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TO STUDY THE CAUSE, OUTCOME AND COMPLICATIONS AMONGST NEWBORNS REQUIRING EXCHANGE TRANSFUSION.

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Abstract-
Treatment modalities for significant hyperbilirubinemia are phototherapy and exchange transfusion. Exchange transfusion in newborns is recommended as emergency management of hyperbilirubinemia and as an effective method to achieve safe bilirubin level in infants at high risk of kernicterus. Amongst the babies who required exchange transfusion, 90% of the cases were outborn cases. While 90% babies were of term gestation, late preterm gestation was noted in only 1 case. Exchange transfusion was performed two times for 20% cases. Analysis of the cause revealed that 50% cases had Rh incompatibility, with a Positive Coomb's test noted in 20% cases. ABO incompatibility was noted in 30% cases, Hirschsprung's disease was diagnosed in 1 case, whereas 1 case had significant weight loss. Umbilical Vein Catheterization was done in 90% cases. The procedure was tolerated well by all cases. Commonly observed complications were hypokalemia, hypocalcemia, hyperglycemia, thrombocytopenia and sepsis. Bilirubin encephalopathy was noted in 20% cases, who had presented with a high Bilirubin Induced Neurological Dysfunction (BIND) score. No mortalities were recorded. In conclusion, most common causes for hyperbilirubinemia needing exchange transfusion are Rh incompatibility and ABO incompatibility. Exchange transfusion is effective in reducing serum bilirubin value and in preventing kernicterus.

INTRODUCTION-

Treatment modalities for significant hyperbilirubinemia are phototherapy and exchange transfusion. Exchange transfusion in newborns is recommended as emergency management of hyperbilirubinemia and as an effective method to achieve safe bilirubin level in infants at high risk of kernicterus.
Severe hyperbilirubinemia in neonates can lead to acute bilirubin encephalopathy or permanent neurological sequelae in survivor.[1] Kernicterus or bilirubin encephalopathy is caused by unconjugated hyperbilirubinemia that develops either as a result of hemolytic process or because of the inability of the liver to conjugate bilirubin.[2] The risk of mortality and severe long-term neurodevelopmental sequelae due to severe hyperbilirubinemia is high in low- and middle-income country like Bangladesh. The burden is likely to be exacerbated by lack of poor or timely access to proven therapies. Treatment modalities for significant hyperbilirubinemia requiring hospital admission are phototherapy and exchange transfusion.[3] Exchange transfusion (ET) is considered as an effective and quick method to achieve safe bilirubin level in infants at high risk of kernicterus.

In this context, this study was intended to share the experience of exchange transfusion in the NICU of a tertiary care center in Mumbai. In a developing country like India and also in developed countries, it will ultimately help to reduce the need for doing exchange transfusion and the complications of exchange transfusion.

AIMS AND OBJECTIVES –

To study the cause, outcome and complications amongst newborns requiring Exchange Transfusion.

MATERIALS AND METHODS-

A retrospective observational study was conducted in the NICU of MGM Medical College, Navi Mumbai from April 2022 to January 2024. Neonates who underwent exchange transfusion for significant unconjugated hyperbilirubinemia were enrolled in the study.

Baseline neonatal data and clinical information were obtained and recorded. The age of onset of jaundice, postnatal age of NICU admission, postnatal age of performing double volume exchange transfusion, cause of hyperbilirubinemia, indication of exchange transfusion, and duration of hospitalization were recorded. A detailed history of the previous and current pregnancies was taken from the mother, such as antenatal care, bad obstetric history including miscarriages, ectopic pregnancy, known alloimmunization, blood transfusion, previous sibling death and history of taking immunoglobulin.

Cord blood investigations in the setting of Rh incompatibility were sent for complete blood count, peripheral blood film, reticulocyte count, ABO blood grouping and Rh typing, direct Coomb's test were sent from peripheral blood. In suspected cases of sepsis, septic workup was done as per unit protocol.

Throughout the procedure, the baby was kept under the radiant warmer. The baseline vitals were recorded prior to commencement, and vital signs were monitored by cardiac monitor continuously throughout the procedure. In 9/10 cases, umbilical vein catheterization was done under sterile conditions, using an umbilical vein catheter. In 1 case, radial artery cannulation was done.

All patients were given phototherapy before and after the procedure. The baby was kept nil by mouth as soon as the decision was made to perform exchange transfusion. In case of Rh incompatibility, ABO compatible, Rh D negative RBCs were used when available, otherwise, O negative blood was used. In case of ABO incompatibility, group O, Rh specific RBCs were used. The blood was crossmatched with both baby and mother before exchange.

The procedure was performed by attending skilled residents of the NICU. After making sure that all connections are tight, pre exchange samples were sent for TSB. Small amount of blood (5ml/kg) was exchanged in each pass using the push and pull technique. Each pass (starting from the drawing of the baby's blood per UVC, disposing off old blood, followed by drawing of donor blood and transfusing that blood into the infant) takes approximately 1.5 to 2 minutes for completion.

The procedure was completed in 3 hours. Baby was monitored throughout the procedure. UVC was kept in situ for 24 to 48 hours till further need of exchange transfusion was excluded. All the newborns were clinically followed up until discharge. Hearing screening was done at discharge or during the first follow up. The newborns who developed sepsis were treated accordingly. All the newborns were exclusively breast fed. Outcomes were determined in terms of bilirubin encephalopathy, rebound hyperbilirubinemia requiring phototherapy, and death.

RESULTS-

Amongst the babies who required exchange transfusion, 90% of the cases were Outborn cases.

- While 90% babies were of term gestation, late preterm gestation was noted in only 1 case. Exchange transfusion was performed two times for 20% cases. Analysis of the cause revealed that 50% cases had Rh incompatibility, with a Positive Coomb's test noted in 20% cases. ABO incompatibility was noted in 30% cases, Hirschsprung's disease was diagnosed in 1 case, whereas 1 case had significant weight loss.

- Umbilical Vein Catheterization was done in 90% cases. The procedure was tolerated well by all cases.

- Commonly observed complications were hypokalemia, hypocalcemia, hyperglycemia, thrombocytopenia and sepsis. Bilirubin encephalopathy was noted in 20% cases, who had presented with a high Bilirubin Induced Neurological Dysfunction (BIND) score. No mortalities were recorded.

CAUSE	NUMBER OF CASES
RH INCOMPATIBILITY	5 (50%)
ABO INCOMPATIBILITY	3 (30%)
HIRSCHSPRUNG DISEASE	1 (10%)
SIGNIIFICANT WEIGHT LOSS	1 (10%)

COMPLICATIONS	NUMBER OF CASES
HYPERGLYCEMIA	7 (70%)
HYPOKALEMIA	6 (60%)
HYPOCALCEMIA	4 (40%)
THROMBOCYTOPENIA	3 (30%)
SEPSIS	1 (10%)

OUTCOME	NUMBER OF CASES
BILIRUBIN INDUCED ENCEPHALOPATHY	2 (20%)
REPEAT EXCHANGE TRANSFUSION	2 (20%)
DEATH	0

PROCEDURE VIA	NUMBER OF CASES
UMBILICAL VEIN CATHETERISATION	9 (90%)
RADIAL ARTERY CANNULATION	1 (10%)

DISCUSSION

- Despite worldwide steady decline in the neonatal exchange transfusion rate, the risk of acute bilirubin encephalopathy and permanent neurological damage from severe hyperbilirubinemia due to delay in identification and lack of access to appropriate care in the context of low- and middle-income country is still remaining.

- In spite of appropriate management, some would require multiple exchange transfusions, especially in the setting of ongoing hemolytic process. Early detection of high-risk cases, timely intervention, and better quality of phototherapy may explain the low frequency of repeated exchange transfusion in this study.

- The most common complication related to the exchange transfusion was hyperglycemia (70%).

- Next to hyperglycemia, hypokalemia following exchange transfusion was the second most common complication found in 60% of newborns.

- In a previous study done in 1990, the most common adverse events noted were thrombocytopenia (44%) and metabolic acidosis (24%).[4] In another study by Chacham et al.,[5] thrombocytopenia was observed in 57.4% of neonates. In this study, thrombocytopenia was present in 30% of cases.

- Catheter block during the exchange transfusion procedure in a study by Chacham et al.[5] was documented as 15.8%. There was no such event in the present study.
- Feature of bilirubin encephalopathy was present in 20% of cases in the current study. In a previous study by Chacham et al.,[5] 28.4% of neonates had acute bilirubin encephalopathy at presentation.

- In our study, we did not have any mortality.

- In our study, 2 babies (20%) required repeat exchange transfusion.

CONCLUSION

Most common causes for hyperbilirubinemia needing exchange transfusion are Rh incompatibility and ABO incompatibility.

Most commonly noted side effects were hyperglycemia and hypokalemia.

In conclusion, exchange transfusion is effective in reducing serum bilirubin value and in preventing kernicterus.

The overall outcome was favourable.

REFERENCES-

1. Yu C, Li H, Zhang Q, He H, Chen X, Hua Z. Report about term infants with severe hyperbilirubinemia undergoing exchange transfusion in Southwestern China during an 11-year period, from 2001 to 2011. PLoS One. 2017 Jun 29;12(6):e0179550. doi: 10.1371/journal.pone.0179550. PMID: 28662083; PMCID: PMC5491324.

2. Sabzehei M K, Basiri B, Shokouhi M, Torabian S. Complications of Exchange Transfusion in Hospitalized Neonates in Two Neonatal Centers in Hamadan, A Five-Year Experience. J Compr Ped. 2015;6(2):e20587. https://doi.org/10.17795/compreped-20587.

3. Ballot, D.E., & Rugamba, G. (2016). Exchange Transfusion for Neonatal Hyperbilirubinemia in Johannesburg, South Africa, from 2006 to 2011. International Scholarly Research Notices, 2016.

4. Patra K, Storfer-Isser A, Siner B, Moore J, Hack M. Adverse events associated with neonatal exchange transfusion in the 1990s. J Pediatr. 2004 May;144(5):626-31. doi: 10.1016/j.jpeds.2004.01.054. PMID: 15126997.

5. Chacham, Swathi; Kumar, Jogender; Dutta, Sourabh; Kumar, Praveen. Adverse Events Following Blood Exchange Transfusion for Neonatal Hyperbilirubinemia: A Prospective Study. Journal of Clinical Neonatology 8(2):p 79-84, Apr–Jun 2019. | DOI: 10.4103/jcn.JCN_96_18

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