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Findings of Cranial Magnetic Resonance Imaging in Neonatal Seizure

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Abstract

Aim of study to know the findings of brain MRI in neonates present with seizure. A retrospective study was done in Maternity & pediatric teaching hospital in Al-Dywanyia city in Iraq, from May 2014 to June 2018. All included neonates diagnosed to have seizure, all of them had cranial magnetic resonance imaging. The standard MRI used protocol T1, T2, diffusion weighted image, gradient echo. Included patients had general anesthesia only 5 patients didn't have anesthesia or sedation as they were in deep sleep during MRI examination. The results that more than half of neonate (58.5%)was male & (41.5%) was female. Term neonate (60.4%) was more than preterm neonate (39.6%).High significant association between preterm & term neonate with MRI findings also there is high significant association between age of neonate at time of 1st attack of convulsion & positive brain MRI findings, abnormal l brain MRI was more common in neonate who had 1st onset on seizure in the 1st week of his life.

Keyword: *Cranial MRI of neonate, neonatal seizure.*

Introduction

Seizure(convulsion) is the commonest central nervous system manifestation during e neonatal life(the first 28 days of life)[1], it can define as attack of alternation in neurological function and usually it shows an underlying problem in the brain[2], due to brain damage and developmental defect in the central nervous system[3]. There is high morbidity (25-35%) and high mortality rate in neonatal convulsions although there is no guide line in diagnosis of neonatal convulsion[4], magnetic resonance imaging (MRI) regarded as the standard imaging technique in diagnosis of development brain disorder[5], its rapidly became study of choice for diagnosis of central nervous system dysgenesis, MRI provide excellent diagnostic imaging technique in evaluation brain disorder superior to cranial computed tomography & ultrasound[6]. Immature brain in preterm baby seem to prone to seizure more than mature brain in term baby[7,8], convulsions are more common in the period of neonate than during other time throughout life & it regard as a commonest neurological emergency especially during 1st days of life[9,10,11], in contrast to convulsion in childhood most neonatal convulsion are acute with suspected specific causes, relatively few neonatal convulsions are idiopathic. The etiology & presentation of neonatal convulsion is different to seizures in childhood & adult[12,13].It's important to detect neonatal seizures causes as early as possible for treatment planning & to know the prognosis, as the prognosis of the neonatal seizure depending on the etiology, for example prognosis after hypocalcaemic attackis excellent. Symptomatic hypoglycaemia and meningitis have a 50% chance of survivors[14]. Overall survivor in hypoxic ischaemic encephalopathy is 30-50%, while central nervous system dysgenesisare generally associated with poor outcome. Preterm neonates with clinical seizures have a higher incidence of impairment than preterm infants without seizures[15].Aim of studyto know the value of brain MRI in neonate present with convulsion in addition to other laboratory investigation

Materials and Method

A retrospective study was done in Maternity & pediatric teaching hospital in AL Dywanyia city in Iraq in a period from May 2014- June 2018. The study included 53 notates all of them diagnosed to have seizure by pediatrician when the neonate had sudden repeated involuntary movement, abnormal tonic movement. EEG

was done to 27 patients. 1st attack of seizures occurred at different time of neonatal period, all of them had brain MRI at a period few hours – 3days from the onset of seizurewhen the neonate became stable,only 5 patients didn't have anesthesia or sedation as they were in deep sleep during MRI examination. We exclude the patients when his family refused MRI or refused anesthesia or sedation also we exclude the patient that was not fit for anesthesia according to the recommendation of anesthetic or not stabilized neonate.

MRI system & protocols: We used Philips - Ingenia 1.5 Tesla system & routine MRI sequences were obtained, axial & sagitalspine echo T1 weighted images (TR/TE = 460/10, slice thickness = 4mm, gap = 1mm), axial T2 weighted image (TR/TE 5500/120, slice thickness = 4mm & gap = 1mm), gradient-echo(GRE) sequences (TR/TE/FLIP angle = 800/40/40), axial diffusion weighted image(DWI) (TR/TE/b factor = 5075/84/1000), MRA (magnetic resonance angiography & MRV(magnetic resonance venography) were done not for all cases only when vascular insults like ischemia or hemorrhage are suspected.Brain MRI findings were evaluated by two radiologist to have final diagnosis this findings are classified to normal brain MRI & abnormal brain MRI than abnormal brain MRI classified to different causes.

Statistical analysis: SPSS version 22.0 and Microsoft Office Excel 2010 were used to analyses the data. The numeric variable was expressed as mean ± SD & categorical variables were expressed as number & percentage, the level of significance was considerable at P- value of 0.05.

Results

Table 1: Distribution of study sample of neonate according to the gender

Gender	No. (%)
Male	31(58.5%)
Female	22(41.5%)
Total	53(100%)

According to table 1more than half of neonate (58.5%)was male & 41.5%) was female.

Table 2: Number & percent of preterm & term neonate in our study

Term & Preterm neonates	No. (%)
Preterm neonates	21(39.6%)
Term	32(60.4%)
Total	53(100%)

Table 2 showsterm neonate (60.4%) was more than preterm neonate (39.6%).

Table 3: Age of neonate at time of fit

Age of fetus at time fit	No.(%)
0-7 days	28(52.7%)
8-14 days	11(20.8%)
15-21 days	11(20.8%)
22-30 days	3(5.7%)
Total	**53(100%)**

Nearly half of fetus (52.7%) have 1st attack of fit at about 1st week of life swing between few hours to 7 days.

Table 4: Cranial MRI of the neonate present with fit.

Cranial MRI Findings	No.(%)
Normal MRI	31(58.5%)
Abnormal MRI	22(41.5%)
Total	53(100%)

Table 5: The association between cranial MRI findings & gender of the neonate.

Cranial MRI findings	Gender		Total
	Male	Female	
Abnormal MRI	10	12	22
Normal	21	10	31
Total	31	22	53
Chi-square=2.633	DF=1		P=.105

According to table 5 there is no significant association between gender & cranial MRI findings in neonatal convulsion.

Table 6: The association between cranial MRI findings with preterm & term neonate in neonatal convulsion.

Cranial MRI findings	Preterm neonate	Term neonate	Total
Abnormal MRI	2	20	22
Normal MRI	19	12	31
Total	21	32	53
Chi-square=14.656	df=1	P value =.000	

High significant association between preterm & term neonate with MRI findings.

Discussion

The susceptibility of seizure recurrence was extremely low with an absence of major cerebral lesions on MRI, for this reason MRI has a value not only diagnosis the etiology but also for predication of neurological outcome[16].In this study neonate male (58.5%) present with convulsion slightly more than female (41.5%) with no significantly association(p=.105) which is go with many study like Moayedi et al[17], Taghdiri et al[18], Sanjeev et al[19], Amjaad et al[20] & Weeke[21]but there is no explanation for this variationMoayedi et al[17].

Percent of term baby (60.4%) was more than preterm baby (39.6%) that's go with many other studies Moayedi et al[17] & Sanjeev et al[19] while Al-Zwaini I et al[22]reported that preterm newborn exhibits higher risk for neonatal seizures than term newborn and this difference may be interfere with other factors like body weight, natal & postnatal complication that affect the occurrence of seizure[23], in this study hypoxic ischemic encephalopathy (40.9%) was the commonest cause which related to the natal complication.

Firstonset of seizure in the neonate most often occur at 1st wk of life[6,20,21], in our study about half of neonate (52.7%) have 1st attack of fit at 1st week of life at a period swing between few hours after birth to 7 days with a high significant association (p value =.000) between age of neonate at time of 1st attack of convulsion & MRI findings.

Less than half of our patient (41.5%) have abnormal brain MRI scan of different etiology & (58.5%) of neonate have normal brain MRI, the most common abnormality seen in neonate was hypoxic ischemic encephalopathy (40.9%) follow by brain dysgenesis(36.4%) which is go with many study like Amjaad et al[20],Snehalatha et al[6] & Shafi M et al.[24].

All patient who have normal brain MRI were undergo to laboratory investigation to detect cause of seizure, in those patient metabolic disorder was the commonest cause (38.7%) follow by kernikterus (35.5%) & unknown etiology was in 12.9%. which is go with many study like Tekgul et al[1] & Ronen et al[2].

Conclusion: MRI is indicated with other tests to diagnose underlying brainpathology in neonatal seizure.

Conflict of Interest: None

Funding: Self

Ethical Clearance: Not required.

Recommendation: Further study is recommended included follow up these neonate to know whether there is recurrence of fit in future. Further study using MRI spectroscopy to predict the severity & prognosis of patients with neonatal seizure.

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