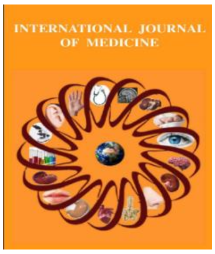
International Medicine 2025; 7(12): 173-177



International Journal of Medicine

https://www.theinternationalmedicine.com

Original Research

Role of Computed Tomography in Evaluating Abdominal Masses in Pediatric Age Group

Dr. Vaishnavi Gaikwad[1], Dr. Poonam Katkade[2], Dr. Nirupama K Patil[3]

[1]*Assistant Professor, Department of Radiodiagnosis, SRTR, GMC, Ambajogai, India.*

[2]*Assistant Professor, Department of Radiodiagnosis, SRTR, GMC, Ambajogai, India.*

[3]*Professor, Department of Radiodiagnosis, SRTR, GMC, Ambajogai, India.*

Received: 18 Oct 2025 / Accepted: 17 Nov 2025

Abstract

Background: Abdominal masses in children encompass a variety of lesions of very diverse origin. They may occur from the period of birth through adolescence. In most of these cases, the lesion is detected late after a long period of vague, nonspecific symptoms. The role of radiological imaging investigations is to identify the exact location and extension of the pathology using the essential imaging modalities. The study aims to assess the role of computed tomography imaging in the evaluation of pediatric abdominal masses. A prospective study was conducted at a tertiary care hospital involving 50 patients. Pediatric patients of age group between 0-12 years with relevant signs/symptoms of abdominal masses referred to radiodiagnosis department. The above table shows majority of cases presented with malignant mass i.e., 23 (46%), followed by benign mass 14 (28%), Infective/inflammatory 9 (18%) and not specified in 2 cases (4%). 2 cases (4%) were found to have no significant abnormalities. The majority of abdominal masses location was Renal i.e., 19 (38%) followed by Hepatobiliary 10 (20%), Non-renal retroperitoneal 7 (14%), Genital 6 (12%) and Gastro-intestinal/Mesenteric 6 (12%). 2 cases (4%) were found with no significant abnormality in the CT scan imaging. Computed tomography is effective, relatively rapid and reliable method of imaging in evaluating pediatric abdominal pathologies. It successfully localises, characterises and delineates the lesions, thus giving a provisional diagnosis which is closer to the final pathological diagnosis. The various abdominal lesions can be differentiated on the basis of presence of calcification, necrosis, haemorrhage, involvement of surrounding structures, distant metastasis and also the pattern of contrast enhancement which are the factors which lead closer to the diagnosis.

Keywords: *Pediatric abdominal masses, Computed Tomography (CT),*

Introduction

Abdominal masses in children encompass a variety of lesions of very diverse origin. They may occur from the period of birth through adolescence [1]. In most cases, there is lack of peculiar signs and symptoms that may help in early diagnosis. In most of these cases, the lesion is detected late after a long period of vague, nonspecific symptoms. The role of radiological imaging investigations is to identify the exact location and extension of the pathology using the essential imaging modalities. Most abdominal masses in children are initially investigated by Plain X-ray. These provide information about the location of the lesion and the presence or absence of calcifications [1]. Their role varies from being a screening modality, giving non-specific information in some cases, to giving specific information in some cases, to giving a specific diagnosis in the others [2]. However, children are exposed to hazardous radiations and have a limited role as only the four basic densities, i.e., bone or mineral, soft tissue, fat, or air are visualized on X-ray[3].

Ultrasound is a very powerful imaging modality for the pediatric patients since it does not have any of the radiation hazards. It enables imaging in multiple planes, permits repetitive examinations and does not require physiological function for anatomic visualization [2]. It can be used in directing the location of the pathology for biopsies and drainage of fluid collections [4]. It aids in localizing the tumour, looking for associated lymphadenopathy and evaluation of vascularity by Colour and Duplex Doppler. Thus, USG is diagnostic in some of the cases while it limits the differential diagnoses in others and hence it is useful as a general screening modality.

However, USG is a highly operator-dependent modality and the presence of bone or gas artefacts affects its precision. In addition, ultrasonography provides comparatively less precise anatomic details [4-6]. In recent times, computed tomography has found an increasing application in the evaluation of pediatric abdominal masses [2]. The anatomic details provided by CT is superior to any other imaging modality currently available. It derives an entire anatomic section of tissue, which helps in determining the location and extent of disease.

It is not operator dependent and allows the precise calculation of tissue attenuation coefficient. Enhancement with a contrast medium facilitates measurement of blood flow to an organ or the pathologic abnormality [7,8]. However, the paucity of tilt in children makes the delineation of anatomic margins in the retroperitoneal region difficult [9]. In addition to this, the conventional CT requires sedation in neonates, infants and small children, intravenous and enteric contrast, immobilization and alteration of environment, and is time consuming [10,11].

Address for Correspondence Dr. Vaishnavi Gaikwad, Assistant Professor, Department of Radiodiagnosis, SRTR, GMC, Ambajogai, India..

DOI: 10.61336/im/25-12-33

A very wide spectrum of tumours which appear to be arising from various organs can involve the pediatric abdomen, which may be benign or malignant in nature. The diagnosis is advocated mainly by the patient's age and imaging appearance of the lesion, including its location, organ of origin, nature and internal architecture. Age of the patient is one of the most important factors that aid in narrowing the potential differential diagnosis as certain masses are particularly common in certain age groups. Relevant history of the patient which includes time since onset of lump, rate of increase in size and its mass effect on adjacent structures may add further to this information. Multidetector computed tomography (MDCT) is an excellent imaging tool which provides rapid and excellent images of such lesions. MDCT with multiplanar reconstructions provide important information regarding the location of the lesion, organ from which the lesion originates, enhancement pattern and characteristics in various phases of contrast administration, whether there is presence of necrotic areas and calcifications or areas of fat attenuation, extensions of the lesion, involvement and invasion into other organs and mass effect on the adjacent structures. It also helps to understand the local extent of the lesion and its distant metastases. MDCT is used to derive differential diagnosis based on above mentioned imaging features and in most of these cases, one can arrive at a definitive diagnosis. If a malignant lesion is suspected, a CT scan of the chest, abdomen, and pelvis can be done to determine mass effect, extension and infiltration into adjacent organs and vessels and to look for distant metastases. Tumours in children include lesions unique to the pediatric age group. Primary liver neoplasms are the third most common abdominal malignancy in childhood, right after Wilms' tumour and neuroblastoma.

Thus, multislice helical technology has expanded the functionality of CT in the evaluation of pediatric abdominal masses. The advantages of CT of single breath-hold acquisition in cooperative and older children, improved vascular post-contrast enhancement, rapid detection of pathology and multiplanar and 3-dimensional reconstruction may make it one of the imaging techniques of choice in evaluation of pediatric abdominal masses.

AIMS AND OBJECTIVES

1. To assess the role of computed tomography imaging in the evaluation of pediatric abdominal masses.
2. To illustrate the common pediatric abdominal masses.
3. To describe CT findings in pediatric patients with abdominal masses.
4. To determine efficacy of CT in evaluation of abdominal masses in pediatric patients.

Materials and Methods

Study design: DESCRIPTIVE STUDY

Study setting: Department of Radiodiagnosis, Tertiary care centre

Study duration: 18 months (Data collection -12 months and analysis 6 months)

Sample size: Sample size of 50 is chosen.

The patients referred for Triple Phase CT on clinical suspicion of pediatric masses are clinically examined, relevant history taken, prior radiological investigations if done are noted. Exclusion criteria is applied and if the patient is not excluded the patient is taken for Triple Phase CT by properly preparing the patient and informed consent. Patients were kept nil orally 6-8 hours prior to CT scan to avoid complications while administrating contrast medium. Details of the study protocol was explained to the subjects. Risks of contrast administration were explained to the patients and consent was obtained prior to the contrast study. Routine antero-posterior topogram of the abdomen was initially taken in all patients in the supine position. Low osmolar and non-ionic intravenous contrast 300mgI/ml was administered at a rate of 1.5 mg per kilogram of body weight. Oral contrast was administered with the help of nasogastric tube in infants and non-cooperative children, whereas in older children it was administered orally 1 to 4 hours prior to the examination to some patients depending upon the organ of interest. Oral contrast given was either negative or positive as per the indication. Oral contrast was not given in all cases, and the decision whether to give oral contrast was determined by the clinical indication for that scan.

The slice thickness used was between 3-5mm, the region of interest was scanned with 1 mmslices. Multi-planar reformatting was applied during reporting of the scan using a PACS reporting system. Thescans were reported by a senior radiology resident on a monitor which was supervised by aconsultant radiologist. The main difficulty which was encountered was relative lack of abdominal fat in children greatly reducing the contrast of abdominal scans.

Results

This prospective observational study was done among 50 cases of abdominal masses referred to Radiodiagnosis department of tertiary care centre during the study period.

Table 1: Distribution of the cases according to age (N=50)

Age in years	Frequency	Percentage
<1	03	6%
1-5	19	38%
6-12	28	56%
Total	50	50 (100%)

Above table shows that majority of study cases belongs to the age group 6-12 years i.e., 28 (56%) followed by 1-5 years age group 19 (38%) and 3 cases were found in the less than 1 year age group.

Table 2: Distribution of the cases according to Gender (N=50)

Gender	Frequency	Percentage
Male	32	64%
Female	18	36%
Total	50	50 (100%)

Above table shows that majority of study cases were Males contributing 32 (64%) and females 18 (36%).

Table 3: Distribution of the cases according to clinical features (N=50)

Clinical features	Frequency	Percentage
Abdominal swelling	38	76%
Abdominal pain	30	60%
Weight loss	18	36%
Fever	9	18%
Vomiting	7	14%
Haematuria	6	12%

The above table shows majority of cases presented with abdominal swelling i.e., 38 (76%) followed by abdominal pain 30 (60%), weight loss 18 (36%), fever 9 (18%), vomiting 7 (14%) and haematuria 6 (12%).

Table 4: Distribution of masses according to nature (N=50)

Nature of Mass	Frequency	Percentage
Benign	14	28%
Malignant	23	46%
Infective/inflammatory	9	18%
Non specific	2	4%
No mass	2	4%
Total	50	50 (100%)

The above table shows majority of cases presented with malignant mass i.e., 23 (46%), followed by benign mass 14 (28%), Infective/inflammatory 9 (18%) and not specified in 2 cases (4%). 2 cases (4%) were found to have no significant abnormalities.

Table 5: Distribution of the cases according to location of mass (N=50)

Location of mass	Frequency	Percentage
Renal	19	38%
Non-renal retroperitoneal	7	14%
Genital	6	12%
Gastro-intestinal/Mesenteric	6	12%
Hepatobiliary	10	20%
Normal	2	4%
Total	50	50 (100%)

The above table shows majority of abdominal masses location was Renal i.e., 19 (38%) followed by Hepatobiliary 10 (20%), Non-renal retroperitoneal 7 (14%), Genital 6 (12%) and Gastro-intestinal/Mesenteric 6 (12%). 2 cases (4%) were found with no significant abnormality in the CT scan imaging.

Table 6: Distribution of the cases according to CT Diagnosis (N=50)

CT Diagnosis	Frequency	Percentage
Wilm's tumour	6	12%
Neuroblastoma	7	14%
Mesenteric cyst/lymphangioma	4	8%
Tailgut cyst	1	2%
Perinephric/renal abscess	3	6%
Rhabdoid tumour of kidney	2	4%
Renal cell carcinoma	1	2%
Hepatoblastoma	3	6%
Hepatocellular carcinoma	2	4%
Liver abscess	4	8%
Hydatid cyst	1	2%
Hydronephrosis	2	4%
Lymphoma	3	6%
Multicystic dysplastic kidney	3	6%
Haemorrhagic adrenal cyst	1	2%
Ovarian cyst	2	4%
Teratoma	2	4%
Appendicular abscess	1	2%
Normal	2	4%
Total	50	50 (100%)

The above table shows CT diagnosis of abdominal masses neuroblastoma 7cases, Wilm's tumour 6, Mesenteric cyst 4, tail gut cyst 1,renal abscess 3, Rhabdoid tumour of kidney 2, Renal cell carcinoma 1, Hepatoblastoma 3, Hepatocellular carcinoma 2, Liver abscess 4,Hydatid cyst 1, Hydronephrosis 2, Lymphoma 3, Multi-cystic dysplastic kidney 3, Haemorrhagic adrenal cyst 1, Ovarian cyst 2, Appendicular abscess 1 Teratoma 2 and normal 2.

CASES

A 9 months old female child with complaints of painless lump in right hypochondriac region on palpation was referred to the radiology department and CT scan was done.

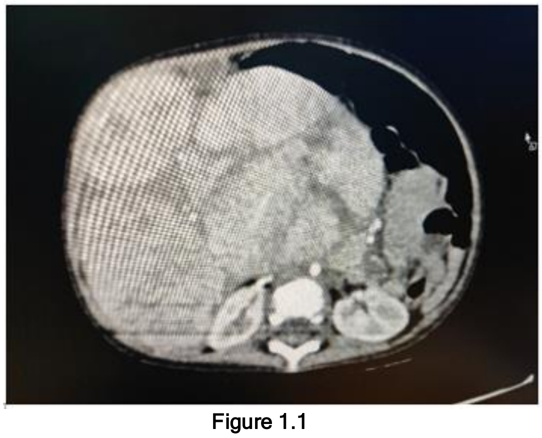


Figure 1.1

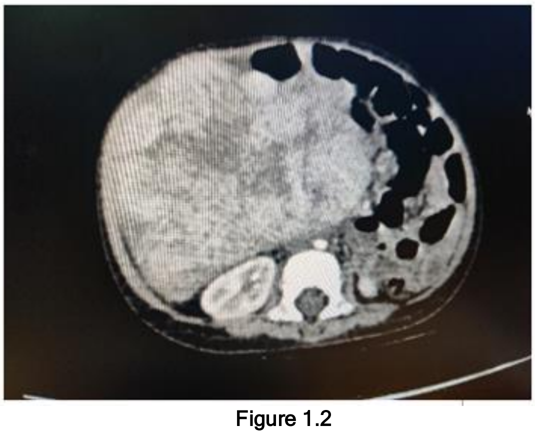


Figure 1.2

Int Med 2025;7(12): 173-177

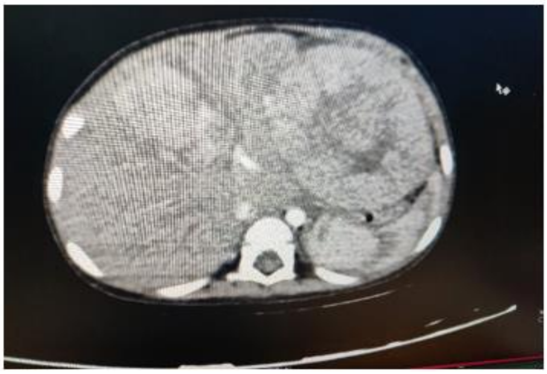


Figure 1.3

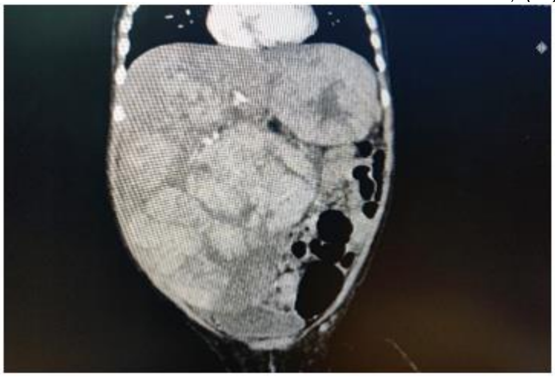


Figure 1.4

Imaging Findings (Figure 1.1 to 1.4): CT Abdomen axial and coronal postcontrast images reveal hepatomegaly with multiple well defined, lobulated, heterogeneously enhancing mass lesions with areas of necrosis within and are causing mass effect on right kidney and inferior vena cava. Narrowed calibre of infrarenal aorta is also noted. These represent features of hepatoblastoma.

A 12 months old female child with a history of swelling in the lower abdomen region and lump on palpation. Contrast-enhanced CT scan was done.

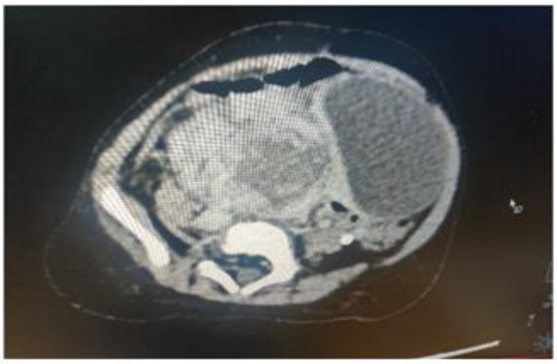


Figure 2.1

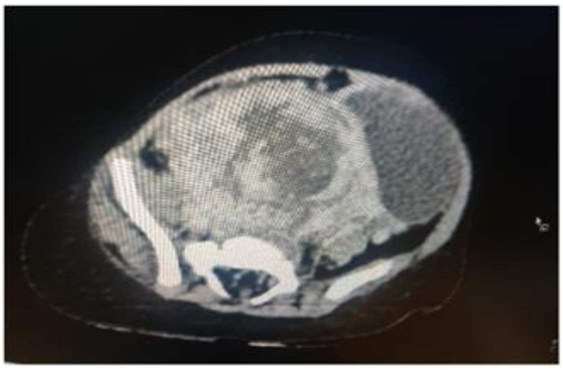


Figure 2.2

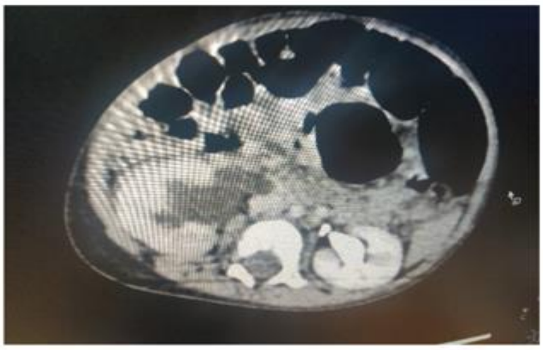


Figure 2.3

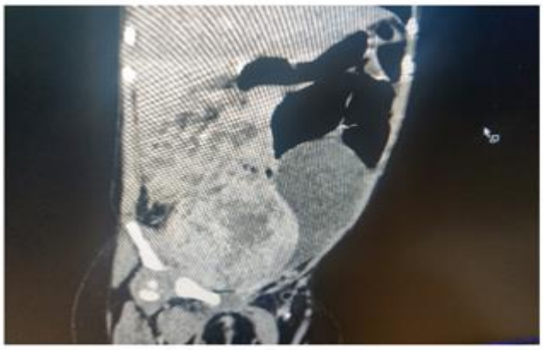


Figure 2.4

Imaging findings (Figures 2.1 to 2.4): CT axial and coronal post-contrast images showing a large fairly well defined heterogeneously enhancing mass lesion in lower abdomen and pelvis with few tiny foci of calcifications within it, which is seen causing mass effect on the urinary bladder and is extending into the presacral region. These imaging findings represent features of teratoma. Right gross hydronephrosis is also noted (figure 2.3).

A 11 years old male child with history of acute pain in right iliac fossa region. CT scan was done using intravenous contrast.

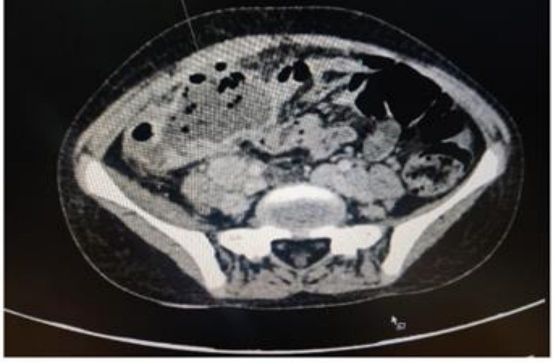


Figure 3.1

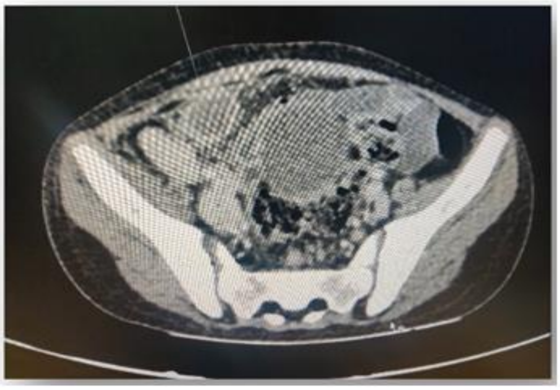


Figure 3.2

Imaging findings (Figure 3.1 to 3.2): CT axial and coronal images showing a well-defined peripherally enhancing collection in right iliac fossa with multiple air foci within, seen communicating within the cecum. Appendix not visualized separately. It is seen causing mass effect on adjacent bowel loops. Adjacent fat stranding is also noted. These imaging features represent appendicular abscess.

Discussion

This present study was done among 50 cases of abdominal masses referred to Radiodiagnosis department of tertiary care centre during the study period. Majority of study cases belongs to the age group 6-12 years i.e., 28 (56%) followed by 1-5 years age group 19 (38%) and 3 cases (6%) were found in the less than 1 year age group. Similar result found in the study conducted by Surbhi Gupta et al. (2017)[13]. It reported that the maximum cases were found in more than 1 year age group i.e., 42,in≤1 year 8 cases were found, 1-5 years 21 and more than 5 years 21 cases. Majority of cases were males 29 and females were 21. Majority of study cases were Males contributing 32 (64%) and females 18 (36%). Similar result was also observed in the study by Biona K et al. (1983) He reported that the males were affected more than females (1.5:1). Rastogi V et al. (1988)[12] They found that the males were affected more often than females (2.4:1). Surbhi Gupta et al. (2017)[13] They reported that the majority of cases were males 29 and females were 21. Bahinipati et al. (2016)102 They reported that the abdominal mass 56% as the most common clinical manifestations. Biona K et al. (1983)96 They reported that the most common clinical presentation was abdominal lump 58%.

Majority of cases presented with malignant mass i.e., 23 (46%) followed by benign mass 14 (28%), Infective/inflammatory masses 09 (18%) and non-specific 2 (4%) and normal 2 (4%). Similar result found in the study conducted by Surbhi Gupta et al. (2017)[13]. They reported that the amongst the 50 cases 22 (44%) were found to be malignant and 28 (56%) were found to be benign, 13 infective/inflammatory, neoplastic 4, congenital 3. Another study conducted by Rastogi V et al. (1988)[12]. They observed that the 58% cases were benign masses and Malignant cases were30%, Infective/Inflammatory masses 22%. According to location of mass majority of abdominal masses location was Renal i.e., 19 (38%) followed by Hepatobiliary 10 (20%), Non-renal retroperitoneal 7 (14%), Genital 6 (12%) and Gastro-intestinal/Mesenteric 6 (12%). Two cases (4%) were found normal. Similar findings observed in the study by Surbhi Gupta et al. (2017)[13] They found that the14 renal masses, Non-renal retroperitoneal masses constituted 24% (12/50) of the cases, Genital 6,Gastrointestinal/Mesenteric 6,Hepatobiliary 8.

CT diagnosis of abdominal masses neuroblastoma 7 cases, Wilm's tumour 6, Mesenteric cyst 4, tail gut cyst 1, renal abscess 3, Rhabdoid tumour of kidney 2, Renal cell carcinoma 1, Hepatoblastoma 3, Hepatocellular carcinoma 2, Liver abscess 4,Hydatid cyst 1, Hydronephrosis 2, Lymphoma 3, Multicystic dysplastic kidney 3, Haemorrhagic adrenal cyst 1, Ovarian cyst 2, Appendicular abscess 1, Teratoma 2 and normal 2. Similar result found in the study conducted by Surbhi Gupta et al. (2017)[13] and Egeibor et al. (1999). They found that the 87% of solid renal neoplasms in children are Wilms' tumours; other renal tumours include clear cell sarcomas (6%), mesoblastic nephroma (2%), rhabdoid tumours (2%); lymphoma (<0.5%) and renal cell carcinoma (<0.5%).

Conclusion

Computed tomography is effective, relatively rapid and reliable method of imaging in evaluating pediatric abdominal pathologies.

It successfully localises, characterises and delineates the lesions, thus giving a provisional diagnosis which is closer to the final pathological diagnosis. The various abdominal lesions can be differentiated on the basis of presence of calcification, necrosis, haemorrhage, involvement of surrounding structures, distant metastasis and also the pattern of contrast enhancement which are the factors which lead closer to the diagnosis.

Computed tomography is a significantly sensitive and efficient imaging tool. It is fast, reliable and significantly accurate method for the localization and characterization of various tumours arising from pediatric abdomen. It helps in narrowing differential diagnosis and arriving at a final diagnosis in most of the cases. It also provides significant information for the operative management of the patients.

Computed Tomography plays a major role in evaluating the paediatric abdominal masses. It helps in depicting the exact anatomical location of the mass, helps in establishing its organ of origin and relations with adjacent structures, readily depicts areas of calcification or necrosis if any. The contrast enhancement pattern in CECT helps in differentiating the various abdominal masses in pediatric age group. All these factors help reaching a differential diagnosis which is much closer to the final pathological diagnosis. Thus, CT is a very efficient tool which helps in assessing the paediatric abdominal masses, giving a differential diagnosis closer to the final diagnosis and as a result helps in their early and appropriate management.

References

1. Merten DF, Stuart GH. Radiological staging of thoracoabdominal tumours in childhood. Radiologic clinics of North America, 1994;32(1):133-149.
2. Goldberg BB, Pollack HM, Capitanio MA, Kirkpatrick JA. Ultrasonography- an aid in the diagnosis of masses in the pediatric patients. Pediatrics. 1975;56(3):421-428.
3. Griscom NT. The roentgenology of neonatal abdominal masses. AJR. 1965;93:447-463.
4. Yamaguchi M, Takeuchi S, Akiyama H, Sawaguchi S. Ultrasonic evaluation of abdominal masses in the pediatric patient. Tohoku J Exp Med. 1980;130(1):25-39.
5. Scott DJ, Wallace WH, Hendry GM. With advances in radiological imaging can the radiologist reliably diagnose Wilm's tumour? Clin. Radiol. 1999;54(5):321-327.
6. Ohtsuka Y, Takahashi H, Ohnuma N, Tanabe M, Yoshida H, Iwai J. Detection of tumour thrombus in children using colour Doppler ultrasonography. J. Paed. Surgery. 1997;32(10):1507-1510.
7. Riccabona M, Uggowitzer KE, Lindbichler F, Ebner F, Fotter R. Echoenhanced color Doppler ultrasonography in children and adolescents. J Ultrasound Med. 2000;19(11):789-796.
8. Bates SM, Keller MS, Ramos IM, Carter D, Taylor KJ. Hepatoblastoma: Detection of tumour vascularity with duplex Doppler US. Radiology. 1990;176(2):505-507.
9. Plumley DA, Grosfeld JL, Kopecky KK, Buckwalter KA, Vaughan WG: The role of spiral CT with 3D reconstruction in pediatric solid tumours. J Pediatr Surg. 1995;30(2):317-321.
10. Miele V, Galluzo M, Bellusi A, Valenti M. Spiral CT in the study of renal neoplasms in children. Radiol Med (Torino). 1998;95(5):486-492.
11. Frush DP, Siegel MJ, Bisset GS. 3rd: Challenges of pediatric spiral CT. Radiographics. 1997;17(4):939-959.
12. Rastogi V, Singhal PK, Aseri A, and Taneja SB: Ind J Ped 1988; 55: 295-300.
13. Surbhi Gupta, Deepak Meena, GL Meena ,Tumours and beyond: an Array of Abdominal masses in children. Symbiosis, Internal journal of Pediatrics child care: Open Access22(2): 1-9.