

PREVALENCE OF FACTORS INVOLVED IN INTRACRANIAL HEMORRHAGE OF PREMATURE NEONATES LESS THAN 34 WEEKS

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Abstract- Intracranial hemorrhage is one of the major causes of neonatal mortality and morbidity. It is the most severe cranial problem in that period. Those who survive would be affected by hydrocephalus, encephalomalacia, and finally brain atrophy. With accurate knowledge of risk factors, hemorrhage may be diagnosed earlier and the complications managed earlier. This study was performed in Neonatal Intensive Care Unit of Imam Khomeini Hospital. All the neonates less than 34 weeks of gestation were undergone intracranial sonography from Feb 2005 to Feb 2006. Sonography was performed via anterior fontanel with proper probe according to neonatal age. 113 neonates less than 34 weeks of gestation have been studied. Mean gestational age was 32 weeks. Mean neonatal weight were 1566 ± 734 grams. Intracranial hemorrhage was evident in 21% of them; 16.8% was grade 1, 0.9% grade 2, 2.7% grade 3, 0.9% grade 4. The mean weight of neonates with hemorrhage was 1504.11 grams. Intracranial hemorrhage had correlation with respiratory acidosis and pneumothorax. The latter was also correlated with hemorrhage grade. Supposing the safety and non-invasiveness of intracranial sonography, we suggest performing sonography in all premature neonates with low birth weight, and also in those neonates with pneumothorax and respiratory acidosis.

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INTRODCUTION

Intracranial hemorrhage is one of the main causes of premature neonatal death. It is the most important, and the most serious intracranial events in neonatal period (1). Those neonates with severe hemorrhage who survive suffer from sequels like hydrocephalus, encephalomalacia, and finally cortical atrophy (2).

Since intracranial hemorrhage in neonates is not

expressed with obvious clinical symptoms, screening of high risk groups is of great importance (3). Risk of intracranial hemorrhage is inversely related to birth weight and gestational age (2).

Maternal smoking, breech presentation, sex, type of delivery, fetal infection, and prolonged delivery, resuscitation after birth, respiratory distress, metabolic acidosis, and pregnancy induced hypertension are all proposed risk factors for neonatal intracranial hemorrhage (4, 5).

Supposing that knowing the risk factors may lead to better prevention or early detection, we designed this study to evaluate neonatal intracranial hemorrhage probable risk factors in a referral center with NICU. We used sonography as a safe, cheap, and available diagnostic modality.

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MATERIALS AND METHODS

Prematurity was regarded as proven risk factor for intracranial hemorrhage, so we evaluated all neonates less than 34 weeks admitted in NICU of Imam Khomeini General hospital from Feb 2005 till Feb 2006.

Sonography was performed through anterior fontanel using appropriate probe. Neonates with demise before sonography and parents unwillingness to perform sonography were excluded from the study. According to previous studies and higher rate of hemorrhage in the first week, we performed sonography as soon as admission to NICU, preferably at 4 hours after birth or the first day. If signs of hemorrhage were seen the case was regarded positive. If no sign of hemorrhage was seen, the second sonography was performed at third day. If this sonography was negative, the last sonography was performed on the seventh day.

Grading was performed according the following criteria. Grade 1: germinal matrix hemorrhage, grade 2: germinal matrix and intraventricular hemorrhage without ventricular dilatation, grade 3: germinal matrix and intraventricular hemorrhage with ventricular dilatation, grade 4: germinal matrix and intraventricular and intraparenchymal hemorrhage (6). Maternal age, type of delivery, presence of pregnancy induced hypertension, history of infertility treatment, fetal presentation, neonatal sex, steroid use in pregnancy, neonatal Apgar score at 1 and 5 minutes, first neonatal hematocrite, history of sepsis, presence of acidosis, multiparity, history of tocolysis, history of O₂ treatment more than 90%, history of premature rupture of membrane were all gathered in a questionnaire.

RESULTS

One hundred thirteen neonates with gestational age less than 34 weeks were studied. Mean gestational age, mean age of neonate on performing sonography, mean birth weight, mean Apgar score at 1 and 5 minutes and mean first hematocrite in addition to SD and their minimum and maximum are given in table 1. Fifty eight percent of neonates were girl and the remaining 42% were boy. Maternal and fetal

Table 1. Main Characteristics of neonates

	Mean	SD	Min	Max
Gestational age	32 weeks	4	25	34
Age on sonography	3.6 days	2	1	7
Birth weight	1566 gr	734	540	3800
Apgar at 1 min	6.7	2.2	1	9
Apgar at 5 min	8.3	2	1	10
First Hct	46.7	11.9	13	68

conditions in neonates included in our study are given in Figure 1.

Respiratory acidosis was evident in 29.5% of neonates. In 81.1% antibiotics were administered. 4.9% had pneumothorax, while in 29.2% mechanical ventilation was used, and 5.8% of whom CPAP mode were also used, 39.6% had history of maternal hypertension, 80.6% of neonates were singleton, and 16.5% were twins, 1.9% triples, and 1% quadruples. In 30% history of PROM, and in 4.3% history of tocolysis were obtained. 3.1% of the mothers experienced prolonged delivery, and 8.3% of them used steroid during pregnancy, 9.4% of neonates were born through infertility treatment. 21.2% of neonates had intracranial hemorrhage that 16.8% had grade 1, 0.9% had grade 2, 2.7% had grade 3, and 0.9% of them had grade 4 intracranial hemorrhage according to sonographic criteria. Mean Apgar score in 1 minute was 5.81 ± 2.4 and 6.85 ± 2.19 in those with and without hemorrhage respectively. This difference was not statistically significant ($P = 0.12$).

At 5 minutes, the Apgar score was 8 ± 2.09 and 8.39 ± 2.01 in neonates with and without hemorrhage, respectively, that again were not different significantly ($P = 0.5$). Mean first hematocrite of neonates with and without hemorrhage 50.01 ± 7.82 and 45.77 ± 12.61 percent respectively. These figures failed to show significant difference ($P = 0.8$). Mean maternal age of neonates with hemorrhage was 26.13 ± 5.4 years, while in neonates without hemorrhage mean maternal age was 28.29 ± 6.06 years, which was not statistically different from those with hemorrhage ($P = 0.6$). 50% of neonates with hemorrhage were boys and another 50% were girls. No statistical correlation was found between gender and hemorrhage (X^2 , $P = 0.6$). 54.16% of neonates with hemorrhage had metabolic acidosis, no significant correlation was obtained (X^2 , $P = 0.07$), while a statistically significant correlation

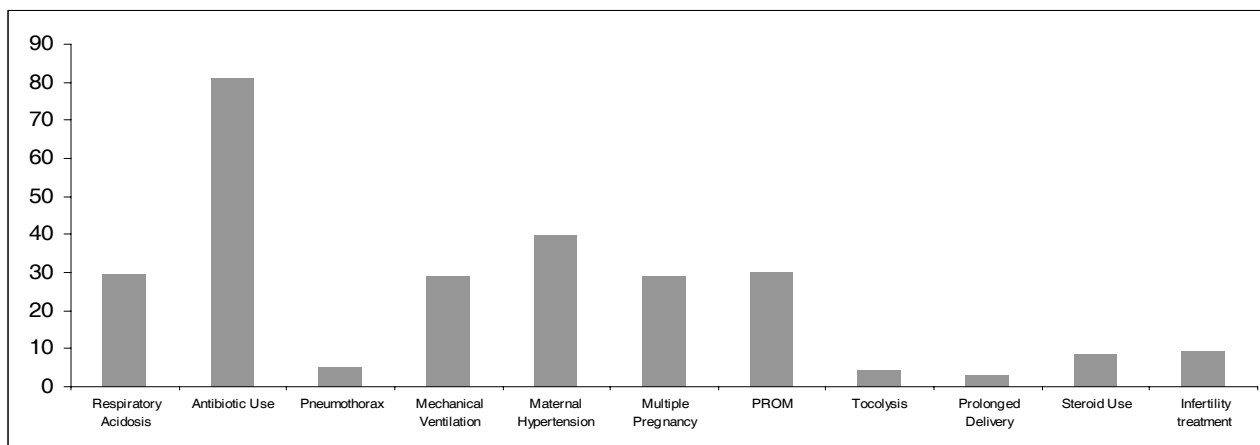


Fig. 1. Maternal and fetal condition in hemorrhage

was found between respiratory acidosis and hemorrhage (X^2 , $P = 0.02$). 70.83% of neonates with hemorrhage received antibiotics, which failed to show significant correlation with hemorrhage (X^2 , $P = 0.6$). 37.5% of neonates with hemorrhage had history of maternal hypertension during pregnancy. Maternal hypertension did not have correlation with hemorrhage (X^2 , $P = 0.78$). Mechanical ventilation used in 16.66% of hemorrhages. Statistically mechanical ventilation failed to show significant correlation with hemorrhage (X^2 , $P = 0.78$). Pneumothorax was present in 8.3% of neonates with hemorrhage, which had statistically significant correlation with hemorrhage (X^2 , $P < 0.000$). In addition pneumothorax had positive correlation with the grade of hemorrhage, which means neonates with pneumothorax had higher grades of hemorrhage. 16.66% of neonates were results of multiple pregnancies. Multiple pregnancy had not significant correlation with hemorrhage (X^2 , $P = 0.8$). In 12.5% of the neonates with hemorrhage, tocolysis treatment had been used during pregnancy. Tocolysis does not seem to have significant correlation with hemorrhage (X^2 , $P = 0.6$). None of the neonates with hemorrhage were the result of prolonged delivery or had history of steroid usage in mother. Infertility treatment was performed in 3.1% of neonates with hemorrhage. It failed to show statistical significance (X^2 , $P = 0.4$). Premature rupture of membrane (PROM) was present in 29.16% of neonates with hemorrhage. PROM does not have significant correlation with hemorrhage (X^2 , $P = 0.3$).

DISCUSSION

In our study 21% of neonates had intracranial hemorrhage. In Previous studies prevalence of intracranial hemorrhage was 10 to 70% depending on the gestational age and weight of the neonates included in the study. Intracranial hemorrhage in neonates has different types. The most common types are intraventricular, and germinal matrix hemorrhage. Birth weight and gestational age were main risk factors in several studies including a study in Sangerardo hospital (5), so our study included only neonates with low gestational age. Among the studied risk factors, only pneumothorax and respiratory acidosis had significant correlation with hemorrhage. Pneumothorax had also positive correlation with hemorrhage grade. In Nehma Lider and colleagues' study in 2003 depicted that every one mmHg decrease in PCO_2 in the first 24 hours of neonatal age will decrease risk of intracranial hemorrhage (4). Meanwhile Jaeger and co-workers declared that there was no correlation with arterial blood gas and intracranial hemorrhage (7).

Continuous improvement in premature neonatal care leads to survive more and more neonates with very low birth weight and gestational age who are severely prone to different complications including intracranial hemorrhage. Along this better instruments and techniques will lead to diagnose lower grade intracranial hemorrhages, which need great care in order to diminish the complications.

Factors involved in ICH in premature infants

In conclusion, supposing the safety and non-invasiveness of intracranial sonography, we suggest performing sonography in all premature neonates with low birth weight, and also in those neonates with pneumothorax and respiratory acidosis.

Conflict of interests

The authors declare that they have no competing interests.

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