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The lowering of bilirubin levels in patients with neonatal jaundice using massage therapy: A randomized, double-blind clinical trial

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ABSTRACT

Objective: Due to the effects of massage on various laboratory parameters (including those related to jaundice) in infants and the expansion of existing studies to achieve effective and safe therapy in the treatment of neonatal jaundice, this study aimed to investigate the effect of massage on bilirubin levels in cases of neonatal jaundice.

Methods: In this study, 134 patients were randomly assigned to either an intervention group (massage combined with phototherapy, n = 67) or a control group (phototherapy only, n = 67). In both groups, serum total bilirubin level and frequency of daily bowel movements were measured and compared during each of the first four days of treatment.

Results: Baseline levels of bilirubin were similar between the two groups ($P > 0.05$). During the measurements obtained post-intervention, significant differences surfaces between the two groups in bilirubin levels and frequency of daily bowel movements ($P < 0.05$ for both). No significant relationship was observed during days 1 and 2 of massage therapy between daily frequency of bowel movements and serum bilirubin level ($P > 0.05$); this relationship became significant during the third and fourth days ($P < 0.05$).

Conclusion: Massage therapy combined with phototherapy is an effective method for reducing serum total bilirubin in infants with neonatal jaundice.

1. Introduction

Neonatal hyperbilirubinemia refers to an excess of more than 5 mg/dl bilirubin above the normal level. Icterus (jaundice) appears as a result of the deposition of bilirubin in the skin and mucosa. Unconjugated (indirect) hyperbilirubinemia is usually benign, but severe cases can lead to kernicterus. Diagnosis and treatment of neonatal hyperbilirubinemia is of great importance in the prevention of encephalopathy. Increased bilirubin occurs in infants between 3 and 7 days of age. However, it is possible for jaundice to occur at birth or any time during infancy (Maisels & Newman, 2007; McGillivray, Polverino, Badawi, & Evans, 2016).

Researchers have considered different treatment methods ranging from phototherapy to neonatal blood transfusion to prevent the effects of hyperbilirubinemia. Each method has positive effects and drawbacks. Watery diarrhea, increased insensible water loss, skin rashes, blue baby syndrome, and temporary skin tanning are some of the effects of phototherapy. It is also a matter of debate whether phototherapy can cause melanoma in treating neonatal jaundice (Dennery & Lorch, 2007; Sharif et al., 2016). Complications associated with blood transfusion include allergic reactions and possible infections. Also, separation of the baby from the mother during

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phototherapy emotionally affects both the mother and the baby. Therefore, it seems necessary to simultaneously maintain the normal range of circulating bilirubin and control possible side effects.

Massage in infants after birth is a method that, in addition to inducing relaxation in the mother and baby, has also been proven to improve parameters such as height, weight, head circumference, bone density, sleep duration, and breathing patterns while reducing the incidence of infant colic (Field, Diego, & Hernandez-Reif, 2010; Hernandez-Reif, Diego, & Field, 2007) As is well-known, defecation is a mechanism whereby bilirubin is removed, decreasing the probability of jaundice (Diego, Field, & Hernandez-Reif, 2005). Published studies have reported that baby massage can ameliorate neonatal jaundice (Chen, Sadakata, Ishida, Sekizuka, & Sayama, 2011). In another study, Vimala massage did not have an effect on the processing of bilirubin (Seyyedrasooli, Valizadeh, Hosseini, Jafarabadi, & Mohammadzad, 2014). The conflicting results of these and other studies led to this study, in which the use of massage in tandem with phototherapy is investigated for its impact on increasing the frequency of daily bowel movements in neonates and thereby reducing neonatal jaundice.

2. Materials and methods

The infants were randomly divided into the intervention study group (67 infants undergoing massage with phototherapy) and the control group (67 undergoing phototherapy only). Infants in the intervention study group (under treatment) received massage and phototherapy 2 times a day for 15–20 min. The inclusion criteria were: 1–14 days after birth, gestational age of 38–40 weeks, no congenital anomalies, absence of maternal addiction to alcohol, cigarettes, or other drugs, no neonatal surgery, mother was exclusively breastfeeding (Jalali et al., 2016; Lotfi et al., 2016; Saba, Valeh, Ehteram, Haddad, & Ghazi, 2017). Each infant was carefully examined, and the related demographic and clinical data were registered in the checklist. Information recorded included gender, gestational age, mode of delivery, birth weight, Apgar score, maternal parity, delivery duration, mean birth weight during the first 4 days, defecation, the time of the first bowel movement (meconium) during the first 4 days, and total bilirubin within the first 4 days (Chen et al., 2011).

Infant massage was performed by mothers under the supervision of trained nurses. Infants were massaged an hour after waking up in the morning and at noon in a place with a room temperature between 24 °C and 28 °C. The mother would rub his/her hands together after washing and drying her hands so as to bring his/her body temperature close to the temperature of the infant's skin. Massaging began with the face; baby oil was applied. The massager applied her two thumbs to gently and slowly massage the area around the eyes and cheeks. This action then continued from the bottom to the top of the chest area. Then, the massager performed some soft and semi-circular movements on the infant's abdomen, followed by massaging with moderate pressure of the upper and lower limbs. Eventually, the spine was massaged using the two thumbs from top to bottom and from the neck to buttock. Terms and the method of massage were the same for all infants in the study group. The infants in the control group were given routine care.

The number of bowel movements in the first 4 days was recorded based on the reports of mothers and nurses. Using venous sampling and testing, we measured serum total bilirubin level for 4 consecutive days (once daily) (Ferdosian et al., 2015).

2.1. Ethical considerations

This clinical trial study has been approved as a research project by the Vice Chancellor for Research and Technology of Hamadan University of Medical Sciences under the project number C.16.359.631. The study was conducted in 2015 on 134 infants admitted to the pediatric ward of Besat Hospital in Hamadan after approval by the ethics committee and registration in the Iranian Registry of Clinical Trials (IRCT2014121610933N4). All procedures involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments.

2.2. Statistical methods

The Kolmogorov-Smirnov test was applied to determine the normal distribution of variables (Hosseini, Moniri, Goli, & Kashani, 2016; Kashani & Moniri, 2015; Kashani, Nikzad, Mobaseri, & Hoseini, 2012; Nikzad, Kashani, Kabir-Salmani, Akimoto, & Iwashita, 2013). Analyses were carried out based on the intent-to-treat population and performed using the analysis of variance (ANOVA) method (Dehghani, Sharif, Moniri, Sharif, & Kashani, 2016; Kashani et al., 2013). We applied one-way, but two-tailed Student's *t* tests and Chi-square test with independent samples to compare between-group ratios. As the bilirubin levels were nor normally distributed in the two groups, the Mann-Whitney was used for the comparison of bilirubin levels between them; $P < 0.05$ was considered statistically significant (Dehghani, Sharif, Assadi, Kashani, & Sharif, 2016). All statistical analyses were done using the Statistical Package for the Social Sciences, version 19 (SPSS Inc., Chicago, Illinois, USA) (Dehghani, Sharif, Madani, Kashani, & Sharif, 2016).

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