

INCIDENCE OF THROMBOCYTOPENIA IN HYPERBILIRUBINEMIC NEONATES DURING PHOTOTHERAPY

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Abstract - *Thrombocytopenia has been reported as a complication of phototherapy. In this study the effect of conventional phototherapy on platelet count was studied in 101 newborns with indirect hyperbilirubinemia, out of whom 50 patients (49.5%) had decreased levels of platelets; 20 (19.8%) of the latter had a platelet count of below 100000/mm³. Decreased platelet count was maximum during the first 24 hours of phototherapy. Ultraviolet light may increase platelet turnover and injury during phototherapy by an unknown mechanism.*

Acta Medica Iranica 38 (1): 7-9; 2000

Key Words: *Thrombocytopenia, hyperbilirubinemia phototherapy complication, neonatal jaundice*

INTRODUCTION

Phototherapy has emerged as the most widely used form of therapy for the treatment and prophylaxis of neonatal unconjugated hyperbilirubinemia. In nearly all infants, phototherapy reduces or blunts the rise of serum bilirubin concentration regardless of maturity, presence or absence of hemolysis, or degree of skin pigmentation (1).

Phototherapy as a modality of treatment of jaundiced babies was first introduced by Cremer et al (2) in 1958 after her chance observation of rapid clearance of jaundice in neonates exposed to sunlight in the nursery. Since then phototherapy has been used extensively and, along with other factors, has contributed to a considerable decline in the need for exchange transfusion in the treatment of neonatal hyperbilirubinemia (3,4,17).

Kernicterus is a neurologic syndrome resulting from the deposition of unconjugated bilirubin in brain cells. From incomplete investigations it was suggested that serum bilirubin levels below 20 mg% were nearly always safe but that above this level the risk of kernicterus increased steadily (5,6).

The ideal treatment for neonatal hyperbilirubinemia would be a safe and simple method for preventing or at

least modifying, its occurrence (7).

Phototherapy is an effective and relatively safe method for reducing indirect bilirubin levels, particularly when initiated before serum bilirubin increase to levels associated with kernicterus (8).

Animal and human studies suggest that hyperbilirubinemia and phototherapy may lead to thrombocytopenia. Maurer et al found that rabbits exposed to phototherapy had decreased platelet counts and increased platelet turnover (9,10).

The purpose of the present study was to define hyperbilirubinemia and phototherapy in neonates as a cause of thrombocytopenia.

MATERIALS AND METHODS

The effects of conventional phototherapy on platelet count were studied in 101 newborn infants referred to neonatal emergency room with indirect hyperbilirubinemia.

On arrival platelet count was performed. Neonates whose platelet count was more than 150000 before starting phototherapy and were healthy on physical examination were included in the study.

Capillary blood samples for platelet count were collected from deep heel stabs. Free flow of blood was achieved by warming and drying the heels before the stab.

Phototherapy was performed by 10 day light lamps covered by 0.5 cm cover glasses, 45 cm away from the patients whose eyes and genitalia had been covered.

Daily platelet counts were performed. Peripheral blood smear was taken from heels and staining was done by the Wright technique. All the slides were watched and counted by one technician under the high power of microscope.

Factors such as sex, birth weight, gestational age, neonatal age, the duration of phototherapy and degree of bilirubin were studied and compared in all of the thrombocytopenic patients. The data were analyzed by Fisher exact test.

RESULTS

101 newborn infants were admitted in the study, 43 females and 58 males, 50 of whom (49.5%) had decreased platelet counts (150000 to 70000/mm³); in 20 (19.8%) of the latter platelet count was below 100000. The thrombocytopenic group 35% female and 65% male (Figure 1). The rate of decreasing platelet count was maximum during the first 24 hours of phototherapy (Figure 2).

We didn't find any relation between the patient's age, gestational age and thrombocytopenia (Table 1).

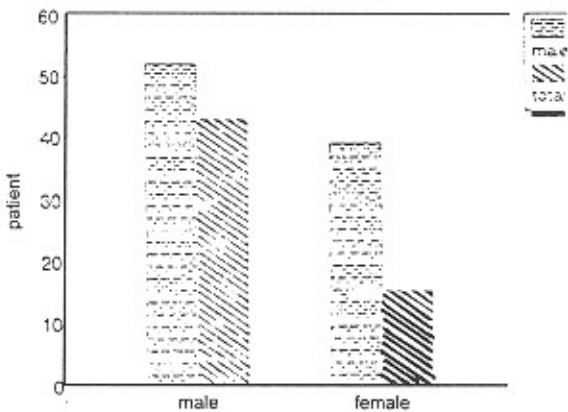


Fig. 1. The sex distribution of patients receiving phototherapy

Table 1- Mean platelet count by sex, age and weight.

	Male	Female	Pvalue
Weight(g)	2944	2923	0.72
Bilirubin mg/dl	17.2	17.1	0.67
Age (day)	5.9	6.1	0.06
Platelet (count in mm ³)	169388	170135	0.94

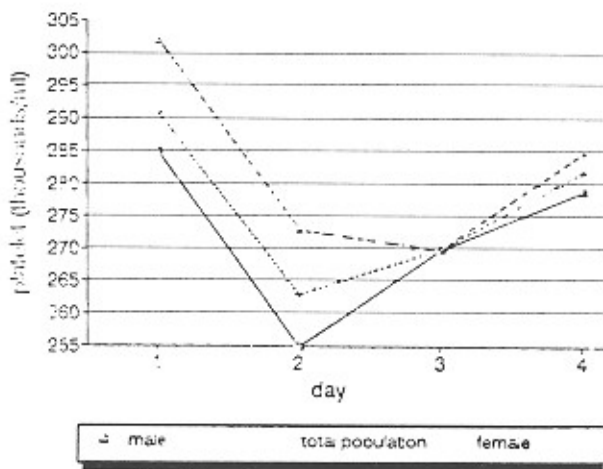


Fig. 2. Mean platelet count during phototherapy

DISCUSSION

In 1966, prior to the introduction of phototherapy into the United States for treatment of neonatal hyperbilirubinemia, Zieve and assistants described the effects of high-intensity white light on human platelets in vitro. Platelets which had been briefly exposed to light following photosensitization by hematoporphyrin lost the ability to aggregate, and released potassium, acid phosphatase, serotonin, and adenosine triphosphate. Electron photomicrographs of these altered platelets showed depletion of cytoplasmic materials and smoothed membrane contours as compared to controls (11-13).

Using broad spectrum blue fluorescent light phototherapy in rabbit comparable to that used for therapy of newborn infants, Harold Maurer observed similar kinds of platelet abnormalities within a two hour period of exposure in the absence of hematoporphyrin preconditioning. Exposed platelets would not aggregate, were depleted of adenine nucleotides and glycogen and on electron photomicrographs showed loss of glycogen granules and organelles plus ill-defined external membranes (10).

This information is of concern because of reports that broad spectrum blue fluorescent light can penetrate the dermis (and other tissues) to a degree that would permit photochemical reactions to occur in subdermal tissues, including the vascular bed.

We should also emphasize that during phototherapy light is transmitted through living tissue to a degree which may lead to photochemical reactions to occur in the vascular bed. It is known that light exposure causes a decrease in blood riboflavin level and alters the excretory pattern of tryptophan metabolites (14,15,16).

Maurer and Fratkin (11) studied the effects of phototherapy on platelet counts in low-birth-weight infants and on platelet production and life span in rabbits undergoing phototherapy continuously for 96 hours. Platelet life span was shortened to a mean of 4.2 days as compared to 6 days in controls receiving no phototherapy. Platelets also emerged from marrow earlier in these animals. Second, in low-birth-weight infants, the effect of 96 hours of continuous daylight phototherapy on platelets showed that in 38.7% of babies platelet counts fall below 150000 /mm³ and the lowest count was 52000/mm³.

In our study, 20 babies out of 101 neonates developed thrombocytopenia, with no relationship birth weight, gestational age or postnatal age and the incidence and/or severity of thrombocytopenia. Since the platelet count was normal before the between inclusion of patients, there was no need for a control group.

The mechanism of action of light on platelets in vivo is unknown. The in vitro data suggest that

photochemical reactions occur in the platelet membrane. Whether these reactions occur in vivo remains to be determined. Shortened platelet life span may be the result of sequestration of damaged platelets in the spleen (14-17).

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