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Radiological evaluation of hydrocephalus in pediatric patients Total 50 patients of 6 months duration.

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ABSTRACT ***INTRODUCTION:*** *Hydrocephalus is characterized by imbalance of cerebrospinal fluid (CSF) formation and absorption which causes dilatation of the ventricular system. The diagnosis is done by Ultrasonography (USG), computed tomography (CT) and magnetic resonance (MR) images.* ***AIMS AND OBJECTIVES*** *: To evaluate the role of USG, CT scan & MRI scan in diagnosis, to compare the sensitivity, specificity and analyze advantages and limitations in identification and characterization of hydrocephalus.* ***METHOD :*** *Selected cases are pediatric patients having hydrocephalus identified radiologically. Out of these 20 were age of < 1 year and 30 were age of 1 to 12 years. Each patient would undergo relevant study.* ***RESULTS:*** *Common reason of hydrocephalus < 1 year is Intraventricular haemorrhage and aqueduct stenosis whereas in children > 1 year is due to meningitis/meningoencephalitis.* ***CONCLUSION:*** *Among all examinations MRI has the best diagnostic value due to excellent quality images.*

KEYWORDS : Hydrocephalus, USG, CT, MRI

INTRODUCTION

Hydrocephalus is characterized by an imbalance of cerebrospinal fluid (CSF) formation and absorption. It is manifested as a dilatation of the ventricular system.[1]

About 55% of all hydrocephalus cases have congenital origin.[2]

There are two types of hydrocephalus: communicating and non-communicating.[3]

The diagnosis depends on the imaging findings of USG, computed tomography (CT) and magnetic resonance (MR) images.[4,5]

AIMS AND OBJECTIVES

- To evaluate the role of USG, CT scan & MRI scan in diagnosis of hydrocephalus in pediatric patients.
- To compare the sensitivity and specificity of USG, CT scan & MRI scan in identification and characterization of hydrocephalus in pediatric patients.
- To analyze the advantages and limitations of each imaging modality in the diagnosis of hydrocephalus in pediatric patients.

MATERIALS & METHODS

PATIENT SELECTION

- INCLUSION CRITERIA

Cases of pediatric patients having hydrocephalus identified radiologically during the study.

- EXCLUSION CRITERIA

Age>12 years.

METHODOLOGY

- Sample size= 50 patients
- Duration – 6 months
- Consent for participation in the study will be taken from the patient's parents or guardian.
- Each patient would undergo relevant study- USG, CT scan & MRI scan as indicated.

RESULTS

- Total 50 patients were imagined. Out of these 20 were age of less than 1 year and 30 were age of 1 to 12 years. Causes are listed in following tables 1 and 2.

Table 1 : Causes of hydrocephalus in < 1 year

CAUSES		NUMBER OF PATIENTS	PERCENTAGE
CONGENITAL			
	1. Acquiductal stenosis	4	8 %
	2. Arachnoid cyst	3	6 %
	3. Neural Tube Defect	1	2 %
	4. Dandy-walker syndrome	1	2 %
	5. Arnold Chiari Malformation	1	2 %

ACQUIRED			
	1. Intra ventricular Haemorrhage	5	10 %
	2. Brain Tumors	3	6 %
	3. Head Injury	2	4 %

Table 2: Causes of hydrocephalus in > 1 to 12 years

CAUSES		NUMBER OF PATIENTS	PERCENTAGE
CONGENITAL			
	1. Arachnoid cyst	4	8 %
	2. Dandy-walker syndrome	2	4 %
	3. Arnold Chiari Malformation	2	4 %
ACQUIRED			
	1. Meningitis/ Meningoencephalitis	15	30 %
	2. Brain Tumors	3	
	3. Head Injury	4	

DISCUSSION

Diagnosis of the hydrocephalus is based on a correlation between clinical symptoms of elevated intracranial pressure and the image of dilated ventricular system. Hydrocephalus is a result of an imbalance of cerebrospinal fluid (CSF) formation over its absorption[6]. Hydrocephalus is not a disease but a dynamic process which proceeds with changes of the ventricular system size.[7] From the diagnostic standpoint and the therapeutic methods the hydrocephalus can be divided into; communicating hydrocephalus whereas narrowed place of CSF outflow exists outside ventricular system and non-communicating hydrocephalus whereas the location of obstruction lies intraventricularly.[8,9]

Imaging findings of Communicating hydrocephalus

- Dilatation of the temporal horns
- Absence of dilatation of parahippocampal fissures
- Increased frontal horn diameter
- Acute ventricular angles
- Peri-ventricular oedema
- Intraventricular flow void on MR
- Upward displacement of corpus callosum on midsagittal plane
- Widening of the third ventricular recesses on midsagittal plane
- Narrow callosal angle

Imaging findings of Acute obstructive hydrocephalus

Lateral ventricles

- Enlargement of the temporal horns (best indicator)
- Transependymaloedema or periventricular oozing, may be seen as high T2 signal on MRI or hypodensity change on CT around the margins of the ventricles.

Third ventricle

- Outward bowing of the lateral walls
- Inferior bowing of the floor

Forth ventricle

- Poor indicator of hydrocephalus as the confined nature of the posterior fossa prevents significant enlargement
- A prominent forth ventricle suggests that the obstruction is either at the foramina of luschka and magendie or within the subarachnoid space

Imaging findings of chronic non-communicating obstructive hydrocephalus

- Following long time the ventricular system above the obstruction gradually enlarge, causes compression and thinning of the overlying cortex.
- Features of **chronic** standing non-communicating obstructive hydrocephalus (at the level of the aqueduct of Sylvius or below) include:

1. Marked dilatation of the ventricles, especially the lateral and third ventricles
2. Fenestration of the septum pellucidum
3. Thinned and elevated corpus callosum
4. Ballooning of the suprapineal recess
5. The floor of the 3rd ventricle is displaced inferiorly, abutting the skull base, obliterating the suprasellar cistern
6. Ballooning of the infundibular, optic and pineal recesses of the third ventricle.

CONCLUSION

- Imaging examinations are needed not only to diagnose hydrocephalus but also to assess enlargement of the ventricular system during the therapy.
- Among all examinations MR imaging has the best diagnostic value due to excellent quality images without any harmful effect.
- The advantages and limitations of each imaging modality in the diagnosis of hydrocephalus in pediatric patients are listed in following table 3.

Table 3

Modality	Advantages	Limitations
USG	• Readily available. • Highly useful in < 2 yrs. • Cost effective. • No radiation exposure	• Not useful after fusion of anterior fontanelle.
CT	• Sensitive for intra cranial haemorrhage.	• Radiation exposure.
MRI	• No radiation exposure • Enables early detection of disease. • Allows assessment of the lesion size and location, which are shown to relate to prognosis and need for treatment.	• Contraindications to MR, e.g. claustrophobia, pacemaker, metallic implant etc. • Time consuming , sometimes need sedation in pediatric patients.

IMAGES

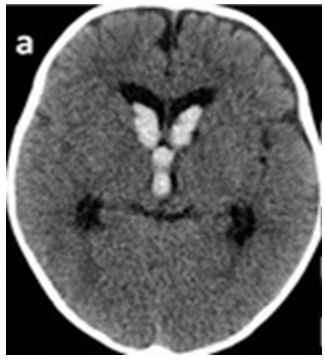

Image A- Plain ct brain axial image showing intraventricular haemorrhage

Image B-Trans cranial USG image is showing dilated bilateral lateral ventricles.

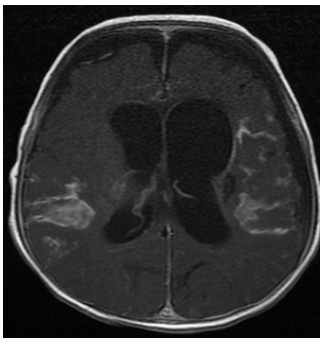

IMAGE –C Axial T1W post contrast image showing meningeal and parenchymal enhancement suggestive of meningoencephalitis

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