Case study

Leukemoid Reaction in a Preterm Infant: diagnostic challenge in resource poor setting: A Case report

Running Statement: Leukemoid reaction, Preterm, Resource poor

Abstract

A preterm neonate delivered at 28 weeks gestation, mother had antenatal steroid. Blood counts showed leukemoid reaction, blood culture, procalcitonin and peripheral blood film was normal. Baby was stabilized in the NICU, recovered and the WBC count done serially showed a downward trend. The leukemoid reaction was presumed to come from antenatal steroid use. The diagnostic and management challenges encountered in managing the infant in resource constrained environment like ours is presented alongside.

Abbreviation

NICU	Neonatal Intensive Care Unit
WBC	White Cell Count
CRP	C-reative protein
BMA	Bone Marrow Aspirate

Introduction

Leukemoid reaction is an extreme form of leukocytosis similar to that seen in leukemia but caused by other conditions .Leukocytosis exceeding 50,000wbc/mm^2 with increase in early neutrophil precursors in the neonatal period is known as neonatal leukemoid reaction (1).

Leukemoid reaction in the neonatal period can be associated with sepsis, congenital leukemia, bronchopulmonary dysplasia , prematurity antenatal steroid use and congenital abnormalities.(2) The incidence of leukemoid reaction in neonate range between 1.3% – 15%.(3)

We report a case of leukemoid reaction in a preterm infant and the challenges in managing such diagnosis in resource poor environment.

Case presentation

A preterm female baby was delivered caesarean section at 28 weeks + 4days on account of antepartum hemorrhage and preterm pre labour rupture of membranes. Apgar scores were 8 and 10 in the first and fifth minute respectively. Birth Weight was 1450 grams. Baby had respiratory distress and was admitted and nursed in an incubator with CPAP in the Neonatal Intensive care Unit. Investigations such as complete blood count (CBC), C-reactive protein, blood culture, procalcitonin, and peripheral blood film were sent. Intravenous antibiotic ceftazidime and amikacin was commenced and later stopped when blood culture did not reveal any organism. Babies initial investigation results ; WBC 81,000 m/mm^3 , Neutrophils 66%, Lymphocytes 25%, monocytes 9% Hb 12.8g/dl, Platelets 311 m/mm^3 on first day of life and by the 3rd day of life it was ; WBC 93,000 m/mm^3 , Neutrophils 74%, Lymphocytes 22.9%, monocytes 3.1% Hb 11.9g/dl, Platelets 260,000 m/mm^3 . The blood culture did not yield any organism, procalcitonine

and CRP were normal while peripheral blood film did not show any abnormal cells and Lumber puncture was normal. Repeated CBC done alternate day showed a decreasing trend and by the 10^{th} day post admission the blood count had reduced to, WBC 14,000 m/mm^3 , Neutrophils 33.83%, Lymphocytes 51.2%, monocytes 9.7% Hb 11.2g/dl, Platelets 185,000 m/mm^3 and remained within normal range till discharge. Bone marrow aspiration and karyotype was not done. Baby continued to improve and was discharge home and has been seen for follow up with the complete blood count now normalized.

Discussion

Leukocytosis is a common finding in newborns in the first few days of life (4). This increase in leucocytes is from a surge or burst in cytokines (Granulocyte colony stimulating factor and Granulocyte-macrophage colony-stimulating factor) (5)

Leukemoid reaction have been demonstrated in up to 15% of preterm infants in the absence of any identifiable factor.(5) However it has been found to be more common in preterm infants , infections , antenatal steroid use , congenital leukemia and transient leukemoid reaction seen in Down Syndrome.(6)

In our reported case, patient's mother was on progesterone from the 7^{th} – 15^{th} week of pregnancy and had one dose of dexamethasone 48 hours prior to delivery, this history led credence to steroid use by mother being the cause of the leukemoid reaction in our case.

Our sepsis work-up in the patient was extensive despite the diagnostic difficulties and challenges faced especially in getting investigation results in real time in our environment.

Other diagnosis such as congenital leukemia was considered, however the peripheral blood film result did not reveal any abnormal cells or blast and the lactate dehydrogenase levels was not elevated. Bone marrow aspiration was not done due to financial challenges as patient could not afford it.

Our patient did not get the benefit of a karyotype as this investigation is not readily available in our environment and when available the turnaround time is in excess of 4 weeks. The index case did not have any dysmorphic features hence the possibility of transient myeloproliferative disease also known as transient abnormal myelopoiesis a form of leukemia seen in Down syndrome was excluded. (7)

Leukemoid reaction is occurs in a different clinical scenario which includes prematurity, antenatal steroid use, infectious etiologies, adverse reactions to medications, asplenia, congenital leukemia diabetic ketoacidosis, and septic shock with end-organ damage. Infants with tisomy 21 can often be born with a leukemoid reaction.(8)

Evaluating and investigating leukemoid reaction involved elimination of the possible etiologies, by birth history to determine the gestational age and antenatal use , carrying out investigations which includes complete blood count , peripheral blood, c-reactive protein and blood culture to eliminate possibility of sepsis. Bone marrow aspirate to eliminate diagnosis of possible congenital leukemia and karyotyping for trisomy 21.(9,10).

The treatment of leukemoid reaction depends on the possible aetiology , more often than not the white cell counts would normalize as the aetiology treated. (11,12).

The mechanism of steroid induced leukemoid reaction involves the following pathophysiology; steroids inhibit L-selectin synthesis at gene level, leading to demargination of leukocytes into the circulation, it also causes delayed migration of PMNs into tissues and rate of apoptosis, and release of non-segmented (band) neutrophils from bone marrow. (13)

Conclusion

Diagnosing leukemoid reaction in preterm infants in very challenging due to lack of adequate diagnostic equipment, cost and prolonged turnaround time of the investigations. These limitations not withstanding any WBC > 30,000 in any neonate should be thoroughly investigated to exclude the possibilities of sepsis, congenital leukemia and transient myeloproliferative disorders.

Consent Disclaimer:

We have added the Consent Disclaimer in the revised paper. The revised paper is attached herewith this mail for your kind perusal. Kindly check the revised paper

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