Late-preterm birth – neonatologist's point of view. Part 2: Neurological problems

PAWEŁ KRAJEWSKI[1,3], ANITA CHUDZIK[1], JAROSŁAW KALINKA[2,3], MICHAŁ SKOCZYLAS[2], MAŁGORZATA POKRZYWNICKA[1]

Abstract

In the group of late-preterm newborns some long-term developing complications are observed. This population is three times more likely to have cerebral palsy and/or mental retardation than population of term neonates. The risk of Sudden Infant Death Syndrome (SIDS) is twice higher in late-preterm newborns than in term ones. The late-preterm newborns are at higher risk of the emotional problems, neurosensory impairments and hyperactivity/inattention problems such Attention Deficit Hyperactivity Disorder (ADHD). These babies need more time for the sustained attention task, they have slightly lower IQ. All of above can result in moderate-to-severe deficits in school achievement. In conclusion it is very important for future to decrease the rates of preterm delivery and to enhance maturity of late-preterm newborns. Multidisciplinary cooperation and long-term follow-up are needed for helping late-preterm newborns to reach the best future results.

Key words: prematurity, late-preterm infants, outcome, neurodevelopmental outcome

The newborns born between $34^{0/7}$-$36^{6/7}$ weeks' gestation (between 239-259 days' gestation) – named "late-preterm" neonates – are not functionally mature and they are not only at higher risk of morbidity and mortality, prolonged hospitalization but also at neurodevelopmental disability than term ones.

The brain of late-preterm newborns is less matured than in term ones. According to Darnalla et al. because of immaturity of respiratory centers in the brain stem about 10% of late-preterm newborns suffer from apnea and many complications connected with coordination breathing and swallowing [1]. They are at twice higher risk of sudden infant death syndrome (SIDS) than term neonates [2]. Some studies suggest that in 35 weeks' gestation the late-preterm neonates have decreased volume of neuronal structures and their brain mass is approximately 60% of term newborns' brain mass. The last part of fetal life, from $34^{0/7}$-$36^{6/7}$ postconceptional weeks, is an intensive period of gyrification, formation of cerebral convolutions, axonal growth and synaptogenesis [2-4] (Fig. 1).

Because of the intensity of cerebral development during the late fetal phase the risk of injury of brain is high. The risk of intraventricular hemorrhage in late-preterm newborn is lower than in very low birth weight infants (VLBW) but higher than in term newborns [3].

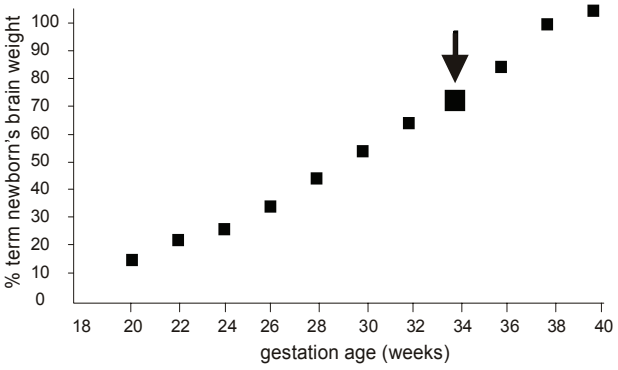

Fig. 1. Fetus brain weigh depending on gestation age [3]

Those of late-preterm newborns with perinatal ultrasonographic evidence of intraventricular hemorrhage of grade I or II who are free of developmental impairments at one year of age, can be at higher risk for motor delay, coordination complications and neurosensory impairments during later developmental periods [3]. Periventricular leukomalacia is responsible for neurodevelopmental disability. Late-preterm newborns rather rarely suffer from periventricular leukomalacia [6]. The white-matter abnormalities are the more common in late-preterm newborns than in term neonates. The presence of white-matter abnormalities is very sensitive in identifying infants who are at risk of neurodevelopmental impairments in future. In the newborns born after 34 weeks'

[1] Division of Neonatology, Department of Perinatology, I Chair of Obstetrics and Gynecology, Medical University of Łódź, Poland

[2] Medical and Environmental Pregnancy Health Hazards Unit, Department of Perinatology, I Chair of Obstetrics and Gynecology, Medical University of Łódź, Poland

[3] Members of PREBIC (Preterm Birth International Collaborative), USA

gestation the cortical and subcortical white-matter injury are the most likely [2, 3, 8, 11, 12]. Severe abnormal findings in the transfontanellar ultrasound examinations in neonatal period strongly predict a disturbed neurodevelopmental outcomes at two years of age. But light-to-moderate abnormal findings in the transfontanellar ultrasound examinations in neonatal period can constitute one of the reasons of the neurodevelopmental disability at five or seven years of age [6].

It is very important that not only the grade of prematurity but also neonatal and maternal medical conditions can influence the newborns' brain development and contribute to long-term developmental complications [7]. Melamed et al. found that intracranial hemorrhage, neonatal seizure, necrotizing enterocolitis, hyperbilirubinemia and blood transfusion increased the risk of long-term impairments in developing of late-preterm newborns [8].

Table1. Comparison of frequency of different methods of therapy in late-preterm newborns and preterm newborns born before 32 weeks' gestation at 12 months of age [7]

	Late-preterm newborns	Newborns < 32 weeks' gestation
Any interventions – early and/or sudden	30%	70%
Physical therapy	28%	66%
Occupational therapy	16%	32%
Speech-language therapy	10%	32%
Special education	6%	21%

Because of functional immaturity the late-preterm newborns are at higher risk of prolonged jaundice and its destructive effects on central nervous system [2, 9, 10]. In this group of newborns the immaturity of the blood-brain barrier, infections and hypoxia are the additional factors which can damage the endothelium and increase the risk of kernicterus. In late-preterm newborns the jaundice can be prolonged to 4-6-12 weeks after delivery and this is the reason why these babies should not be discharged from hospital with bilirubin level exceeding 15 mg/dl [6].

Many researches assessed the psychomotor development of the late-preterm newborns and some impairments such mental development complications and learning complications are observed in this group. Gray et al. suggest that at 8th years of age newborns born between 34$^{0/7}$ and 36$^{6/7}$ weeks' gestation had about 20% statistically significant higher risk of mental development complications than term neonates [2]. The neurodevelopmental assessment of late-preterm newborns should be always conducted according to corrected gestational age of prematurity. The preterm newborns need a methodical follow-up and balanced interpretation of neurodevelopmental examination. [4]. There are many difficulties in prediction of the neurodevelopment of every late-preterm newborn because the children with similar birth weigth, gestation age and neonatal period complications can develop in different way [2]. We should also remember that the more neonatal period complications the higher risk of neurodevelopmental impairments.

Petrini et al. reported that newborns born between 34$^{0/7}$ and 36$^{6/7}$ weeks' gestation three times more likely suffer from cerebral palsy and global developmental delay [14, 15]. This data suggest that there is a correlation between grade of prematurity and late developmental consequences; the more immature newborn the higher risk of the complications. The need for rationalization for elective deliveries is highlighted thus balancing between the risk of pregnancy prolongation and the risk of developmental delay in newborns born between 34$^{0/7}$ and 36$^{6/7}$ weeks' gestation [14].

Concluding the late-preterm newborns are at higher risk of the emotional problems, neurosensory impairments and hyperactivity/inattention problems such Attention Deficit Hyperactivity Disorder (ADHD). These babies need more time for the sustained attention task, they have slightly lower IQ and all of above can be the reasons of moderate-to-severe deficits in school achievement. Identification of these problems at younger age is needed to conduct prevention purposes to achieve the best long-term results. Cooperation among parents, pediatricians, neurologists, psychologists, therapists and speech therapists is important for helping newborns to reach the best future results [3, 13, 16, 17]. According to Figure 1 very preterm newborns need more attentions and special care than late-preterm newborns (Fig. 1).

Despite the more detailed medical knowledge and improved medical techniques the late-preterm newborns are at three-fold higher risk for developing psychomotor delay, other neurodeveloping complications or cerebral palsy than term infants. Greater awareness of consequences of late-prematurity, better mothers and newborns health care, working out the perinatal care standards for pregnant women, caution in approach to elective delivery of late-preterm newborns and promotion of three-degree perinatal health care system are needed to decrease the negative long-term consequences for babies delivered between 34$^{0/7}$-36$^{6/7}$ postconceptional weeks.

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P. Krajewski
Division of Neonatology, Department of Perinatology
I Chair of Obstetrics and Gynecology
Medical University of Łódź
37 Wileńska, 94-016 Łódź, Poland
e-mail: pawel.krajewski@umed.lodz.pl