

Role Of Cect In The Evaluation Of Paediatric Liver Lesions – a Prospective Observational Study

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Abstract

Background: Paediatric liver lesions are frequently encountered in clinical practice and CECT plays an important role in diagnosis. Proper knowledge of various conditions and imaging features helps in narrowing the differential diagnosis and helps to differentiate benign from malignant liver lesions thus reducing the need of biopsies and helps in proper management of patients.

Aims And Objectives: To evaluate the spectrum of liver lesions in paediatric age group. To differentiate benign from malignant lesions based on CECT findings. To assess the anatomical extent and associated findings which help the clinician for planning the management.

Materials And Methods : In our study, during a period of 2 years 10 months(from January 2020 to October2022) 74 children admitted in paediatric and paediatric surgery departments with focal liver lesions on ultrasound were subjected to CECT examination. The various imaging features of liver lesions on CT were noted.

Results : Out of 74 paediatric patients, which included infants from 3 days of life to children of 14 years age. The most common age of presentation was less than 5 years age group and no gender predilection. The most common lesion in our study was liver abscess followed by choledochal cyst and hepatoblastoma. Out of 74 cases, 59

were benign lesions and 15 were malignant lesions.

Conclusion: CECT plays an important role in diagnosis of paediatric liver lesions and a knowledge of imaging features helps to differentiate benign from malignant lesions and helps to narrow the differential diagnosis. Knowledge of extent of lesions and associated findings on CT helps in proper management of patients.

Keywords: Liver lesions, Paediatric, CECT

Introduction

In paediatric population, wide spectrum of focal liver lesions is seen. Most of the patients present with abdominal pain, distension or palpable lump. Imaging plays an important role in evaluation of paediatric liver lesions. Ultrasound is the first line modality as it does not involve ionising radiation (1). It helps in detection, characterisation and to know the extent of lesion. CECT helps in further characterisation of liver lesions based on morphology, presence of calcifications, enhancement pattern, other associated findings and detection of metastasis in malignant lesions. As causes can be both benign and malignant, CT plays an important role in non invasive characterisation of liver lesions, predicting patient outcome and helps in surgical planning. Although some lesions may require biopsy for definitive diagnosis, most of the times it is possible to narrow the differential diagnosis and to arrive an exact diagnosis based on imaging findings thus avoiding invasive biopsy (2). The incidence of complications after percutaneous liver biopsy in pediatric patients was 6.83%, of which 2.4% were major complications, as reported by Scheimann et al (3). CT depicts liver lesions and their involvement with adjacent structures with excellent spatial resolution in adults and older children, giving improved anatomic location and focal liver lesion characterization(4). The potential risks of radiation exposure have to be especially considered in children (5-8). The need for sedation is decreased due to shorter imaging times(9,10).

Materials And Methods

In this institutional review board approved study, after informed consent, 74 paediatric patients admitted in Niloufer hospital for women and children, Hyderabad, with focal liver lesion diagnosed on ultrasound were evaluated with CECT for a duration of two years ten months (January 2020 to October 2022). Our study included patients of age groups 3 days of life to 14 years with an equal proportion of female and male children. Patients were initially evaluated with routine investigations and later ultrasound examination. Ultrasound findings of hypoechoic, hyperechoic and heterogeneous single or multiple liver lesions were further evaluated with Computed Tomography. Serum AFP levels were done in suspected cases of hepatoblastoma.

CECT examination was performed on Toshiba Aquilian 16 slice machine before and after intravenous contrast administration of Iomeprol which is a non-ionic water soluble contrast medium. Contrast was given with pressure injector based on the weight of the child(1-2ml/ kg body weight).The paediatric patients were put to sleep by the attendant naturally or a dose of Pedicloryl was given orally and the CT done after the child is calm. The images were acquired in arterial, portal and delayed phases and examined in axial, coronal and sagittal planes. On CT examination, the liver lesions were thoroughly examined to assess the size, extent of the lesion and its enhancement pattern . Presence of calcifications, haemorrhage,

enhancement of vessels (hepatic artery, portal vein and aorta) were noted. Note of all the normal structures and any other pathology in the anatomical area scanned was also noted.

Results

Table-1 showing Distribution of study subjects according to age

Age group of patient	No of male patients	No female patients
0 -5 yrs	28	25
6 to 10 yrs	4	8
11 -14yrs	5	4
Total number of patients	37	37

Table-1 out of the 74 patients , the most common age group was less than five years. There was an equal sex predilection in our study.

Fig 1 showing nature of liver lesions.

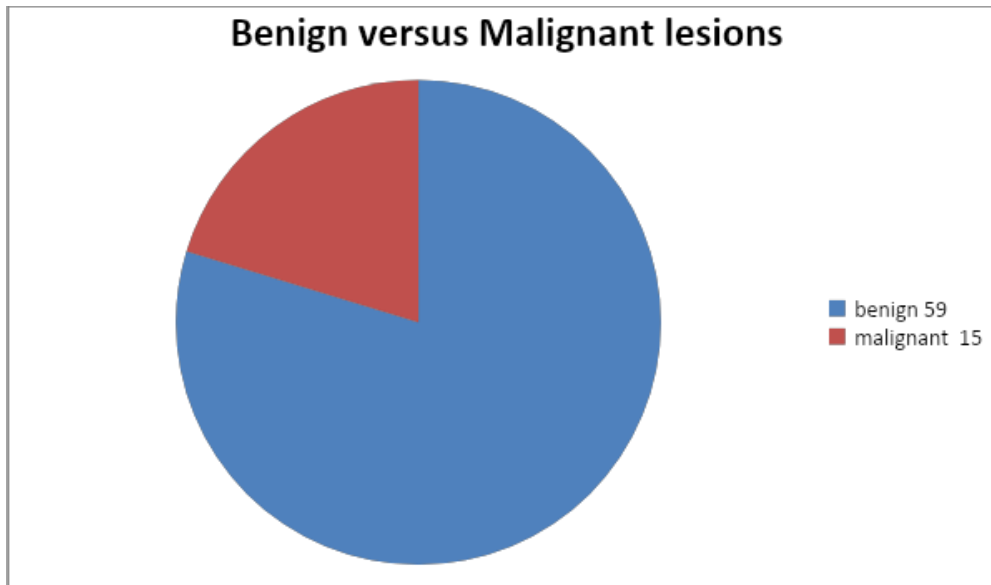


Fig 1 showing out of the 74 cases, 59 were benign and 15 were malignant.

Table-2

BENIGN LESIONS		MALIGNANT LESIONS
no. of cases	59	15
Abscess – 17		Hepatoblastoma – 10
Calcified granulomas – 10		Neuroblastoma secondaries – 2
Noncalcified granulomas – 3		Lymphoma – 3
Simple cyst -2		
Choledochal cysts – 14		
Hydatid cyst – 1		
LCH -1		
Infantile haemangioma / Haemangio endothelioma – 8		

Mesenchymal hamartoma – 2	
Nodular regenerative hyperplasia – 1	

Table-2, out of the 59 benign lesions , 17 were abscesses. One case of liver abscess was CMV cholangitis with multiple cholangitic abscesses. 13 were granulomatous among which 10 were calcified , 3 were non calcified tuberculous granulomas. 1 case of Langerhan cell histiocytosis, 2 cases of simple cysts ,1 case of hydatid cyst, 14 cases were choledochal cysts and 2 were mesenchymal hamartomas. One case of nodular regenerative hyperplasia associated with cirrhosis of liver and 8 cases were infantile haemangiomas / haemangioendotheliomas. Out of 15 malignant lesions, 10 were hepatoblastomas and 3 were lymphomas and 2 were hepatic secondaries of adrenal neuroblastoma.

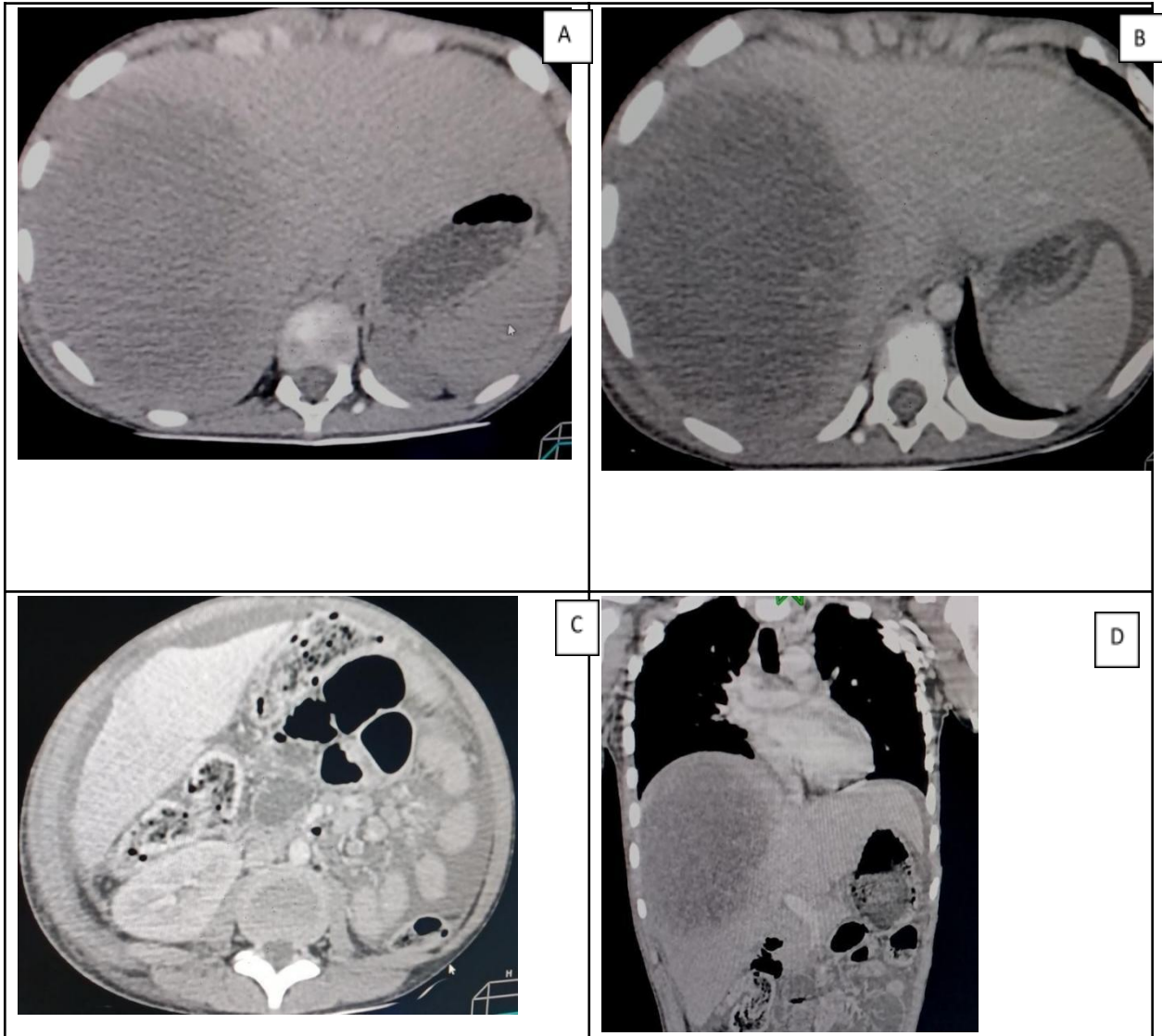


Fig 2 A)Axial plain CT abdomen B &D) axial & coronal contrast CT abdomen showingrim enhancing hypodense lesion in right lobe of liver.
C)Axial contrast CT abdomen showing ascites.

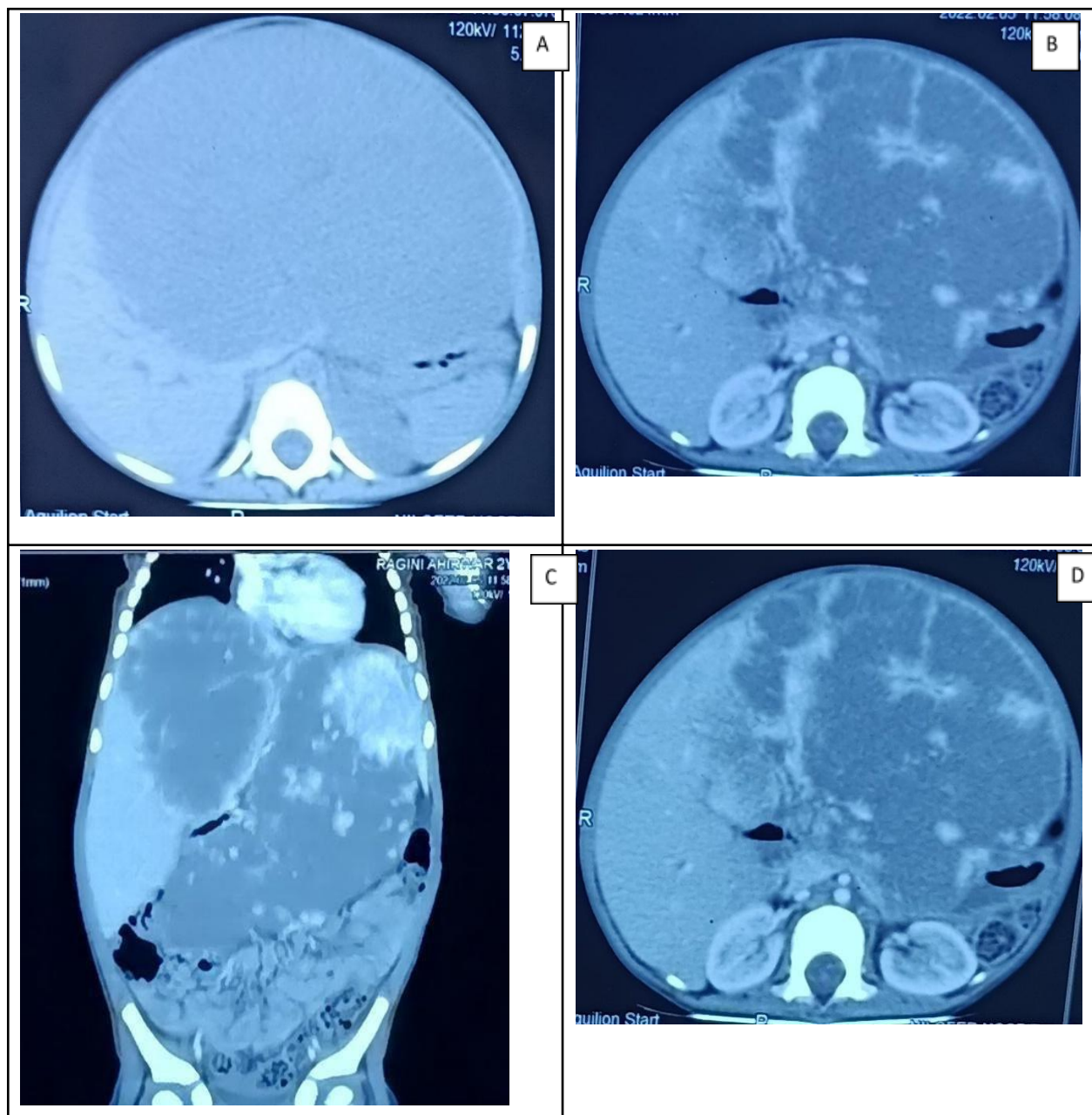


Fig 3 A)Axial plain CT abdomen showing large hypodense lesion in left lobe and anterior segment of right lobe.

B & D) axial contrast CT abdomen C) Coronal contrast CT abdomen showing irregular nodular enhancement of the lesion matching with blood pool – infantile haemangioma/ haemangioendothelioma.

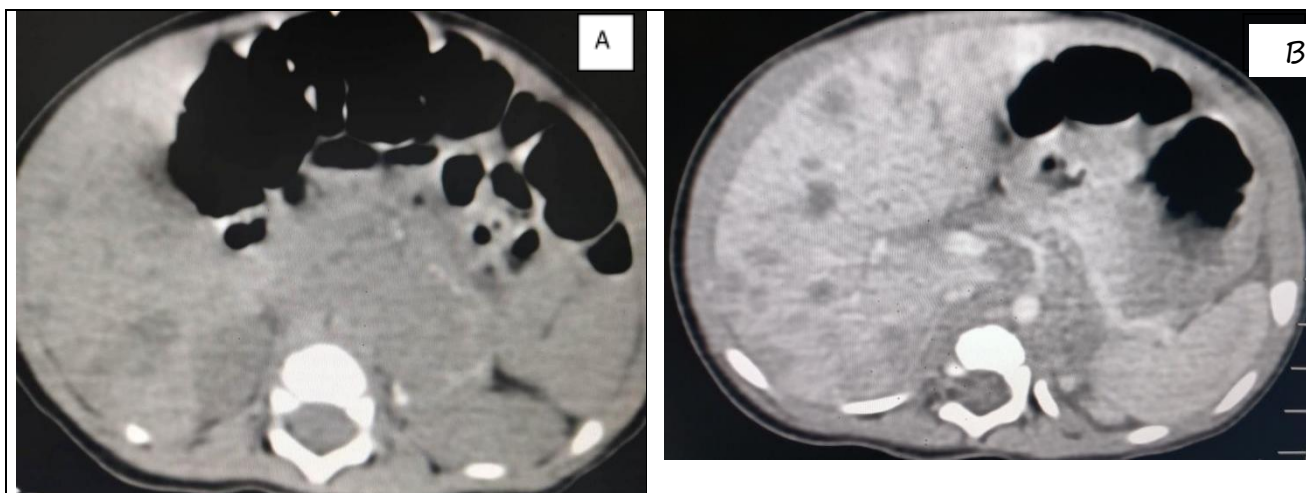


Fig 4 A)Axial plain CT abdomen B) axial contrast CT abdomen showing heterogeneous mass with calcifications in left adrenal region crossing the midline – neuroblastoma and minimally enhancing multiple hypodense lesions in liver – metastasis.

Discussion

Paediatric focal liver lesions are a heterogeneous group that includes benign or malignant lesions and can be single or multiple. They can be congenital, infective / inflammatory or neoplastic(11). Imaging plays crucial role in the management of paediatric patients with suspected liver lesions. Ultrasound is the initial imaging modality in suspected liver lesions as it helps in characterisation of lesion like solid or cystic, solitary or multiple. Colour Doppler provides information about the hepatic artery , portal vein and intra lesional vascularity. Though MRI is recommended in children because of no radiation(12,13). CECT is preferred as it has shorter acquisition time and easy availability. Low dose protocol used in paediatric patients to reduce the radiation dose. CT provides information about accurate anatomical extent , enhancement pattern and any associated pathology which helps to arrive exact diagnosis thus avoiding invasive biopsy in most of the cases.

Our study of role of CECT in evaluation of focal liver lesions consisted of 74 paediatric patients, of which 37 were males and 37 were females. Age of the patients varied from 3 days of life to 14 yrs. Commonest age group in our study was less than 5 years.

Benign hepatic lesions can be congenital (simple hepatic cysts , choledochal cysts), infective (abscess, granulomas, hydatid cyst), regenerative nodules, neoplastic (haemangioma, mesenchymal hamartoma). Malignant hepatic lesions can be primary (hepatoblastoma, hepatocellular carcinoma) , secondary (metastasis).Lymphoma can be primary or secondary. In our study , 59 were benign and 15 were malignant. Most common benign lesion was abscess followed by equal incidence of granulomatous lesions and choledochal cysts. Most common malignant lesion was hepatoblastoma.

Among 59 cases of benign lesions 2 were simple cysts. One case female and one case male. Hepatic cysts are thought to be of biliary origin as a result of deranged development of biliary tree, but no communication with biliary tree(14). Cysts are generally asymptomatic. On CT, simple cysts have fluid attenuation with imperceptible wall and no enhancement on contrast. Hepatic cysts rarely become complex as a result of haemorrhage or infection(15). No treatment required as they are asymptomatic.

One case of hydatid cyst in 3yr old female child. The liver is the most common site. Most cysts are in the right lobe (16). Our case had two well defined thick walled non-enhancing cystic lesions with curvilinear rim calcification in left lobe involving segment IV B and in segment III.

Among the 14 cases of choledochal cysts, 8 were males and were females. They represent congenital cystic dilatation of biliary tree. The clinical presentation of choledochal cysts occurs before the age of 10 years in 80% of patients, usually the result of complications, namely cholangitis and pancreatitis(17). One case in our study presented with acute pancreatitis.They are classified according to Todani's classification. All cases in our study are type 1 choledochal cysts. On CECT, fusiform or cystic dilatation of extra hepatic bile duct. 6 cases showed prominent intrahepatic ducts along with extrahepatic duct dilatation. One case had simple cyst in body of pancreas, one case was associated with nephrocalcinosis.

Among 17 cases of abscesses (Fig 2), 8 were males and 9 were females.11 cases were solitary and 6 cases were multiple.They can be pyogenic, amoebic or fungal. Commonest cause of abscess in new born children was umbilical vein sepsis. Excellent anatomical detail of CT allows precise localization. Hepatic abscess on CT, seen as rim enhancing hypodense lesion. Largest size of the lesion in our study was 15cm and smallest size was 2 cm. Three cases associated with ascites. One case associated with portal vein thrombosis and focal pyelonephritis. Two cases were associated with umbilical vein sepsis. One case was cholangitis with cholangitis abscesses. one case ruptured into right pleural cavity. Three cases had intraperitoneal rupture with subdiaphragmatic collection.

Among 13 cases of granulomatous lesions, 10 were calcified and detected incidentally. 3 cases of non calcified granulomas seen on CT as minimally enhancing multiple small hypodense lesions. One case had retroperitoneal and right iliac lymphadenopathy. One case had associated lung consolidation, mediastinal and mesenteric lymphnodes. One case had necrotic periportal, retroperitoneal and mesenteric lymphadenopathy.

One case in our study was Langerhan cell histiocytosis. Associated with lytic lesion in left parietal bone, thick enhancing pituitary stalk, multiple hypodensities were noted along the portal vein radicles with retroperitoneal lymphadenopathy. Diagnosed as LCH based on associated findings.

One case was regenerative nodular hyperplasia associated with cirrhosis. On CT lesions were hyperdense on plain scan, isodense to liver on post contrast images. Hyperdense lesions on non contrast CT represent siderotic nodules. The accuracy of non contrast CT in detecting regenerative nodules is 25%(18).

Among the 8 cases of infantile haemangiomas (Fig 3) , 4 were females, and 4 were males. All lesions showed peripheral nodular enhancement matching with blood pool, progressive fill in. Three cases showed reduced caliber of aorta distal to origin of coeliac trunk. One case associated with intrahepatic porto venous anastomosis. Two cases had multiple lesions. CT features of our cases were similar to cavernous haemangioma in adults as described by Barnett et al(19).

Among 2 cases of mesenchymal hamartoma , one case was male and one was female. On CT, they were multilocular cystic lesions. One case showed large exophytic component.

Among 10 cases of hepatoblastomas, 5 were males and 5 were females. Most common primary malignant liver tumour under five years of age (20). All our cases were associated with raised serum AFP levels. On CT , they were heterogeneous lesions with arterial phase heterogeneous enhancement . Most of the lesions showed intralesional calcifications, one case showed intralesional aneurysms. One case has associated tumour thrombus in portal vein and SMV. Two cases had metastatic deposits in liver and three cases had lung metastasis. Incidental detection of left renal agenesis in one case and pancake kidney in pelvis in one case.

Among 2 cases of metastatic deposits one was male and one was female. Two cases were from left adrenal neuroblastoma. Multiple hypodense lesions in both lobes of liver with primary heterogeneous mass lesion with calcifications in left adrenal gland. Liver metastasis in paediatric age group commonly seen with neuroblastoma and wilm's tumour. In our study two cases were from neuroblastoma (Fig 4).

Among three cases of lymphoma, 2 were females and one male. On CT, one case had multiple hypodense liver lesions along with mesenteric lymphadenopathy. Two cases had periportal lymphadenopathy, retroperitoneal lymphadenopathy along with multiple hepatic lesions. Hepatic lymphoma can be primary or secondary. In primary hepatic lymphoma, the disease is limited to liver and hilar lymph nodes with no distant involvement. Primary hepatic lymphoma is quite rare accounting for less than 1% of all Non-Hodgkins lymphoma(21). All three cases in our study showed secondary involvement of liver and proven histopathologically.

Conclusion

CECT plays an important role in diagnosis of paediatric liver lesions and a knowledge of imaging features and pattern of enhancement helps to differentiate benign from malignant lesions which helps in optimal patient management.

Conflict Of Interest

The authors declare that there is no conflict of interest concerning this paper, the published research results, the financial aspects of conducting the research, obtaining and using its results and any non financial personal relationships.

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