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Radiology

THE ROLE OF COMPUTED TOMOGRAPHY IN DIAGNOSING AND STAGING OF THE PEDIATRIC ABDOMINAL NEOPLASM

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ABSTRACT Background :Abdomen is the most common site of solid neoplasm in the pediatric age group. Majority of the patients are under 5 years of age. Neuroblastoma is the most common tumour, followed by Wilms' tumour. The local staging of the tumour is confirmed with the surgical staging in the case those are operated. So the aim of the study to find out the role of Computed Tomography in diagnosing and staging of the pediatric abdominal neoplasm. Methods and Material :100 consecutive abdominal CT scan done in the tertiary care hospital for children (age 0- 18 years) with abdominal tumours in last one and half years. were included in the study . Results : The accuracy of the CT scan in diagnosing the pediatric abdominal neoplasm in our study is 82 %. CT scan is not able to diagnoses the tumour in the 18 % of cases due to atypical imaging features of the common tumour or due to rare tumours. Conclusion : Computed tomography is most commonly used in the imaging of the abdominal mass in the pediatric patient as it is easily available and can be in done in very short time. Computed tomography can be used to diagnoses and stage the individual tumour based on the clinical data and imaging features.

KEYWORDS : .

Introduction

Abdomen is the most common site of solid neoplasm in the pediatric age group. Majority of the patients are under 5 years of age. Neuroblastoma is the most common tumour, followed by Wilms' tumour. Others are non-Hodgkin's lymphomas, germ cell tumours, hepatoblastoma, rhabdomyosarcoma, Burkitt's lymphoma, hepatoce llular carcinoma, etc. Though most of the tumours are round cell tumours, the management is very specific for each neoplasm and its stage and hence accurate diagnosis and staging is essential. [1-3]

Cross-sectional imaging is an essential investigation in evaluation of these tumours. MRI has the advantage of being free of radiation. CT is performed more often than MRI because of availability, cost and time required for the scan. The imaging features on the computed tomography (CT) are used to differentiate the individual abdominal tumours and stage the diseases[1]. CT scan of the abdomen has both a diagnostic and therapeutic use. [2]

To obtain a diagnosis in retroperitoneal masses when this cannot be arrived at by a combination of conventional radiology, ultrasound and scintigraphy. The imaging features used for the diagnosis and staging of the pediatric abdominal neoplasms are site of the tumour, organ of origin, pattern of enhancement on post contrast scan, presence or absence of the necrosis, calcification, intra-tumoural hemorrhage, cystic changes, relation with surrounding visceral organs, vascular involvement (invasion or displacement or encasement), crossing across the midline and detection of the metastasis. [4-8] Definitive diagnosis of the tumours is with the help of the histopathological examination. The local staging of the tumour is confirmed with the surgical staging in the case those are operated. The role of Computed Tomography in diagnosing and staging of the pediatric abdominal neoplasm.

Methods and Material

100 consecutive abdominal CT scan done in the tertiary care hospital for children (age 0- 18 years) with abdominal tumours in last one and half years. were included in the study . Patients who have taken any form of therapy prior to the abdominal CT scan were excluded from the study. The scans of the patients meeting the study eligibility criteria were reviewed on workstation by the investigator who was blinded to histological diagnosis but was provided with age and sex of the child. The CT scan imaging features of the intra abdominal mass were noted as using parameters like site of the tumour,organ of origin, pattern of enhancement on post contrast scan, presence and pattern of calcification within the mass, presence of necrosis or cystic areas, relationship with surrounding organs. relation with vessels (invasion or displacement or encasement), presence of any metastases.

Based on these findings the most appropriate single diagnosis or a list of differential diagnosis was suggested. The probable local stage of the tumour was identified on the basis of imaging features on the CT scan. [9-11] The radiological diagnosis was then correlated with histopath ological diagnosis. Local staging (T and N) seen in the CT scan was correlated with the surgical staging in the operated cases.

RESULTS AND ANALYSIS

Table no 1: Table showing distribution of the pediatric abdominal neoplasms.

LOCATION	
Hypochondriac region	39
Epigastric region	2
Lumbar region	20
Retroperitoneum	13
Iliac fossa	3
Pelvis	14
Pre sacral region	5
Abdominal wall	1

Table no 2: Table showing distribution of the organ of origin in the intra-abdominal neoplasm.

ORGAN OF ORIGIN	
Liver	10
Kidney	16
Adrenal gland	27
Node	17
Adnexa	5
Pre sacrum	7
Peritoneum	2
Mesentry	2
Urinary bladder	2
Bowel wall	4
Spleen	1
Pelvic bone	1

Table no 3 : Presence or absence of the calcification in intra-abdominal tumours.

CALCIFICATION IN ABDOMINAL MASSES		
	Present	**Absent**
Neuroblastoma	33	5
Wilms' tumour	1	11
Hepatoblastoma	1	7
Nodal metastasis	1	3
PNET	1	1

Discussion:

Abdomen is most common site for the solid malignancy in the pediatric patients. Most of the children presents with the palpable

abdominal mass. Imaging plays a vital role in the diagnosis and staging of the tumour. Robert C. Brasch, et al, in 1990, reviewed the diagnoses from computed tomographic (CT) and ultrasonic examinations of the abdomen in 29 pediatric patients retrospectively to assess their differential diagnostic accuracies. No difference in sensitivity (87%) and specificity (100%) was observed between the two imaging methods. However, the differential diagnostic accuracy in abnormal cases was greater with CT than ultrasound47. Various studies 12-16 assessed the utility of computed tomography (CT) in evaluation of the retroperitoneum in 54 pediatric patients and compared with that of conventional radiography. In 20 patients (group 1) with an abnormality on conventional radiographs, CT improved diagnostic understanding in 17 and affected management in four patients. In 31 patients (group 2) with clinical suspicion of a mass but normal abdominal radiograph, CT contributed diagnostic information in seven and had a beneficial effect on therapy in five patients. CT contributed diagnostic information in three other patients evaluated for trauma (group 3). CT was most useful in defining the extent of a lesion in group I and in demonstrating absence of a suspected mass in group 2[48].

In our study, CT scan of the 100 pediatric patients with abdominal neoplasm has been reviewed. Those patients who have received prior treatment such as surgery or chemotherapy or radiotherapy are excluded from the study. The accuracy of the CT scan in diagnosing the pediatric abdominal neoplasm in our study is 82 %. CT scan is not able to diagnoses the tumour in the 18 % of cases due to atypical imaging features of the common tumour or due to rare tumours.

In our study, the imaging features of various abdominal neoplasms in pediatric patients are evaluated and probable diagnosis or differential diagnosis has been given. In those cases which have been operated, local staging based on CT images are also given. The imaging features used to give diagnosis and staging of the pediatric neoplasm are age of the patient, location within the abdominal cavity, organ of origin, presence of calcification within the mass, cystic or necrotic changes in the mass, whether mass is crossing midline or not, relation of the mass with surrounding organ (displaces or infiltrates the mass), relation with the blood vessels (whether mass is causing displacement, encasement or infiltration of the mass), pattern of enhancement, and presence of any lymphadenopathy or metastases to the liver, bone, lungs or adrenals.

Abdomen is the most common site for the pediatric neoplasm. Most of the patients are below 5 years of the age. Neuroblastoma is most common site of the tumour (38 %), followed by the lymphoma (15 %), Wilms' tumour (12 %), hepatoblastoma (8 %) and teratoma (6 %), rhabdomyosarcoma (4 %), ovarian neoplasm (3 %), nodal metastases from the germ cell tumour (3 %). Other rare tumours seen are the soft tissue sarcoma (1 %), malignant peripheral nerve sheath tumour (MPNST) (2 %), hepatocellular carcinoma (1 %) and PNET (2 %). The pediatric patients most commonly presents with the palpable abdominal mass. Some of these patients due to loss of appetite, weight loss, vomiting. Patients with the Wilms' tumour may presents with the hematuria. Patient with neuroblastoma may present due to metastases to bone causing bone pain or due to para-neoplastic syndrome such as opsoclonus. [17-18] Basic investigations carried out in these patients are complete blood count, biochemistry, tumour marker and imaging studies. Imaging studies plays a very important role in diagnosing, staging, management, treatment planning and follow up after treatment in these patients. Imaging modalities available are radiograph, conventional radiography, ultrasound, computed tomography, magnetic resonance imaging and nuclear imaging. Ultrasound is the first modality used for screening and diagnosing the patients presenting with the abdominal mass. Cross sectional imaging such as computed tomography (CT) and magnetic resonance imaging (MRI) plays very important role is diagnosing and staging of the pediatric abdominal neoplasm. The computed tomography (CT) scan is the readily available and faster scanning imaging technique. MRI provide better soft tissue resolution, however, it is the limited in availability, requires longer time for scanning, require longer sedation. Computed tomography is most commonly preferred imaging technique in the pediatric patients due to its wider availability and shorter scanner time.

The imaging features of the various abdominal neoplasm seen in our study are described in the following text. In the patients who are operated for the abdominal neoplasm, correlation between the staging based on CT scan and staging based on surgical findings are also described.

CT alone accurately staged 82% of cases; when complemented by bone marrow biopsy, staging accuracy was 97%. CT alone was more accurate than any combination of imaging tests that excluded CT . [18] As compared to these earlier studies, our study shows the calcification in the 91 % of the cases. The accuracy of the CT scan to diagnoses the neuroblastoma is 97 %. CT scan is able to stage the tumour accurately in 50 % of the cases. However it has accuracy of 100 % in diagnosing stage I of the tumour and 80 % in stage III. Low accuracy in diagnosing stage II in most of the case is due to metastasis in the normal sized retroperitoneal nodes seen on histopathology.

Abdomen is most common site for the solid tumour in the pediatric patients. Most of the patients presents with the palpable abdominal mass. Imaging plays a vital role in the diagnosis and staging of the tumour. Ultrasound (USG), computed tomography (CT), magnetic resonance imaging (MRI) and nuclear imaging are the available modalities. [17,18] Computed tomography is most commonly used in the imaging of the abdominal mass in the pediatric patient as it is easily available and can be in done in very short time. Computed tomography can be used to diagnoses and stage the individual tumour based on the clinical data and imaging features.

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