

Radiological Assessment of Retroperitoneal Neoplastic Lesions in a Tertiary Care Hospital, Rajkot, Gujarat, India: A Cross-sectional Study

DEVASISH TARAFDAR¹, MAULIK CHANDRAKANTBHAI JETHVA², CHIRAG MAHENDRASINH SOLANKI³, ANJANA V TRIVEDI⁴

ABSTRACT

Introduction: The retroperitoneum is an important potential space in the human abdomen. Retroperitoneal (RP) tumours are extremely vast in position, size, rate of growth and in pathological types. They silently grow before giving rise to symptoms or become palpable. Radiology plays a unique role in sustaining the optimum information for the diagnosis of lesions of retroperitoneal space. Computed Tomography (CT) is generally more superior in the diagnosis of retroperitoneal neoplastic lesions in comparison to X-Ray or Ultrasonography (USG) but later are cost-effective and readily available.

Aim: To describe the clinical spectrum of retroperitoneal neoplastic lesions and also to evaluate the radiographic features of different retroperitoneal neoplastic lesions with various radiological modalities.

Materials and Methods: This cross-sectional study was conducted on 50 patients from November 2019 to April 2021, in Department of Radiology of Pandit Deendayal Upadhyay

Government Medical College and Civil Hospital, Rajkot, Gujarat. Each patient had undergone CT, USG and X-ray as indicated. Descriptive data was analysed and presented in terms of frequencies and percentages.

Results: In this study among 50 patients, males (60%) were found to be affected more than the females (40%) with a male:female ratio of 1.5:1. The most common malignant RP neoplastic lesion was metastatic nodal masses and lymphoma. 41 (82%) of cases were malignant while 9 (18%) were benign neoplasms. The most common benign RP neoplastic lesion was teratoma. The most common presentation in patients with retroperitoneal lesions was pain and lump in the abdomen with abdominal distension. Most of the malignant lesions were of average size more than 10 cm.

Conclusion: Most of the retroperitoneal neoplastic lesions were malignant and seen in males. CT, USG and X-ray are helpful in the characterisation and diagnosis of retroperitoneal neoplastic masses.

Keywords: Lymph node, Lymphoma, Malignant mass, Soft tissue sarcoma

INTRODUCTION

“Retroperitoneal mass” is a broad term forming an umbrella covering masses of infectious, inflammatory, neoplastic and traumatic aetiology. Retroperitoneal neoplastic lesions are rare entities, of about 0.2-1% incidence among all solid tumours [1,2]. Clinical diagnosis of retroperitoneal lesions is a challenging problem. The signs and symptoms may be obscured, non specific, or may be delayed in appearance and the concerned area is generally not accessible to palpation, percussion, or auscultation [1,2]. Retroperitoneal tumours are very diverse in position, size, and rate of growth and pathological types. They may be extremely large in size before giving rise to symptoms or become palpable [1-3].

The evaluation of retroperitoneal neoplasms has historically presented a challenge to the physicians and surgeons. The tumours are relatively rare and present with advanced disease in an anatomically complex location [3]. The signs and symptoms of retroperitoneal diseases are myriad and often subtle. For years, retroperitoneum has been a difficult region to image radiologically [3].

Since the description of CT by Godfrey Hounsfield in 1972, the technique has evolved rapidly and has become one of the most spectacular journeys of the recent scientific boon [1]. The advent of modern multidetector scanners with their better spatial resolution and speed allow for shorter examination time and thinner sections. The capability of three-dimensional reconstruction not only help the radiologist in reaching the diagnosis but also help in assessing the exact extent and to some degree the composition of retroperitoneal tumours as well as their effect on neighbouring structures. Today, for most reasons, CT is the diagnostic modality of choice for imaging the retroperitoneum and various pathologies that it harbours [1].

It is difficult to envelope such vast pathologies in one study. And this demands categorisation of retroperitoneal neoplastic masses in such category which, comprised of neoplasms (benign/malignant and primary/metastatic) arising in the retroperitoneum and the lymph nodes confined to the retroperitoneum, likewise done in present study.

Radiology plays a unique role in obtaining optimum information with the minimum number of imaging procedures and diagnosis of abnormalities of retroperitoneal space and content. This region of the body could not be directly studied and only when gross abnormalities present could be appreciated. New imaging modalities help radiologists to study this area which in the past had been a domain reserved for anatomists and surgeons. With the advancement of new imaging modalities, it helps to identify anatomy and its relationship, fascial planes. Detection, delineation of the extent of mass, diagnosis of organ origin, demonstration of its anatomic relationship, and information regarding its internal characteristics have become a lot easier [2].

New imaging modalities provide accurate staging of malignancy, which helps in planning radiotherapy and in the monitoring of treatment of tumour. Interventional procedures like USG or CT-guided FNAC or biopsy are useful in taking direct tissue samples to strengthen the diagnosis [2]. There is a need to compare multiple modalities as X-rays and USG can suspect the possibility of retroperitoneal lesions, but are not confirmatory. So cross-sectional imaging comes into play for definite affirmation.

There are many similar published studies [2,4-10], but all of them are a single modality study or two. Hence, present study was conducted to describe the clinical spectrum of retroperitoneal

neoplastic lesions, evaluate the current trend in the clinical spectrum of different retroperitoneal neoplastic lesions and also to evaluate the radiographic features of different retroperitoneal neoplastic lesions with various radiological modalities.

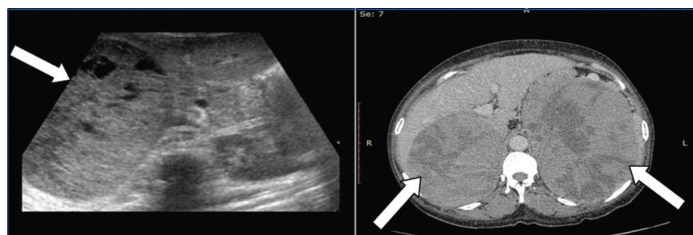
MATERIALS AND METHODS

This cross-sectional study was conducted in Department of Radiology in PDU Gov. Medical college and Civil Hospital, Rajkot, Gujarat, India over a period of one and half years from November 2019 to April 2021. The study was commenced after taking permission from Institutional Ethics Committee {IEC no. PDU/MCR/IEC/20024/2019 (25th October 2019)}. The study was conducted on 50 patients, who reported in the department within the study period and fulfil the inclusion criteria.

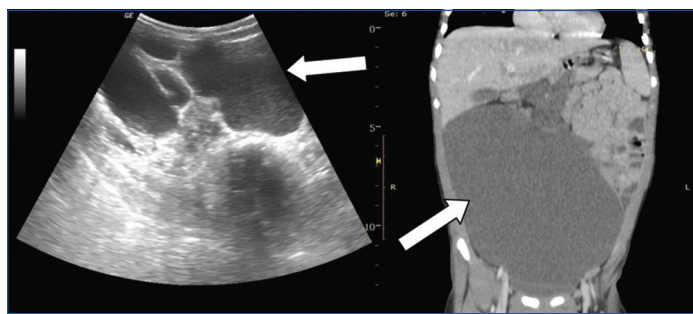
Inclusion criteria: Cases clinically suspected for abdominal/retroperitoneal neoplasms and cases of retroperitoneal neoplastic lesions identified radiologically during the study period were included.

Exclusion criteria: Patients unwilling for the study, patients contraindicated for intravenous (i.v.) contrast, patients with suspected neoplastic lesion but turned out to be non neoplastic in histopathological study and patients who were lost to follow-up were excluded.

The indication and details of the radiological procedure was explained to the patient. A written consent was obtained either from patient or his/her relatives. Each patient had undergone (CT-16 slice), USG (Colour Doppler USG machine) and X-ray as indicated [Table/Fig-1,2].



[Table/Fig-1]: USG and CT showing a case of leiomyosarcoma.



[Table/Fig-2]: USG and CT showing a case of lymphangioma.

The data was primarily gathered for various aspects of the study like age, sex distribution, X-ray, USG and CT features and then extrapolated to arrive at a conclusion. The lesions are then categorised according to their characteristics into benign and malignant, as per the standard World Health Organisation (WHO) classification [3].

STATISTICAL ANALYSIS

Descriptive data was analysed and presented in terms of frequencies and percentages.

RESULTS

In this study, males were found to be affected more than the females with a male:female ratio of (1.5:1). The majority of patients 16 (32%) were seen in the age group of 51-60 [Table/Fig-3].

In this study, out of 50 patients, the majority of patients 34 (68%) presented with distension of the abdomen. Twenty-two (44%) presented with pain in the abdomen and 20 (40%) lump in abdomen

Age (years)	Males	Females	Total n (%)
1-10	3	1	4 (8%)
11-20	3	4	7 (14%)
21-30	3	1	4 (8%)
31-40	5	3	8 (16%)
41-50	3	4	7 (14%)
51-60	10	6	16 (32%)
61-70	2	0	2 (4%)
71-80	1	1	2 (4%)
Total	30	20	50 (100%)

[Table/Fig-3]: Age and sex distribution of retroperitoneal neoplastic lesions.

with 4 (8%) having other complain like urinary symptoms or loss of appetite [Table/Fig-4].

Signs and Symptoms	Frequency (%)
Lump in abdomen	20 (40%)
Pain in abdomen	22 (44%)
Fever	2 (4%)
Weight loss	12 (24%)
Distension of abdomen	34 (68%)
Hypertension	2 (4%)
Others (loss of appetite, urinary symptoms)	4 (8%)

[Table/Fig-4]: Clinical presentation (N=50).

In the present study, out of 50 patients, 41 (82%) retroperitoneal neoplasms were found to be malignant and 9 (18%) were benign. Metastatic masses were the most commonly found malignant RP neoplastic lesions followed by RP lymphoma and Soft Tissue Sarcomas (STS) which had incidence of 11 and 9, respectively [Table/Fig-5].

RP Neoplasm	Frequency (%)
Malignant	41 (82%)
RP metastatic masses	12 (24%)
Lymphomas	11 (22%)
Soft tissue sarcoma	9 (18%)
Other primary (RCC, Wilms, Ca colon)	7 (14%)
Extraadrenal Neuroblastoma	1 (2%)
Malignant teratoma	1 (2%)
Benign	9 (18%)

[Table/Fig-5]: Spectrum of retroperitoneal neoplastic lesions (N=50).
RCC: Renal cell carcinoma; Ca: Carcinoma

Total 41 (82%) had malignant RP neoplastic lesions of which 18 were primary malignant retroperitoneal lesions. Out of these 18 primary malignant retroperitoneal lesions, 9 (18%) were STS, of which 3 (6%) were leiomyosarcoma, 3 (6%) were liposarcoma, 2 (4%) were malignant fibrous histiocytoma, 1 (2%) was of mesenchymal chondrosarcoma. In present study, 1 (2%) each of malignant teratoma and extra-adrenal neuroblastoma were also found. There were also 3 (6%) cases of the Renal Cell Carcinoma (RCC) and 2 (4%) each of Wilms tumour and Carcinoma (Ca) colon [Table/Fig-6].

Primary malignant RP neoplasms	Frequency (n=18)
Soft tissue sarcoma	
Leiomyosarcoma	3 (6%)
Liposarcoma	3 (6%)
Malignant fibrous histiocytoma	2 (4%)
Mesenchymal chondroarcoma	1 (2%)
Malignant teratoma	1 (2%)
Extra-adrenal neuroblastoma	1 (2%)

Others	
Renal origin	3 (6%)
Colonic origin	2 (4%)
Pancreatic origin	2 (4%)

[Table/Fig-6]: Spectrum of primary malignant retroperitoneal lesions.

In present study, 9 (18%) were benign retroperitoneal neoplastic lesions. Among that 3 (6%) were mature teratoma, 2 (4%) were each of neurofibroma and lymphangioma, 1 (2%) was each of ganglioneuroma, and paraganglioma [Table/Fig-7].

Benign RP neoplasms	Frequency (%)
Ganglioneuroma	1 (2%)
Neurofibroma	2 (4%)
Praganglioma	1 (2%)
Lymphangioma	2 (4%)
Teratoma	3 (6%)

[Table/Fig-7]: Spectrum of benign retroperitoneal neoplastic lesions (n=9).

All the RP neoplastic lesions showed soft tissue density on X-ray. Most of the primary malignant RP lesions 15/18 (83.3%) and benign 7/9 (77.7%) showed bowel displacement [Table/Fig-8].

RP neoplastic lesions	X-ray features	
	Soft tissue density	Bowel displacement
Primary RP neoplasm	Malignant (n=18)	15
	Benign (n=9)	7
Lymphomas (n=11)	11	1
Metastatic nodal masses (n=12)	12	5

[Table/Fig-8]: X-ray features of retroperitoneal neoplastic lesions.

In this study, out of 50 cases, 38 cases (76%) were solid and 12 cases (24%) had cystic components. Thirty-eight (76%) were hypoechoic and 12 cases (24%) were hyperechoic in echotexture on USG. Thirty-three (66%) had a regular margin and 17 (34%) had irregular. Forty cases (80%) showed vascularity on colour doppler and 10 cases (20%) were avascular [Table/Fig-9].

Findings	Frequency (%)
Component	
Cystic component	12 (24%)
Solid component	38 (76%)
Echo intensity	
Hypoechoic	38 (76%)
Hyperechoic	12 (24%)
Margin	
Regular margin	33 (66%)
Irregular margin	17 (34%)
Vascularity	
Vascular	40 (80%)
Avascular	10 (20%)

[Table/Fig-9]: USG findings in retroperitoneal neoplastic lesions (N=50).

In this study, about 23 (46%) of cases were hypodense and 27 (54%) were isodense. About 23 (46%) showed each mild and moderate enhancement and 4 (8%) showed no enhancement. In 26 (52%) the enhancement was homogenous and in 24 (48%) it's heterogenous. Necrosis was found in 22 (44%) cases, calcification in 10 (20%) and displacement of adjacent organs in 34 (68%) cases [Table/Fig-10].

Almost all the STS were larger than 10 cm in size. Out of 9 benign RP masses, 4 (44.4%) were smaller than 10 cm. The majority of the lymphomas (7 out of 11; 63%) were found in the range of 5 to 10 cm. Among the metastatic retroperitoneal neoplastic masses,

Findings	Frequency (%)
Density	
Hypodense	23 (46%)
Isodense	27 (54%)
Enhancement	
Mild enhancement	23 (46%)
Mod. Enhancement	23 (46%)
No enhancement	4 (8%)
Pattern of Enhancement	
Homogenous enhancement	26 (52%)
Heterogenous enhancement	24 (48%)
Other characteristics	
Necrosis	22 (44%)
Calcification	10 (22%)
Displacement of adjacent organs	34 (68%)

[Table/Fig-10]: CT characteristics of retroperitoneal neoplastic lesions (N=50).

lymph nodal masses were sized >10 cm. Average sizes of different lesions are shown in [Table/Fig-11].

Retroperitoneal neoplasms	Average size (cm)
Malignant fibrous histiocytoma	15
Liposarcoma	21
Leiomyosarcoma	18.5
Paraganglioma	5
Neurofibroma	6
Lymphangioma	25
Ganglioneuroma	5.5

[Table/Fig-11]: Average size of different lesions.

DISCUSSION

In this study, males 30 were found to be affected more than the females 20. The majority of patients were seen in the age group of 51-60, 16 (32%). These findings are consistent with the findings of similar previous studies [11, 12]. In the study done by Dalen TV et al., the most commonly affected age group was 60-79 years of age in both sexes [13]. This disparity in age-related incidence goes with the difference in the sample composition. In Dalen TV et al., study, the majority of patients were above 60 years of age whereas, in the present study, the majority of the patients were below 60 years of age [13].

In this study, 60% of the patients were males and 40 % were females. Male: female ratio in the present study, for STS, was found to be 2:1. In the study conducted by Dalen TV et al., male: female ratio for STS was 1: 0.73 [13]. In the present study, benign neoplasms were found to be more common in females (66.6%) than in males (33.3%). Similar findings were noted by Lane RH et al., [5]. In this study, the majority of retroperitoneal neoplastic masses were malignant (n=41, 82%) whereas, only a few were benign (n=9, 18%) [Table/Fig-12]. In a similar study done by Dalen TV et al., about 566 (80%) were malignant and 140 (20%) were benign [Table/Fig-12] [13]. Also, in a similar study done by Lane RN et. al., the respective values are 59 (66%) and 31 (34%) [5].

In this study, out of 50 patients, the majority of patients presented with distension of the abdomen (68%), pain in the abdomen (44%) and lump in abdomen (40%) with few having other complain like urinary symptoms or loss of appetite (8%).

In a similar, study conducted by Charan KA et al., the majority of patients (30%) presented with abdominal pain and vomiting, followed by loss of appetite (19%) and weight loss (15%) [9], 15% of the findings were incidental. Few patients complained of fullness and lump in the abdomen (7%). Another similar study done by Nakashima J et al., showed the majority of patients presented with lump in abdomen (44%), pain in the abdomen (36%), and a few

RP neoplasm	Dalen TV et al., [13], 2001 (n=706)	Present study, 2023 (n=50)
Soft tissue sarcoma	30%	18.%
Lymphomas	21%	24%
RP metastatic masses	24%	30%
Extraadrenal neuroblastoma	-	2%
Malignant teratoma	1.2%	2%
Benign	20%	18%
Other primary (RCC, Wilms, Ca colon)	4%	14%

[Table/Fig-12]: Comparison of the findings in present study with previous study.

with hypertension and urinary symptoms (8% each), and few were incidental [11].

In the present study, 82% (n=41) retroperitoneal neoplasms were found to be malignant and 18% (n=9) were benign. Overall lymph nodal masses (metastatic nodal masses and lymphomas taken together) were more common than RP STS. Metastatic nodal masses were the most commonly found malignant RP neoplastic lesions followed by RP Lymphoma and STS which had incidence of 11 and 9, respectively. According to Dalen TV et al., 80% (n=566) of all non visceral retroperitoneal neoplasms were malignant while 20% were benign [13]. Malignant three groups as primary STS lesions were further classified 34% (n=192) into lymphomas 21% (n=154) and carcinoma of unknown primary (metastatic retroperitoneal masses) 24% (n=172). They stated that retroperitoneal lymph nodal masses together (primary-lymphoma and metastatic) are the most commonly found group. Among the individual malignancies, STS are far ahead [Table/Fig-12].

In another similar study done by Charan KA et al., out of the 36 patients, 14 (38%) retroperitoneal masses were seen arising from the kidneys, followed by the adrenals (8 cases, 23%) and pancreas (5 cases, 14%). Three cases were primary retroperitoneal. One case was seen arising from the caecum [9]. In this study, out of 50 patients, 41 (82%) had malignant RP neoplastic lesions of which 9 (18%) were STS, of which 3 (6%) were leiomyosarcoma, 3 (6%) were liposarcoma, 2 (4%) were malignant fibrous histiocytoma, 1 (2%) was each of malignant teratoma, mesenchymal chondrosarcoma, and extraadrenal neuroblastoma. There are 3 (6%) cases of the RCC and 2 (4%) each of Wilms tumour and Ca colon. In a similar study done by Lane RN et al., leiomyosarcoma was 11%, liposarcoma 12%, malignant fibrous histiocytoma 17%, 4% each of malignant teratoma and extraadrenal neuroblastoma [5].

In this study, out of 50 patients, 9 (18%) were benign retroperitoneal neoplastic lesions. Among that 3 (6%) were mature teratoma, 2 (4%) were each of neurofibroma and lymphangioma, 1 (2%) was each of ganglioneuroma, and paraganglioma. In a similar study done by Lane RN et al., 1% was mature teratoma, 7% were of neurofibroma and 4% were of lymphangioma, 2% were of ganglioneuroma and 10% were paraganglioma [5].

In this study, STS were the largest among RP neoplastic masses whereas benign neoplasms and metastatic nodal masses except testicular secondaries were among the smallest. Almost all the STS were larger than 10 cm in size. Liposarcomas were the largest RP neoplastic masses followed by leiomyosarcomas and malignant fibrous histiocytoma. Lymphangioma was the largest benign RP neoplastic mass. Out of nine benign RP masses, 4 (44.4%) were smaller than 10 cm. The majority of the lymphomas (7 out of 11; 63%) were found in the range of 5 to 10 cm. Among the metastatic retroperitoneal neoplastic masses, lymph nodal masses of the testicular primary were the largest. In a similar study done by Lane RN et al., the largest soft tissue sarcoma was liposarcoma with an average size of 20 cm, and the smallest one was leiomyosarcoma [5]. Among benign retroperitoneal neoplastic lesions, the largest one was lymphangioma and the smallest one was paraganglioma [Table/Fig-13].

Retroperitoneal neoplasms	Present study, 2023 (n=50) Average size (cm)	Lane RH et al., [5], 1989; (n=90) Average size (cm)
Malignant fibrous histiocytoma	15	12
Liposarcoma	21	20
Leiomyosarcoma	18.5	11
Paraganglioma	5	4
Neurofibroma	6	5
Lymphangioma	25	28

[Table/Fig-13]: Comparison of the findings in present study with previous study.

In this study, out of 50 cases, 38 cases (76%) were solid and 12 cases (24%) had cystic components. Thirty-eight (76%) were hypoechoic and 12 cases (24%) were hyperechoic in echotexture on USG. Thirty-three (66%) had a regular margin and 17 (34%) had irregular. Forty cases (80%) showed vascularity on colour doppler and 10 cases (20%) were avascular. So, with the help of USG, the diagnosis of retroperitoneal neoplastic lesions is in the range of 76% among all the cases. In a similar study done by Charan KA et al., out of the 36 cases only 28 (78%) cases were identified on USG [9]. 19 cases (65%) were solid masses, 8 cases (27%) were cystic and 4 cases (9%) had both solid and cystic components. A 67% of the masses were hypoechoic, followed by 26% of the masses were heterogeneous. Only 6% of the masses were hyperechoic. Mild vascularity was seen in 16 cases, moderate vascularity in 8 cases.

In this study, about 46% of cases were hypodense and 54% were isodense. About 46% showed each mild and moderate enhancement and 8% showed no enhancement. In 52% the enhancement was homogenous and in 48% it's heterogenous. Necrosis was found in 44% cases, calcification in 20% and displacement of adjacent organs in 68% cases. Similar findings were noted in previous studies [14-17]. In a similar study done by Charan KA et al., about 75% of cases were hypodense and 13% were isodense [9]. About 46% (n=23) showed each mild and moderate enhancement and 8% (n=4) showed no enhancement. In 51% the enhancement was homogenous and in 17% it's heterogeneous.

Limitation(s)

There may be technical limitations due to faulty interpretation on USG as ultrasound cannot penetrate upto deep structures and due to gas shadows from bowel. Sometimes there may be non working condition or decreased acumen of instruments (due to continuous wear and tear) that may limit the diagnosis of retroperitoneal neoplastic lesions. Also, limitations of study circumstances as patients may sometimes unable to lie supine and decreased number of patients as few of the lesions are silent and not produce symptoms.

CONCLUSION(S)

It can be concluded, that most of the retroperitoneal neoplastic lesions are malignant and affects males more commonly. The most common malignant RP neoplastic lesion was metastatic nodal masses and lymphoma, and kidney is the most commonly affected organ. The most common benign RP neoplastic lesion was teratoma with the pain and lump in the abdomen with abdominal distension as most common presentation. In this study X-ray could suspect retroperitoneal neoplastic lesions as large soft tissue opacity. USG can predict retroperitoneal neoplastic lesions up to about 76% as seen in our study. CT, USG and X-ray all-together helps in the characterisation and diagnosis of retroperitoneal neoplastic masses. USG or CT guided intervention procedures give an extra edge in confirmation of the radiological diagnosis of retroperitoneal neoplastic lesions and thus retains enough possibilities for future studies and explorations.

REFERENCES

- [1] Burkill GJC, Healy JC. Anatomy of the retroperitoneum. The British Institute of Radiology. 2000;12:10-20.
- [2] Yang DM, Jung DH, Kim H. Retroperitoneal cystic masses: CT, clinical and pathological findings and literature review. Radiographics. 2004;24(5):1353-65.
- [3] Sutton D. Text book of Radiology and Imaging, 4th edition. Publisher: Elsevier-Saunders, Mosby, Churchill. Year: 2009.
- [4] Cohan RH, Baker ME, Cooper CT, Moore JO. Computed tomography of primary retroperitoneal malignancies. J comput Assist Tomogr. 1988;12(5):804-10.
- [5] Lane RH, Stephens DH, Reiman HM. Primary retroperitoneal neoplasms: CT findings in 90 cases with clinical and pathologic correlation. AJR Am J Roentgeol. 1989;152(1):83-89.
- [6] Schmidt B, Schmiedl U, Kegel T. CT of primary retroperitoneal soft tissue masses. Digitale Bild diagn. 1989;9(3):114-18.
- [7] Storm FK, Mahvi DM. Diagnosis and management of retroperitoneal soft tissue sarcoma. Ann Surg. 1991;214(1): 02-10.
- [8] Zhong H, Zhong L, Za Z. Computed tomography of retroperitoneal masses. Diagnose JR. 1992;14(6):455-57.
- [9] Charan KA. Role of MDCT and USG in evaluating retroperitoneal masses: IJCMSR. 2021;6(1):A54-A58.
- [10] Hayasaka K, Yamada J, Saitoh Y. CT evaluation of primary benign retroperitoneal tumour. Radiat Med. 1994;12(3):115-20.
- [11] Links Nakashima J, Ueno M, Nakamura K. Differential diagnosis of benign and malignant primary retroperitoneal tumors. Int J Urol. 1997;4(5):441-46.
- [12] Leung D, James M, Woodruff, Murray F, Brennan: Retroperitoneal soft tissue sarcoma. Analysis of 500 patients treated and followed up at a single institute. Annu Meet. ASA; Apr1998.
- [13] Dalen TV, Jan-Willem W. Coebergh. Soft tissue sarcoma: the predominant primary malignancy in the Retroperitoneum Original Article. Sarcoma. 2001;5(1):05-08.
- [14] Rosai J. Peritoneum, retroperitoneum and related structures. In: Rosai J.ed. Rosai and Ackerman's surgical pathology. New York: Mosby, 2004:23734-2415.
- [15] Rha SE, Byun JY. Neurogenic tumors in the abdomen: Tumor types and imaging. Radiographics. 2003;23(1):29-43.
- [16] Madrigal Rubiales B, Vara Castrodza A, Fresno Forcelledo M. Non secreting, extra-adrenal retroperitoneal paragangliomas. Arch Esp Urol. 2002;55(5):543-47.
- [17] Gupta AK, Richard HC, Isaac RF. CT of recurrent retroperitoneal sarcoma. AJR. 2000;174(4):1025-30.

PARTICULARS OF CONTRIBUTORS:

1. Senior Resident, Department of Radiology, Pandit Deendayal Upadhyay Government Medical College, Rajkot, Gujarat, India.
2. Associate Professor, Department of Radiology, Pandit Deendayal Upadhyay Government Medical College, Rajkot, Gujarat, India.
3. Junior Resident, Department of Radiology, Pandit Deendayal Upadhyay Government Medical College, Rajkot, Gujarat, India.
4. Professor and Head, Department of Radiology, Pandit Deendayal Upadhyay Government Medical College, Rajkot, Gujarat, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Mauilik Chandrakantbhai Jethva,
Block 70, Street 2, Green Park Society, Oppo. Vasundhara Residency, Airport
Road, Rajkot-360007, Gujarat, India.
E-mail: jethvamauliking@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Aug 11, 2022
- Manual Googling: Jan 24, 2023
- iThenticate Software: Feb 01, 2023 (3%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Aug 09, 2022**

Date of Peer Review: **Oct 28, 2022**

Date of Acceptance: **Feb 02, 2023**

Date of Publishing: **Jul 01, 2023**