THE IMPORTANCE OF CAFFEINE CITRATE USE IN PRETERM INFANTS WITH RESPIRATORY DISTRESS SYNDROME

Rasulova Ogiloy Nematjon qizi

Master's student in Neonatology

Department of Pediatrics

Bukhara State Medical Institute

Mukhamedova Shakhnoza Tolibovna

Head of the Department of Pediatrics No. 2, Doctor of Medical Sciences (DSc)

Bukhara State Medical Institute

Abstract

This article analyzes the importance of caffeine citrate use in preterm infants with respiratory distress syndrome based on current scientific literature. Respiratory distress syndrome is one of the major problems of the neonatal period and is associated with pulmonary immaturity and functional insufficiency of the respiratory center. According to the literature, caffeine citrate stimulates the respiratory center, reduces the frequency of apnea episodes, and decreases the need for respiratory support. The article is presented as a literature review, and no clinical or experimental studies involving patients were conducted.

Keywords:

respiratory distress syndrome, preterm infants, caffeine citrate, apnea, neonatology

ЗНАЧЕНИЕ ПРИМЕНЕНИЯ ЦИТРАТА КОФЕИНА У НЕДОНОШЕННЫХ НОВОРОЖДЁННЫХ С РЕСПИРАТОРНЫМ ДИСТРЕСС-СИНДРОМОМ

Расулова Угилой Нематжон кизи

магистрант по специальности «Неонатология»

кафедра педиатрии

Бухарский государственный медицинский институт

Мухамедова Шахноза Толибовна

Заведующий кафедрой педиатрии №2, доктор медицинских наук (DSc)

Бухарский государственный медицинский институт

Аннотация

В статье представлен анализ значения применения цитрата кофеина у недоношенных новорождённых с респираторным дистресс-синдромом на основе данных современной научной литературы. Респираторный дистресс-синдром является одной из актуальных проблем неонатального периода и связан с незрелостью лёгочной ткани и функциональной недостаточностью дыхательного центра. По данным литературы, цитрат кофеина оказывает стимулирующее действие на дыхательный центр, снижает частоту апноэ и уменьшает потребность в респираторной поддержке. Статья подготовлена в форме обзора литературы, без проведения клинических или экспериментальных исследований.

Ключевые слова:

респираторный дистресс-синдром, недоношенные новорождённые, цитрат кофеина, апноэ, неонатология

Introduction

Respiratory distress syndrome (RDS) remains one of the most significant causes of morbidity and mortality in preterm infants. The condition primarily develops due to pulmonary immaturity, surfactant deficiency, and functional immaturity of the respiratory control center. As a result, preterm neonates frequently experience apnea, hypoventilation, and respiratory failure requiring respiratory support.

In recent years, methylxanthines, particularly caffeine citrate, have gained wide acceptance in neonatal practice. Caffeine citrate is known for its stimulatory effect on the central nervous system and respiratory center, improvement of lung function, and reduction in the need for mechanical ventilation. The aim of this article is to analyze the importance of caffeine citrate use in preterm infants with respiratory distress syndrome based on available scientific literature.

Materials and Methods

This article was prepared as a narrative literature review. Scientific publications related to neonatology, pediatrics, and pharmacology were analyzed using available international and local sources. The review focused on the pharmacological properties of caffeine citrate, its mechanisms of action, and its clinical relevance in preterm infants with respiratory distress syndrome.

Results

Analysis of the reviewed literature indicates that caffeine citrate has a positive effect on respiratory function in preterm infants. By antagonizing adenosine

receptors in the central nervous system, caffeine stimulates the respiratory center, increases respiratory rate, and enhances tidal volume.

The reported benefits of caffeine citrate use include:

reduction in the frequency of apnea episodes;

decreased need for mechanical ventilation and respiratory support;

improvement in pulmonary function and lung maturation;

lower risk of developing bronchopulmonary dysplasia.

In addition, caffeine citrate demonstrates favorable pharmacokinetic properties, such as a long half-life and predictable dosing, which contribute to its widespread use in neonatal intensive care units.

Discussion

Immaturity of the respiratory control system plays a central role in the development of respiratory distress syndrome in preterm infants. Caffeine citrate addresses this issue by enhancing respiratory drive and improving neuromuscular transmission to the respiratory muscles.

Compared with other methylxanthines, caffeine citrate is associated with fewer adverse effects and better tolerability, particularly regarding cardiovascular and gastrointestinal systems. Literature data also suggest that early administration of caffeine citrate may contribute to improved short-term respiratory outcomes and better overall prognosis in preterm neonates.

Thus, caffeine citrate is considered an essential pharmacological agent in the management of respiratory disorders associated with prematurity.

Conclusion

Based on the analysis of available literature, caffeine citrate plays an important role in the management of preterm infants with respiratory distress syndrome. Its ability to stimulate the respiratory center, reduce apnea episodes, and decrease dependence on mechanical ventilation makes it a valuable therapeutic option in neonatal care.

The relative safety and effectiveness of caffeine citrate support its widespread use in neonatal intensive care practice. Further large-scale clinical studies are warranted to explore its long-term effects and optimize treatment strategies.

References

1. Martin RJ, Fanaroff AA, Walsh MC. Fanaroff and Martin's Neonatal-Perinatal Medicine. 11th ed. Philadelphia: Elsevier; 2020.

2. Eichenwald EC, Hansen AR, Martin CR, Stark AR. Cloherty and Stark's Manual of Neonatal Care. 8th ed. Philadelphia: Wolters Kluwer; 2017.
3. Schmidt B, Roberts RS, Davis P, et al. Caffeine therapy for apnea of prematurity. N Engl J Med. 2006;354(20):2112–2121.
4. Schmidt B, Anderson PJ, Doyle LW, et al. Survival without disability to age 5 years after neonatal caffeine therapy for apnea of prematurity. JAMA. 2012;307(3):275–282.
5. Henderson-Smart DJ, Steer PA. Caffeine versus theophylline for apnea in preterm infants. Cochrane Database Syst Rev. 2010;(1):CD000273.
6. Bancalari E, Jain D. Bronchopulmonary dysplasia: 50 years after the original description. Neonatology. 2019;115(4):384–391.
7. Erenberg A, Leff RD, Haack DG, et al. Caffeine citrate for the treatment of apnea of prematurity: A double-blind, placebo-controlled study. Pharmacotherapy. 2000;20(6):644–652.
8. Aranda JV, Turmen T. Methylxanthines in apnea of prematurity. Clin Perinatol. 1979;6(1):87–108.
9. Lodha A, Entz R, Synnes A, et al. Early caffeine administration and neurodevelopmental outcomes in preterm infants. Pediatrics. 2019;143(1):e20181348.
10. Doyle LW, Schmidt B, Anderson PJ, et al. Reduction in bronchopulmonary dysplasia with early caffeine therapy in very preterm infants. Arch Dis Child Fetal Neonatal Ed. 2017;102(3):F244–F249.
11. Schmidt B. Caffeine therapy in preterm infants: Evidence-based outcomes. J Perinatol. 2014;34(1):S14–S18.
12. Sweet DG, Carnielli V, Greisen G, et al. European consensus guidelines on the management of respiratory distress syndrome – 2019 update. Neonatology. 2019;115(4):432–450.
13. Poets CF, Roberts RS, Schmidt B, et al. Association between caffeine therapy and mortality in very preterm infants. Pediatr Res. 2015;77(5):684–690.

14. McPherson C, Neil JJ, Tjoeng TH, Pineda RG. A pilot randomized trial of high-dose caffeine therapy in preterm infants. Pediatr Res. 2015;78(2):198–204.
15. Aranda JV, Beharry K, Valencia GB, Natarajan G, Davis J. Caffeine impact on neonatal morbidity and mortality. J Matern Fetal Neonatal Med. 2010;23(Suppl 3):20–23.