Effect of an exchange transfusion on plasma level of some preventive antioxidants in the newborn

Khaled Abdel Kawey Ibrahim Ahmed

In recent years increasing experimental and clinical data have provided compelling evidence for the involvement of oxygen radicals in the 3 main diseases of prematurity (chronic lung disease, retinopathy of prematurity and intraventricular hemorrhage (Kelly, 1993).In healthy humans, a balance exists between oxygen derived free radical production and their removal by antioxidants. In preterm infants, inadequate antioxidants defenses may contribute to the pathogenesis of the complication of prematurity (Drury et aL, 1998).A number of antioxidants are present in human tissues, which comprise the secondary defense system against oxygen free radicals and oxidants stress. These protecting agents can be classified as scavengers, antioxidants, repair agents and antioxienzymes (Stahelin, 1999).Gutteridge & Halliwell, (1989) further classified antioxidants into primary (preventive) antioxidants like transferrin and ceruloplasmin, and secondary (chain breaking) antioxidants, mainly vitamin C, vitamin E, uric acid, bilimbin and thiols. In plasma the primary antioxidants, ceruloplasmin and transferrin, respectively oxidize and bind iron, thus synergistically preventing hydroxyl radical production.Exchange transfusion rapidly produced variable changes in the concentration of prooxidants and antioxidant substances in the plasma and may thus influence the free radical metabolism in the newborn (Lindeman et aL, 1992).the present study was carried out to determine the levels of some primary (preventive) antioxidants in the neonates with diseases producing free oxygen radical before and after exchange transfusion, thus to understand the effect of exchange transfusion on some primary antioxidants levels and the consideration of it’s possible protective effect on the free radical metabolism in the newborn.The study was carried out on 45 newborn babies who were classified into 2 main groups:Group I: Included 35 babies as studied cases.Group 11: Included 10 healthy full tenn neonates as control.According to the clinical diagnosis, studied cases (Group I) wasclassified into 3 subgroups:Subgroup IA: Included (13) jaundiced cases (38%). Subgroup IB: Included (11) septicemic cases (31%). Subgroup lc: Included (I I) hypoxic cases (31%).The newborn babies were subjected to the following:•Full clinical history including perinatal history.•Gestational age assessment.•Thorough clinical examination including all systems.•The following investigations:*Serum iron, TIBC, ferritin (pre & post exchange).*Serum ceruloplasinin(Cp)&transferrin (Tf)(pre & post exchange).*Other investigations were done according to case studied.•Exchange transfusion was done for all studied cases according toits indication.(69JIn our

cases, the exchange transfusion produced potentially important changes in prooxidant and antioxidant concentrations of the newborn. Ferritin was lowered, and the raised transferrin & lowered iron levels increased the latent binding capacity. An exchange transfusion by lowering ferritin and raising the latent binding capacity will decrease the risk of non-protein bound iron (free iron) in the plasma. The simultaneous increase in cendoplasmin and therefore the ferroxidase activity would enhance this effect because only ferric ions can bind to transferrin.Our results clarified that a statistically significance increase in the serum levels of ceruloplasmin and transferrin after exchange transfusion in the 3 subgroups of studied cases.The measurement of serum cendoplasmin, being the most reliable in this study, could be used as a test to evaluate the primary antioxidant activity and it might be added in the future to the criteria indicating exchange transfusion. This point needs further study.As regards birth weight, a positive correlation between post exchange serum levels of transferrin and birth weight, but with gestational age we found a positive correlation between post serum levels of ceruloplasmin and gestational age.Statistical analysis revealed no statistical difference between both sexes in the effect of exchange transfusion on mean serum levels of iron, TIBC, ferritin, ceruloplasmin and transferrin.Moreover, raising the plasma concentration of ceruloplasmin and transferrin by exchange transfusion would limit iron induced oxygenSumm.9221170)toxicity especially in low birth weight and preterm neonates who are more vulnerable to neonatal oxygen radical diseases. Thus they will certainly benefit from the preventive role of exchange transfusion on the free radical metabolism in the newborn. Exchange transfusion performed for the cases with various clinical conditions as hyperbilirubinemia, sepsis and perinatal asphyxia will acquire in addition, another advantage from this line of therapy used in adjunct as an effective preventive therapy against oxygen radical injury.