyperdense contents inside seen arising from the body and tail region of pancreas and insinuating into the lesser sac. The lesion is abutting the spleen with maintained fat planes, causing compression over the left renal and suprarenal gland and displacing the bowel loops

Figure 3: Axial contrast-enhanced computed tomography scan of a 61-year-old female patient with retroperitoneal renal cell carcinoma well-defined enhancing solid-cystic lesion with central areas of necrosis is seen in left kidney arising from the upper pole. The lesion shows heterogeneous enhancement of the cystic part and homogenous enhancement of the solid area

Figure 4: Contrast enhanced computed tomography scan of a 59-year-old male patient with retroperitoneal IVC leiomyosarcoma, an ill-defined heterogeneously enhancing filling defect in the IVC. The wall of IVC is imperceptible

In our present study, the 2nd most common mesodermal neoplasm was liposarcoma, forming 22.22%. Liposarcoma showed thick, irregular, and nodular septa. On post contrast study, they showed enhancement. These features help in differentiating it from lipoma. This is consistent with the study done by Rajiah *et al*., [17].

In our study two case diagnosed as primary retroperitoneal masses on CT were confirmed to be neurogenic tumors on histopathological examination. Among them one was schwannoma and one paraganglioma. The lesion diagnosed as schwannoma appeared as a well-defined homogenous mass in the paravertebral region and shows heterogenous enhancement on post contrast study. Paraganglioma was found as a large well-defined lobulated mass with haemorrhage and shows intense enhancement on post contrast, the finding of which is consistent with the description by Rajiah *et al*., [17].

In our study one case diagnosed as teratoma out of 9 primary retroperitoneal masses and shows features as complex mass that contained multiple well-circumscribed fluid components, fat, and calcification in a tooth like configuration. Similar, characteristic imaging features of teratoma as described by Shin *et al*., [18].

In our study, the retroperitoneal masses were of pancreatic, adrenal, renal and aortic origin. Out of the 7 masses of pancreatic origin, 3 were of pseudocysts, 2 were of adenocarcinoma, 1 each of serous and mucinous cystadenomas. Pancreatic pseudocysts showed variable presentations with one of them showing splenic and portal vein thrombosis.

Renal lesions consisted 2 cases of RCC, 1 case of oncocytoma, 1 cases of Wilms tumour and 1 cases of angiomyolipoma. Out of the 2 cases of RCC that were included in the study, 1 showed Embedded organ sign, and another showed both Embedded organ & Beak sign. one case had distant metastasis.

Adrenal lesions consisted of 1 cases of adenoma, 1 of metastasis, and 1 of neuroblastoma. Adrenal adenoma shows HU value of less than 10showed washout of >60% on delayed study, findings consistent with the findings of adrenal adenoma and also showed phantom sign.

CONCLUSION

This prospective cross-sectional study comprised of 25 patients who were suspected for retroperitoneal lesions, all the patients were subjected to contrast enhanced MDCT of abdomen to assess varies imaging features of lesion and diagnosed on the bases of characters.

Contrast Enhanced MDCT imaging can demonstrate important imaging features of these tumors, diagnosis is often challenging for radiologists. Diagnostic challenges include precise localization of the lesion, determination of the extent of invasion, organ of involvement and characterization of the specific pathologic type.

Characteristic imaging features, such as the composition (fat, calcification, haemorrhage and necrosis with in the lesion), enhancement pattern, vascularity, location, and relationship to adjacent structures, may be combined with clinical information to help narrow the differential diagnosis.

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Conflict of interest: None declared.

Ethical approval: The study was approved by the Institutional Ethics Committee.

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