Influence of Phototherapy on Markers of Apoptosis in Full-Term Infants

Thesis

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List of Abbreviations

Abb.	Full term
AAP	*American Academy of Pediatrics*
CMF	*Congenital malformations*
CRP	*C-reactive protein*
ELISA	*enzyme linked immunosorbent assay*
ER	*Endoplasmic reticulum*
FADD	*Fas associated death domain protein*
GRx	*Glutayhione reductase*
GSH	*Glutathione perioxidase*
GST	*Glutathione -S- transferase*
HIE	*Hypoxic ischemic encephalopathy*
HO	*Heme oxygenase*
IR	*Infra red*
kDa	*Kilo Dalton*
LED	*Light-emitting diode*
MDA	*Malondialdehyde*
NICUs	*Neonatal Intensive care unit*
OD	*Oligomerization domain*
ROC	*Receiver operating characteristic curve*
SOD	*Superoxide dismutase*
TAD	*Transcription –activation domain*
UDPGT	*Uridine-diphospho-Glucuronic acid transferase*
UGT	*Uridine diphosphate glucuronyl transferase*
UGTs	*Uridine diphospho glucuronosyltransferase*
UTI	*Urinary tract infection*
UV	*Ultra violet*

Abstract

Background: Jaundice is the most common condition that requires medical attention in newborns. Although phototherapy is the standard treatment for neonatal hyperbilirubinemia, it may lead to potential side effects such as retinal degeneration, diarrhea, dehydration, and skin rash. Experimental studies have demonstrated that phototherapy increased apoptosis in the mouse lymphoma cell line and neonatal small intestine cells. It is essential to study the side effects of phototherapy to restrict its use in those with significant hyperbilirubinemia.

Aim: To assess the influence of phototherapy on apoptosis in peripheral blood lymphocytes in full-term infants using an apoptotic marker. **Methods:** A case control study was conducted on 50 full term neonates (30 with unconjugated hyperbilirubinemia requiring phototherapy according to American Academy of Pediatrics <AAP> Guidelines and 20 healthy non jaundiced neonates as a control) enrolled from neonatal intensive care unit (NICU). Laboratory investigations including P53 as an apoptotic marker and oxidative stress markers(Malondialdehyde MDA, Reduced glutathione GSH, Superoxide dismutase SOD and Glutathione Peroxidase GPx) were done for the two groups. **Results:** There is a significant increase of apoptosis as indicated by a significant increase in P53 induced by phototherapy and hyperbilirubinemia. Our study results also show that Phototherapy has a great effect on oxidative stress markers by increasing Malondialdehyde MDA level, Superoxide Dismutase SOD activity and Glutathione Peroxidase GPx activity and decreasing reduced glutathione GSH level. **Conclusion:** phototherapy induces apoptosis in peripheral blood lymphocytes of full-term infants and has a great effect on oxidative stress markers so Phototherapy use should be restricted to those with significant hyperbilirubinemia.

INTRODUCTION

Jaundice is the most common condition that requires medical attention in newborns. The yellowish discoloration of the skin and sclera in newborns with jaundice is the result of accumulation of unconjugated bilirubin. In most infants, unconjugated hyperbilirubinemia reflects a normal transitional phenomenon ***(Manning et al., 2007).***

However, in some infants, serum bilirubin levels may rise excessively, which can be cause for concern because unconjugated bilirubin is neurotoxic and can cause death in newborns and lifelong neurologic sequele (kernicterus) in infants who survive ***(Macias et al., 2009).***

Although phototherapy is the standard treatment for neonatal hyperbilirubinemia, it may lead to potential side effects such as retinal degeneration, diarrhea, dehydration, and skin rash ***(Xiong et al., 2011).***

Moreover, experimental studies have demonstrated that phototherapy increased apoptosis in the mouse lymphoma cell line ***(*Bruzell, *2005)*** and neonatal small intestine cells ***(Tanaka et al., 2008).***

Peripheral blood lymphocytes are commonly used to monitor environmentally induced genetic damage. P53 is a tumor suppressor protein that regulates the cell cycle and, thus, functions as a tumor suppressor that is involved in preventing

cancer. As such, P53 has been described as “the guardian of the genome” because of its role in conserving stability by preventing genome mutation. One of the most dramatic responses to P53 activation is the induction of apoptosis ***(Jiang et al., 2015).***

Aim of the Work

To assess the influence of phototherapy on apoptosis in peripheral blood lymphocytes in full-term infants using an apoptotic marker.