

Exchange Transfusion: Indication and Adverse Effect

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Abstract:

Objective: To determine the indication and complications of exchange transfusion (ET) performed for neonatal hyperbilirubinaemia.

Methods: The medical records of infants < 28 days old who required exchange transfusion (ET) due to neonatal jaundice in Special Care Baby Unit (SCABU), BIRDEM hospital from January 2009 to April 2010 were retrospectively reviewed.

Results: Exchange transfusion was performed in 30 neonates during the study period. Indications of exchange transfusion were ABO incompatibility (30.0%), Rh incompatibility (13.3%), septicaemia (6.6%) and in majority causes, were unidentified (50%). Most common complication were thrombocytopenia (33.3%) hyperkalaemia (20%), hypocalcaemia (16.7%)

Conclusion: Indication of ET was unidentified in majority cases and among identified cases most common causes was ABO incompatibility. Adverse events were common after exchange transfusion.

Introduction

Approximately 60% of healthy term neonates have clinical jaundice in the first week after birth¹⁻⁴. About 0.02–0.16% of these infants develop extreme hyperbilirubinemia (>428 mmol/L)^{1,5}. Treatment is usually given for the prevention of bilirubin encephalopathy⁴. When the bilirubin is rising continuously, instead of declining in spite of phototherapy, to the level that kernicterus is considered a threat, then exchange transfusion (ET) is considered. Although ET is considered to be a safe procedure, it is not risk free, and mortality rates vary from 0.5 to 3.3%⁶⁻⁹. The level of bilirubin concentration at which ET should be indicated remains the subject of disagreement, since the incidence of bilirubin encephalopathy also depends on other variables such as gestational age, the presence or absence of haemolysis and the newborn's clinical status. Current recommendations for performing ET are based on balance between the risks of encephalopathy and the adverse events related to the procedure¹⁰. This study was undertaken with the objectives of determination of the indication of exchange transfusion and also to

evaluate the morbidity and mortality associated with the procedure.

Materials and methods

The medical records of infants < 28 days old who required ET due to neonatal jaundice in Special Care Baby Unit (SCABU), BIRDEM hospital from January 2009 to April 2010 were retrospectively reviewed. ET procedures were performed by the medical team of the unit. Infants' heart rate and oxygen saturation were monitored during the procedure. The umbilical vein was the only access employed for the procedure and the volume of blood used in the exchange corresponded to twice the patient's blood volume. In all cases, whole blood was used for the procedure within 12 hours after collection. All patients were given to phototherapy before and after the procedure. Serum bilirubin, complete hemogram including reticulocyte count, blood grouping (ABO and Rh) for mother and baby and direct Coomb's test report were collected for all babies. The morbidity and mortality caused by each ET which occurred within 3 days of the procedure was defined as complications. All episodes of complication were recorded. Statistical analysis was carried out using SPSS (version 12.0).

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Results

Exchange transfusion was done in 30 neonates during the study period. Among them 13 (43.33%) were male and 17(56.67%) were female; 63% were inborn and 37% were outborn. Mean gestational age of neonates was 33.33 ± 3.67 wks and mean birth weight was 1725 ±400 gm. Twenty two (73.34%) baby were preterm and 8 (26.66%) baby were term (Table-I). In this study 46.7% were infant of diabetic mother, 10% neonate had respiratory distress syndrome and 6.66% had birth asphyxia (Table-II).

Table-I
Clinical-pathological characteristics of neonate (n=30)

Place of delivery	
Inborn	19 (63.33%)
Outborn	11 (36.67%)
Sex	
Male	13 (43.33%)
Female	17 (56.67%)
Gestational period	
Term	8 (26.66%)
Preterm	22(73.34%)
Mean±SD	33.33 ± 3.67weeks
Birth weight	
Mean±SD	1725 ±400gms
Pre exchange S. bilirubin mg/dl	
Maximum	31.6mg/dL
Minimum	11.6 mg/dl
Mean	21.37(±5.10) mg/dl
Post exchange S. bilirubin mg/dl	
Maximum	17.3mg/dl
Minimum	3.8mg/dl
Mean	8.46±2.94 mg/dl
Day of Exchange Transfusion	
Mean±SD	5.2±1.62 day
Direct coomb's test	
Positive	5(38.46%)
ABO+ve	3(33%)
Rh+ve	2(50%)

Table-II
Contributing factors for Exchange Transfusion

Contributing factors	No (%)
Preterm	22(73.34%)
Infant of diabetic mother	14(46.7%)
Respiratory distress syndrome	3(10%)
Birth asphyxia	2(6.66%)

Mean serum bilirubin was 21.37(±5.10) mg/dl at the time of exchange transfusion. Fig.-1. Shows the indications for which neonates needed exchange transfusion. Among the 30 cases, no causes were unidentified in 50% of the neonates, ABO incompatibility was found in 30.0%, Rh incompatibility in 13.3% and septicemia was found in 6.6% cases. Multiple exchange transfusions were required in 10% neonates. Post exchange mean serum bilirubin was 8.46(±2.94) mg/dl and mean day of exchange transfusion was 5.2±1.62 day.

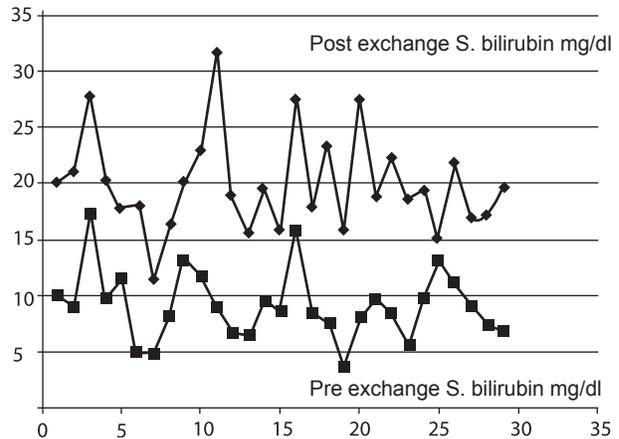


Fig.-1: S. bilirubin mg/dl (n=30)

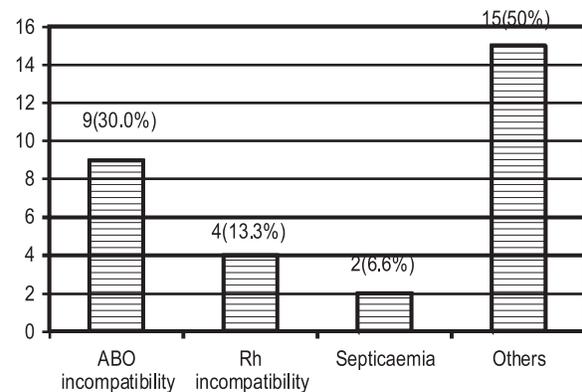


Fig.-2: Indication of Exchange Transfusion (n=30)

Table -III
Complications of Exchange Transfusion

Complications	n	%
Trombocytopenia	10	33.3
Hyperkalaemia	06	20.0
Hypocalcaemia	05	16.7
Hypoglycaemia	04	13.3
Hyponatraemia	04	13.3
Septicaemia	01	3.3
Death	01	3.3

During and immediately after exchange transfusion 60.0% baby developed complications. Most common complications were thrombocytopenia (33.3%), hyperkalaemia (20.0%), hypocalcaemia (16.7%), hypoglycaemia (13.3%), hyponatraemia (13.3%) and septicaemia (3.3%). One (3.3%) baby died after exchange transfusion due to extreme prematurity (26wks) and incredibly low birth weight (650mg), and developed septicaemia and electrolyte imbalance following ET.

Discussion

Exchange blood transfusion remains the gold standard for effective treatment of neonatal hyperbilirubinaemia. Although exchange transfusion rate was progressively declining over the years, it is still required in up to 7% of neonates admitted to nurseries¹¹. This reduction in the number of exchange transfusion may be due to the development of anti-Rh globin for Rh-negative mothers and the widespread use of phototherapy for neonatal jaundice^{12,13}. In this study, causes of exchange transfusion were unidentified in 15 (50%) cases. Infant of diabetic mother (46.7%), prematurity (73.3%), respiratory distress syndrome (8.57%) and birth asphyxia (5.7%) were risk factors for hyperbilirubinaemia needed ET in this group. Narag A et al analyzed 501 cases of neonatal jaundice and they found that in 52% cases no cause for exchange transfusion was identified¹⁴. Exchange transfusion was done due to ABO incompatibility in 9 (30%) cases, which was similar to the findings in some other series. Dikshit and Sanpavat reported that ABO haemolytic disease of newborns was the most common cause of ET in neonates (35.9% and 21.3%, respectively)^{15, 16}. Multiple exchange transfusion was required in 10% of our neonates. This is similar to findings of Abu-Ekteish et al¹⁷, but is lower than Dikshit SK study¹⁵.

Despite improvement in neonatal intensive care in the past two decades, exchange transfusion remains a high-risk procedure. One (3.3%) of the 30 patients in this study died of complications probably attributable to exchange transfusion. This neonate was extremely premature (26wks) and incredibly low birth weight (650mg), and developed septicaemia and electrolyte imbalance following ET.

Panagopoulos et al in Greece examined 606 exchanges performed on 502 neonates between 1962 to 1966 and reported a mortality rate of 0.66 % per patient and 0.79% per procedure; Keenan et al reported a mortality rate of 0.5%; but Chima et al

reported no serious adverse event or death in 22 infants who underwent 26 ET between 1990 and 1998¹⁸⁻²⁰.

Eighteen baby (60%) developed complications. Most common complications were thrombocytopenia (33.3%), hyperkalaemia (20.0%) and hypocalcaemia (16.7%). Badiie Z in his study done in Iran found similar results. In that study common complications of ET was hypocalcaemia (29.0%) and thrombocytopenia (44%)²¹.

In conclusion, though sample size was small, this report indicates that ABO incompatibility was the commonest identified cause of exchange transfusion. Adverse events remain common after exchange transfusion. Most of the complications were transient and improved with treatment. Mortality rate was low in this study. So it is still a good modality of treatment for severe neonatal jaundice.

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