The Impact of Cesarean on the Fetus

Subjects: Pediatrics

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Birth is a physiological act that is part of the morpho-functional economy of the maternal body. Each stage in the act of birth has a predetermined pathway that is neurohormonally induced and morpho-functionally established through specific and characteristic adaptations. Cesarean section performed at the request of the mother with no medical underlying conditions besides the prolonged hospitalization risk can also cause breathing problems in children, delayed breastfeeding, and possible complications in a future pregnancy.

newborns cesarean section abnormalities in adaption

1. Introduction

When we talk about vaginal birth or cesarean birth, we have in mind childbirth, that is, the process by which the product of conception-the newborn-separates from the maternal environment and begins its life under completely new conditions. Physiologically, this passage is gradual and phased, equally including maternal participation and fetal adaptation in an absolutely physiological manner that characterizes labor for the human species [1][2]. The World Health Organization (WHO) defined normal birth as "spontaneous in onset, low-risk at the start of labor and remaining so throughout labor and delivery. The infant is born spontaneously in the vertex position between 37 and 42 completed weeks of pregnancy. After birth, mother and infant are in good condition" [3]. As for vaginal birth, it includes spontaneous vaginal delivery without labor-inducing drugs, induced vaginal delivery using drug, or other techniques to induce labor and assisted vaginal delivery that uses a specific instrument such as forceps or a vacuum device to extract the newborn. Both natural and induced vaginal delivery can be assisted. The term "natural childbirth" is used to describe a vaginal delivery without medication for pain or to start or speed up labor [4][5]. We try to summarize the impact that cesarean section have on the newborn regarding his/her attempt to adapt to extrauterine life.

2. Impact of Cesarean on the Fetus

The absence of positive stimuli determined by the mother-child relationship that is delayed in cesarean delivery would negatively influence the child's adaptation, especially because nutrition is delayed by the absence of lactation or the impossibility to practice it during the first 24 h [1][2][6]. The forced expulsion of the fetus causes sudden decompression of the head as well as possible intracranial hemorrhage \mathbb{Z} . However, many speculations are based on this adaptation to the extrauterine life of a cesarean-born baby, such as thermoregulation, hormonal activity, the enzyme behavior of the new-born baby, the reaction to the environment, and immune response.

However, these adaptations are characteristic of the neonatal period and childhood; they occur over time, and their maturation follows a route that does not depend on the type of birth; the digestive adaptation is accomplished in the first year and immunological maturity at 10 years, not to mention the morpho-functional maturity, which is complete in adolescence.

Regarding the pediatric consequences of cesarean section, several studies concluded that cesarean section is a risk factor for respiratory tract infections, asthma, obesity, and neurological disorders in children ^[8]. Current studies consider early alteration of the human microbiome to play an important role in the onset and progression of several diseases by modulating important metabolic and immunomodulatory processes ^{[9][10]}. Depending on the delivery mode, quantitative and qualitative differences have been found in newborns' intestinal microflora ^[8]. Infants born through the birth canal share their mothers' vaginal and fecal flora, while those delivered through cesarean section have a microbiota similar to their mothers' skin and to the surrounding environment ^[10].

During the last years, the relationship between cesarean section and childhood asthma has been a subject of debate, with contradictory opinions available in the literature. Darabi et al., in their systematic review and metaanalysis, concluded that cesarean section, whether elective or performed for emergency reasons, increased the risk of childhood asthma ^[11]. The lack of contact with maternal vaginal microbiota, which is necessary for the growth and development of the newborn's immune system and the completion of pregnancy without perinatal stress hormone responsible for lung maturation, both increased the risk of difficulties in extrauterine life adaptation and long-term negative effects on lung function ^[12]. Cesarean birth influences the risk of asthma partially by gut microbial colonization and perturbed immune responses reflected by dysregulations in bile acid and tryptophan metabolism during early life ^[13]. In their study on cesarean section without medical indication and the risk of childhood allergic disorder, Chu et al. reported that the risk of childhood asthma might be attenuated by breastfeeding although further research is required ^[14].

Lavin et al. compared the risk of obesity in childhood of children born through cesarean section (elective and performed in emergency) and children born through vaginal birth. Their findings suggested that there might be an association between cesarean section and childhood overweight ^[15]. Concerning the risk of childhood obesity following cesarean delivery, Zhang et al. recently realized the first systematic review and meta-analysis focused on the association between elective cesarean and children's weight development as long-term outcome. Their study concluded that children delivered through cesarean section present an increased risk of obesity from infancy to adolescence ^[16]. Obesity and insulin resistance may come as a result of the chronic inflammation produced by an altered intestinal microbiota and its metabolites ^[17].

Cesarean section is thought to have a negative effect on early brain development. Zhang et al. conducted a systematic review and meta-analysis to evaluate neurodevelopment and psychiatric pathologies in children delivered via cesarean section compared to those born through vaginal birth. They concluded that cesarean section was associated with an increased risk of several disorders. Autism spectrum disorder (ASD) and attention deficit/hyperactivity disorder (ADHD) were most statistically significant ^[18]. Similarly, Zhang et al. reported that children born via planned or intrapartum cesarean section experienced an increased risk of neurodevelopmental

disorders such as ADHD and intellectual disability compared to children born through vaginal delivery. These findings were mainly explained by familial factors ^[19]. According to Blazkova et al., the mode of delivery seems to have a significant influence in psychological cognitive tests applied on 5-year-old children, with cesarean-born children obtaining notably lower scores than vaginally born children ^[20]. Regarding the IQ score of children delivered by cesarean section and those delivered vaginally through the birth canal, Khadem et al. observed no significant difference in IQ scores of children born vaginally with respect to those delivered by cesarean section ^[21]. It is thought that a normal human microbiome is essential for central nervous system development and emotional regulation. Any imbalance of the normal intestinal microbiota, such as the one resulting in the newborn's microbiota after cesarean section delivery, affects the central nervous system under the action of the microbe–gut–brain axis through nerve, immune, endocrine, and metabolic pathways, increasing the risk of neuropsychiatric disorders ^[22]. However, the association between cesarean section and behavioral pathology needs additional evidence, and it is a direction of future research.

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