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Intracranial Hemorrhage and Acute Kidney Injury in Newborns after Vacuum Assisted Delivery

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Abstract

Background: Vacuum assisted delivery is fairly common worldwide. Subgaleal Hematoma (SGH) is rare and lethal complication of vacuum assisted delivery. Intracranial Hemorrhage is even rarer.

Method: It is prospective observational study mentioning six neonates which were diagnosed with subgaleal hematoma following vacuum assisted delivery.

Results: Out of 6 neonates two babies were diagnosed with Acute Kidney Injury (AKI). Both of them had serious intracranial hemorrhage (subarachnoid hemorrhage and Grade 4 Intraventricular Hemorrhage).

Conclusion: Since there is recent surge in vacuum delivery it is important that obstetric care providers are aware of neonatal risks and related co-morbidities associated with such deliveries. Six Neonates should be monitored for diagnosis of intracranial bleed and acute kidney injury as early treatment can be implemented. Early suspicion especially when baby have inappropriate weight gain can be helpful.

Introduction

Instrumental vaginal delivery is fairly common worldwide [1]. Intracranial bleeding is rare complication of vacuum assisted vaginal delivery. Intracranial hemorrhage occurs 1 in 860 infants delivered by vacuum extraction in nulliparous women [2]. The incidence of acute kidney injury in NICU is 8% to 24% and associated mortality rate is 20% to 50% [3-5]. The purpose of this report is to alert those who care for Newborn to this entity of acute kidney injury associated with serious intracranial hemorrhage.

In this study six neonates born through vacuum assisted delivery were admitted at Max Hospital Greater Noida with diagnosis of subgaleal hematoma. Two cases had Acute Kidney Injury (AKI) which are discussed in detail.

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Case Series

Case 1

A term baby with weight of 2,500 gm was delivered through ventouse as during labor there were signs of fetal distress and meconium stained liquor. Mother was given antibiotics in view of fever. Baby was born at periphery hospital. Apgar score of 3/5/6 at 1, 5 and 10 min respectively. Baby arrived at 1 hour of life in intubated state on ventilator, peripheries were cold and cyanosed, SpO_2 was 88%. Blood tests revealed pH-7.05 and RBS 34. Baby was resuscitated and put on ventilator SIMV mode. Antibiotics started as per protocol. On further examination subgaleal bleed was suspected so baby was put on hematocrit and head circumference monitoring. Head compression dressing done to prevent further bleed. Baby was transfused packed red blood cell due to fall in hematocrit and increasing head circumference. Baby had seizures at 4 h of life controlled on antiepileptics and Inj Midazolam drip. Cranial ultrasonography revealed diffuse subgaleal hematoma. On day 2 baby had high grade fever and investigation revealed very high procalcitonin levels (>100), total leucocyte count was 46,000 with 82% neutrophils, coagulation profile was deranged and fibrinogen degradation particles were positive (>20). Chest X-ray showed consolidations on right lung. Baby shifted to second line antibiotics as per protocol along with fresh frozen transfusion.

On day 3 hematocrit stabilized, total leukocyte count and procalcitonin levels were on improving trend. Midazolam drip was tapered. Non-Contrast CT Head revealed marked diffuse subarachnoid hemorrhage seen along falx, tentorium cerebelli, bilateral sulci spaces, sylvan fissures and basal

Table 1: AKIN Criteria [8].

Stage	Serum creatinine	Urine output
1	Increase >0.3 mg/dL or increase >150% to 200% baseline	<0.5 ml/kg/h over 6 h
2	Increase >200% to 300% baseline	<0.5 mL/kg/h over 12 h
3	Increase >300% baseline or >4.0 mg/dL with acute increase >0.5 mg/dL	<0.3 mL/kg/h over 24 h or no urine for 12 h

Table 2: Summary of Cases.

S.no	Birth Weight (Kg)	Diagnosis
1	3.3	Severe birth Asphyxia with hypoxic Ischemic Encephalopathy Stage 2 with subgaleal hematoma
2	2.5	Severe birth Asphyxia with hypoxic ischemic encephalopathy Stage 3 with drug refractory seizure with Right lung Consolidation with Respiratory Failure with Septicemia with DIC with Subgaleal and Subarachnoid Hemorrhage with Acute Kidney Injury with Neonatal Hyperbilirubinemia
3	2.6	Severe birth Asphyxia with Hypoxic Ischemic Encephalopathy Stage 2 with Subgaleal Hematoma with Grade 4 Intraventricular Hemorrhage with Acute Kidney Injury with Neonatal Hyperbilirubinemia
4	3.1	Moderate Birth Asphyxia with Subgaleal hematoma with Neonatal Hyper- bilirubinemia
5	3.5	Subgaleal hematoma with Neonatal Hyperbilirubinemia with deranged KFT
6	2.9	Subgaleal hemorrhage

Table 3: Clinical pattern of neonates presented with acute kidney injury.

Age at onset of deranged Kidney function test	Peak S. Creatinine Levels mg/dl	Related Symptoms	Management and Outcome	CNS complications	Other Risk factors
94 hours	3.3	Oliguria, weight gain, Hyponatremia	Conservative, oliguria improved in 2 days, Kidney function started improving in 3 days	Subgaleal hematoma with sub arachnoid hemorrhage, Drug Refractory Seizures	Septicemia, DIC, asphyxia
50 hours	2.1	Normal urine output, weight gain, mild hyonatremia	Conservative, Kidney Function tests improved in 2 days	Subgaleal hematoma, Grade 4 intra- ventricular hemorrhage	Asphyxia
60 hours	1.9	Mild weight Gain	Conservative, Kidney Function Tests improved in 2 days	Subgaleal hematoma	Nil

cisterns more marked along mesencephalic cisterns and posterior subarachnoid spaces. No shift on mid line structures seen. Both lateral ventricles and 3rd ventricles are chinked. The cerebellum and 4th ventricle are normal. There was over-riding of occipito-parietal bone with subgaleal hematoma seen in bilateral high parietal region, right more then left.

On day 4 of life in view of oliguria, progressively deranged Kidney function test and inappropriate weight gain baby was put on fluid restriction and extraneous monitoring. On day 6 urine output started increasing with improvement in kidney function tests on day 7. Baby was discharged on Day 20 of life.

Case 2

A term baby with weight of 2,600 gm was referred on Day 3 of life from periphery hospital as case of severe birth asphyxia and hypoxic ischemic encephalopathy stage 2. There were no risk factors during pregnancy. Antenatal period was uneventful. Baby was born through vacuum assisted vaginal delivery in view of obstructed labor. On examination baby was lethargic, neonatal reflexes were poor, tone and activity were depressed, anterior fontanel was at level. Baby was maintaining Spo_2 at 0.5l/min of oxygen therapy. Cranial ultrasonography revealed right lateral ventricle intraventricular hemorrhage with extension into adjacent brain parenchyma, volume corresponding to 22cc. There is also a germinal matrix hemorrhage in left lateral ventricle. Both lateral ventricles are prominent. Therefore, Grade four Intraventricular hemorrhage with adjacent brain parenchymal involvement. Baby was given packed cell transfusion and fresh frozen plasma. On day 4 of life baby landed with inappropriate weight gain and kidney function tests were deranged. Baby was diagnosed with Acute Kidney Injury and put on fluid restriction and extraneous monitoring. Fluids were revised every 6 hours as per urine output. Urine output improved on day 6 of life. Kidney function test started improving on day 7 of life. Baby was discharged on Day 14 of life.

Discussion

In this study six neonates born through vacuum assisted delivery were hospitalized in NICU with subgaleal hemorrhage. Out of six two babies had AKI, one is having oliguria and others were having normal urine output. Both babies with AKI improved and were discharged. One baby is having mildly deranged kidney function test at 60 h of life. All three babies with deranged kidney function tests were having inappropriate weight gain as presenting clinical symptom. Babies were put on fluid restriction and extraneous monitoring. All babies were managed conservatively and kidney function tests started improving in 3 days.

All babies diagnosed with acute kidney injury had serious intracranial bleed (Subarachnoid hemorrhage and Grade 4 Intraventricular Hemorrhage) along with subgaleal hematoma. Perinatal asphyxia and Septicemia can be worsening risk factors for acute kidney injury.

Subgaleal Hemorrhage (SGH) is bleeding in the potential space between the skull periosteum and the scalp galea aponeurosis. It is rare and lethal complication. Pediatricians should be notified whenever an operative vaginal delivery has been attempted as such neonates should be closely observed. All vacuum-related injuries in term neonates were evident within 10 h of birth. Hence, neonates may be discharged 10 or more hours after vacuum delivery if no complications are evident [6]. Neonatal death from SGH can be prevented if appropriate attention is paid to identification of risk factors, early diagnosis, close observation and aggressive treatment [4]. SGH can present with anemia, metabolic acidosis, hyperbilirubinemia, intracranial hemorrhage, respiratory distress, seizures, shock, and death.

In previous studies while extra-cranial hematomas and skull fractures have been associated with vacuum assisted deliveries, a causal link to neonatal intracranial hemorrhage (intracranial hemorrhages, subarachnoid, subdural, and intracerebral) is less evident.

Acute Kidney Injury: The incidence of acute kidney injury in NICU is 8% to 24% and associated mortality rate is 20% to 50% [5]. AKI is common and associated with poorer outcomes in perinatal asphyxia. The presence of perinatal asphyxia and its severity appears to correlate with increasing incidence of AKI [6,7]. We had used AKIN Criteria to classify into three stages: Stage 1 (Mild), 2 (moderate), and 3 (severe) [8]. This study reminds us the association of serious intracerebral hemorrhage and AKI. But limitation of this study is etiology of AKI was not explored further (Tables 1-3).

Conclusion

Since there is recent surge in vacuum delivery it is important that obstetric care providers are aware of neonatal risks and related co-morbidities associated with such deliveries. Neonate should be monitored for diagnosis of intracranial bleed and acute kidney injury as early treatment can be implemented. Early suspicion especially when baby have inappropriate weight gain can be helpful.

Direct association between serious intracranial bleed and acute kidney injury can't be established due to small sample size of study. Moreover, other risk factors like septicemia and perinatal asphyxia were also present. Larger studies are needed to correlate these risk factors and occurrence of AKI.

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