Intracranial Hemorrhage In Preterm Newborn

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Abstract: Intracranial hemorrhage (ICH) in neonates is an acquired lesion with enormous potential impact on morbidity , mortality , and long-term neurodevelopmental outcome.this study was done to study the prevalence of ICH in preterm neonates without any neurological signs detected and to determine the different obstetric and neonatal risk factors associated with the development of ICH .Case – control study throughout the period from June 2011 to December 2011 .This study was conducted on 58 preterm neonates who were admitted to Neonatal Intensive Care Unit (NICU) of Obstetrics and Gynecology Hospital , Ain Shames University. Detailed history taking: maternal, obstetric and delivery circumstances laying stress on maternal and obstetric risk factors of ICH. Assessment of the general condition using APGAR score at 1and 5 minutes. Assessment of gestational age (GA) using Ballard score. Assessment of birth weight, thorough clinical examination laying stress on neurological examination according to Sarnat. Imaging studies using cranial ultrasound (CUS) on 3rd days of life. The prevalence of asymptomatic cases with ICH was 60.7 %. There are certain maternal and neonatal risk factors that are associated with increased risk of ICH. CUS can be considered as a specific and sensitive indicator for occurrence of ICH

Introduction:

Intracranial hemorrhage (ICH) in neonates is an acquired lesion with enormous potential impact on morbidity, mortality, and long-term neuro-developmental outcome {1}.

Bleeding within the skull can occur external to the brain into the epidural, subdural or subarachnoid space, into the parenchyma of the cerebrum or cerebellum or, into the ventricles from the subependymal germinal matrix (GM) or choroids plexus {2}. Of all types of ICH, germinal matrix-intraventricular hemorrhage (GM-IVH) is the most common and distinctive pathology {3}.

Periventricular-intraventricular hemorrhage (PIVH) is a major cause of neurological disabilities in preterm newborns {4}. Diagnosis typically depends on clinical suspicion, when an infant presents with typical neuralgic signs such as, seizures, irritability, or depressed level of consciousness and or with focal neuralgic deficits referable either to the cerebrum or brain stem {5}.

The associated clinical signs of IVH are typically nonspecific or absent, therefore it is recommended that premature infants < 34 week GA should be evaluated with routine real time CUS through the anterior fontanel to screen for IVH within the first 3-5 days of age. CUS is the preferred imaging technique for screening because it is non-invasive, portable reproducible, sensitive and specific for detection of IVH {6, 7, and 8} Aim of this study Studying the prevalence of ICH in preterm neonates without any neurological signs detected and Assessing the different obstetric and neonatal risk factors associated with the development of ICH Patients

This case- control study was conducted on 58 preterm who were admitted to Neonatal Intensive Care Unit (NICU) of Obstetrics and Gynecology Hospital, Ain Shams University throughout the period from June 2011

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to December 2011. An informant written consent was taken from parents of each patient.

The studied neonates were divided into two groups:
1-Cases with ICH group .2-Cases without ICH group.
Subdivision of cases with ICH into two subgroups:
1-Symptomatic group (with neurological signs).
2-Asymptomatic group (without neurological signs).

Inclusion criteria:-

Preterm neonates <37 week gestational age

Exclusion criteria:-

1- Extreme low birth weight newborns (<1000 grams of birth weight).
2- Congenital malformation of the brain
3- Neonatal sepsis such as meningitis, encephalitis

Methods:

All neonates were subjected to:

1-Detailed history taking: maternal , obstetric and delivery circumstance laying stress on maternal and obstetric risk factors of ICH assessment of the general condition using apgar score at 1 & 5 min {9}.Assessment of gestational age using Ballard score {10}. Anthropometric measurement (birth weight, head circumference)

2-Thorough clinical examination laying stress on neurological exam. According to Sarnat stages {11}. Assessment of the need of the ventilator support.

3-Investigations:- A-Laboratory:-Complete blood count (CBC), C-reactive protein, Arterial blood gases (ABG) B-Cranial ultrasound : on 3rd day of birth trans-cranial ultrasound was used via anterior fontanel using GE LOG IQ3 probe , using 8 MHz probe, 8C (convex) , 8L (linear).

PIVH was graded into 4 grades according to the papile grading {12}:-

Grade I: Isolated GMH (no PIVH)

Grade II: PIVH without Ventricular dilation
Grade III: PIVH with Ventricular dilation
Grade IV: PIVH with parenchymal hemorrhage

Statical analysis:-

The data were coded, entered and processed on computer using SPSS (version 15). The level P < 0.05 was considered the cut-off value for significance. Results this case – control study was conducted on 58 preterm were admitted to the NICU of Gynecology and obstetrics Hospital Ain Shams University Hospital during the study period from June 2009 to December 2009. 28 of them(48.3 %) were ICH ,in which 20 cases (71.4 %) male , 8 cases (28.6 %) female , 19 cases (67.8 %) delivered vaginally, 9 cases (32.2%) cesarean section ,their mean gestational age was 30.4 weeks ,and their mean birth weight was 1.3 Kg , their mean Apgar score at 1 minutes was 0.79 and at 5 minutes was 3.27. 30 were cases without ICH in which 12 of them (40 %) male , 18 of them (60 %) female, 17 of them (56.6%) delivered vaginally , 13 (43.4%) cesarean section their mean gestational age was 33.4 weeks ,and their mean birth weight was 2.6 Kg , their mean Apgar score at 1 minutes was 5.6 and at 5 minutes was 8.5 (figure 1 and 2) . Percentage of cases with ICH was 48.3 % (28cases). Grade one IVH was the commonest representing 53.5% (15 cases), grade II was 17.9 % (5 cases), grade III 17.9 % (5 cases), grade IV 10.7 % (3cases) There are certain maternal factors that are associated with increased risk of ICH, including, prolonged and instrumental delivery by forceps and ventose extraction were the commonest representing 25 %, 21.4 % was PROM, 17.8 % was male presentation (table 1) There are certain neonatal factors that are associated with increased risk of ICH, including , prematurity , pneumothorax , trauma , mal-presentation , ventilator use, Increase CO_2 (table 2) Mortality rate was 35.7 %(10 cases) in cases with ICH in comparison to cases without ICH was 16.6 % (5 cases). The sensitivity of CUS for detection of ICH was 92.8 %, the specificity of CUS was higher representing 96.6 % and positive predictive value of CUS for detection of ICH was 96.2 % (figure 5) In the current study it was found that the neurological signs were detected in 39.3% of cases with ICH while 60.7 % were asymptomatic (table 3).
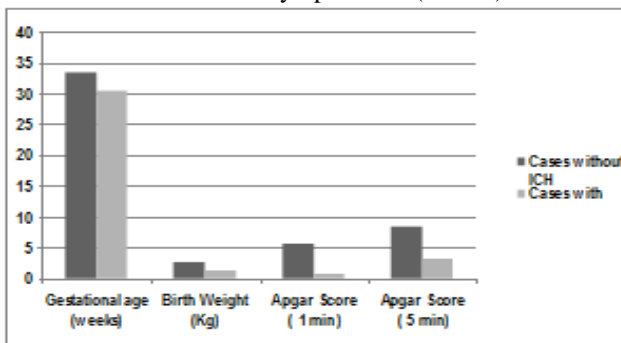
Figure(1) GA,birth weight,Apgar score
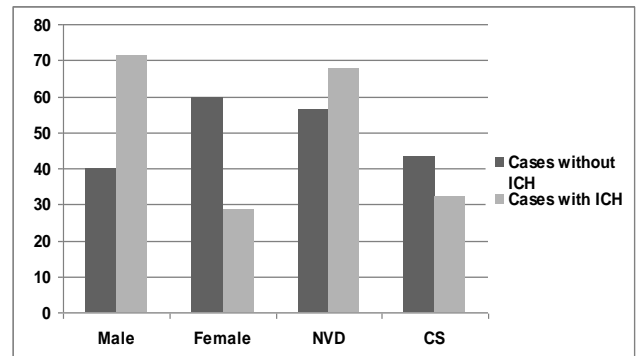
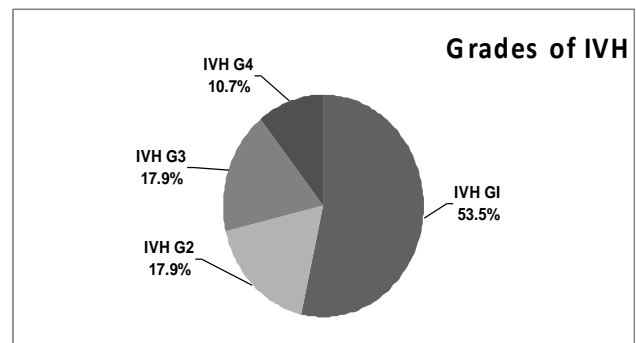Figure(2)Sex,MOD
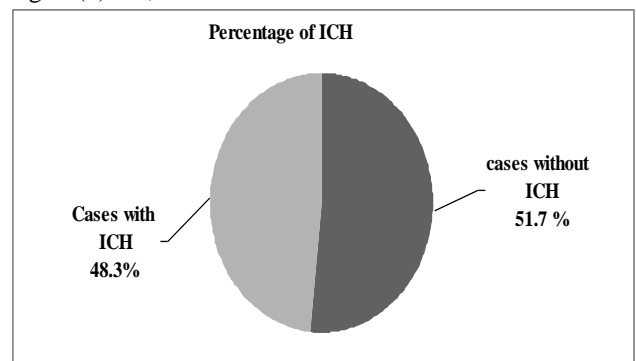
Figure(3) Percentage of cases with ICH

Figure (4)Grades of IVH

This case-control study was conducted on 58 preterm, 28 of them (48.3 %) were IVH. Grad one IVH was the commonest representing 53.5 %, grade II was 17.9%, grade III 17.9%, and grade IV 10.7% this was in agreement with Kadri {13} who was found that the incidence of PIVH among preterm neonates was 44.68%. The majorities were mostly grade I Lee {4} was found that 79.7 % with grad I IVH, 6.9 % grad II As regard the GA we found that there was highly significant lower GA in which 22 preterm <32 w had ICH (78.5%), this was in agreement with Dolfin {14} who was found that the incidence of PIVH was 45% in infants ≤ 29, weeks whereas in infants > 29-weeksGA was 19%. Lim {15} was found that the massive IVH took place at 32 GA Male gender showed significantly higher rate (71.4 %) of ICH than female (28.6 %),

Maternal risk factors	no	%
Prolonged and vacuum - forceps delivery	7	25
PROM	6	21.4
Mal presentation	5	17.8
Multiple pregnancy	3	10.7
Toxemia of pregnancy	3	10.7
Diabetic vasculopathy	1	3.5
Pulmonary disease	1	3.5
Polyhydramnions	1	3.5
Placental abnormality	1	3.5

Table (1) Maternal risk factors among mothers of cases with ICH, PROM = premature rupture of membrane.

Neonatal risk factors	Cases without ICH		Cases with ICH		X2	P	Sig.
	no	%	no	%			
Prematurity GA =28-32 W	13	43.3	22	78.5	7.51	0.006	HS
GA= 33-36 W	17	56.6	6	21.5			
Pneumothorax	4	13.3	14	50	11.8	0.001	HS
Trauma	3	10	7	25	4.46	0.035	S
Mal presentation	2	6.6	5	17.8	4.21	0.021	S
Ventilatory use	11	36.6	18	64.2	4.41	0.032	S

Neonatal risk factors	Control group		Cases with ICH		t	p	Sig.
	Mean	± SD	Mean	± SD			
Increase CO2	39.7	± 11.16	62.74	± 3.93	8.03	0.0001	HS

Table (2) neonatal risk factors among cases with and without ICH

CO2 = Carbon dioxide   X2 = Chi-square test   t = Student t test   P = probability p value

Neurological signs	Cases without ICH		Cases with ICH		X2	P	Sig.
	no	%	no	%			
Negative	25	83.3	17	60.7	3.71	0.041	S
Positive	5	16.7	11	39.3			

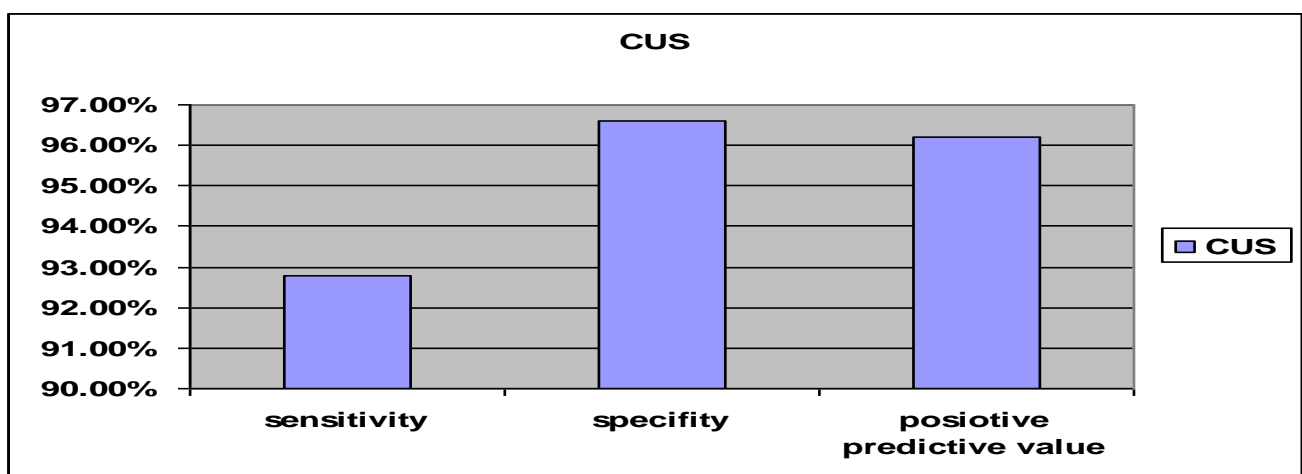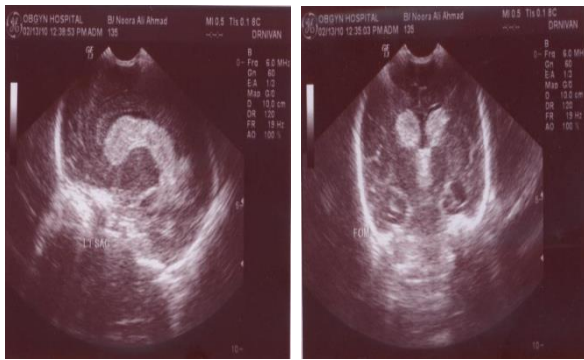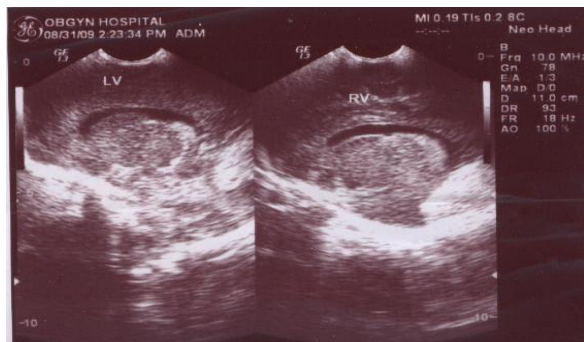Table (3): Neurological signs among cases with and without ICH

Figure (5): Sensitivity, specificity and positive predictive value of CUS for detection of ICH

Figure(6) CUS showing grade I
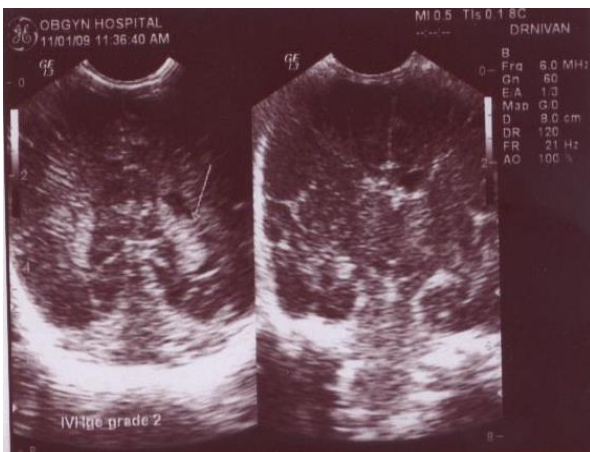

Figure(7) CUS showing grade II, IV,

Figure (8) CUS showing grade III IVH

Figure (9) CUS showing grade IV IVH,

Discussion

this was in agreement with Tioseco {16} & Mohamed {17} they were found that IVH significantly higher in male infants In this study it was found that there was a significant lower birth weight among cases with ICH (mean = 1.3 kg) in comparison to cases without ICH (mean = 2.6 kg). This finding was in agreement with the study done by Dykes {18}who was found that, birth weight less than or equal to 1,200 gm, were associated with PIVH. Mohamed {17} reported that the increased rates of IVH in boys were significant in the birth weight subgroups of < 1000 grams and 1000-1499 grams   It was found that Apgar score was a highly significant lower at one minute and 5 minutes among cases with ICH, This finding was in agreement with Baumert {19} who was reported that lower Apgar score at 5 minutes was associated with greater risk of high IVH occurrence. It was found that among cases delivered vaginally, 67.8 % developed ICH while only 32.2 % of cases delivered by CS had ICH. This finding was in agreement with Towner{20} who found that vaginal delivery with forceps assistance, ventose extraction were associated with an increased risk for ICH There are certain maternal factors that are associated with increased risk of ICH, including, prolonged and instrumental delivery were the commonest representing 25 % , 21.4 % was PROM, 17.8 % was male presentation , loony {21}was reported that assisted vaginal delivery, maternal parity , fetal weight , PROM and prolonged duration of labor increase the risk of ICH newborns . There are certain neonatal factors that are associated with increased risk of ICH, including, pneumothorax, prematurity, trauma, nonvertex presentation, ventlatory use, increased CO2. These findings were in agreement with Khodapanahandeh {22} reported that the following factors were associated with greater risk of high-grade IVH occurrence :lower GA , lower birth weight , mechanical ventilation , HMD , symptomatic hypotention , hypercapnia and lower Apgar score at 5 minutes . In the current study it was found that the neurological signs were detected in 39.3% of cases with ICH while 60.7% were asymptomatic. This finding were in agreement with loony {21} who found that there was high prevalence of ICH in asymptomatic newborns , ICH causes more subtle injury to the developing brain The sensitivity of CUS for detection of ICH was 92.8 % ,the specificity of CUS was higher representing 96.6 % and positive predictive value of CUS for detection of ICH was 96.2% ,this finding were in agreement with Khan{7}who stated that CUS examination provides a relatively sensitive and highly specific means of detecting IVH . In the present study it was found that the mortality rate among cases with ICH was 35.7% , in comparison to cases without ICH was 16.6 %   , Gomella {23}was reported that the mortality rate in cases with mild to moderate PIVH was 5-10% ,20% with sever PIVH,50% with severe PIVH and parenchymal involvement.

Conclusion:

The prevalence of asymptomatic cases with ICH was 60.7 %. There are certain maternal and neonatal risk factor that are associated with increased risk of ICH. CUS can be considered as a specific and sensitive indicator for occurrence of ICH recommendation Good perinatal care, avoid instrumental delivery. Routine screening using CUS are recommended for all infants born at 34 weeks' gestation or earlier and for all VLBW infants (<1500 grams of birth weight).

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