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Research Article

The Impact of Elective Cesarean Section on Neonatal Morbidity

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Abstract

A significant number of infants each year are delivered, worldwide, by caesarean section (CS), before the onset of spontaneous labor. Although complications such as birth asphyxia, meconium aspiration, and hypoxic ischemic encephalopathy are reduced, a significant number of these infants develop respiratory distress and may require invasive treatments, such as mechanical ventilation, surfactant administration, inhaled nitric oxide therapy, and ECMO. In the present study, the most common cause of CS was the previous CS (37.36%) in pregnancies with gestational age (GA), 35^{+1} - 39^{+0} weeks (p = 0.001). An absolute medical indication for CS was recorded in 14 pregnancies (29.16%) with GA ≤ 35^{+0} weeks (p = 0.034). Elective CS before the onset of labor was performed in 115 (60.52%) pregnancies with GA 35^{+1} - 39^{+0} weeks (p = 0.001). Although, preterm infants with GA ≤ 35^{+0} weeks present with the highest rates of respiratory distress (39,56%), equally high percentages of respiratory distress are also recorded in the other gestational age groups (16 - 18%). There is an urgent need for interventions to prevent complications and optimize the outcome of this vulnerable population. Elective CS after 39 weeks of pregnancy seems to reduce the risk of respiratory distress and other complications immediately after birth.

Keywords: *Cesarean Section; Elective; Morbidity; Outcome*

Introduction

In recent years there has been a steady increase in the rate of caesarean section (CS) in Greece and worldwide. In fact, over the years, a number of research studies around the world have seen diversity in the epidemiological profile of women who give birth by CS. A typical example is the group of Elderly primigravida, which has been reported as the most frequent population group with a particularly worrisome increase in the percentage of CSs [1,2].

However, according to publications in medical literature, there are various other reasons, as social, economic and cultural, that play an important role in increasing the number of CSs. Mother's own desire to perform a CS, even without the existence of a specific medical indication, seems to be of particular importance [3-5]. The need of rules and clear clinical guidelines, for birth by CS, is mandatory because of this change in attitude towards CS.

In many countries, local scientific communities have published such guidelines [6-8], which state that the decision for CS, should aim to protect the mother and the newborn, from the possible complications of a normal delivery [8]. According to the latest guidelines elective CS should be limited to pregnancies with a gestational age (GA) of 39^{+0} weeks [9]. However, in clinical practice, elective CS is also performed at younger gestation ages, increasing perinatal morbidity and mortality, as demonstrated by the results of various research

studies. The fact that infants born with CS are more likely to develop respiratory distress, compared to those born with normal delivery, is the final conclusion, of a large multicenter study of 1271549 births. In many studies, such as hours, the main conclusion is that neonates born with elective CS have almost four times more chance to develop respiratory distress [1-9].

A possible explanation for the respiratory distress that has been observed, can be the absence of all these hormonal and physical changes, which contribute to the preparation for normal lung development and occur during the process natural birth [10]. Accordingly, a recent study in England reported that women, who choose to give birth by CS, are four times more likely to die during childbirth while their newborns are more likely to suffer from respiratory distress. The group of investigators examined 620604 births, isolating the influence of factors such as maternal age, maternal body weight, smoking, and alcohol intake during pregnancy, so that the results will be more significant. In this same study, the risk of respiratory distress increased, as the GA at which CS was performed decreased. The risk of respiratory distress was increased by four times at 37 w of gestation, by three times at 38 w, while at 39 w it was twice as high [11].

Researchers estimate that significantly less newborns will develop respiratory illness, if selective CS is postponed up until the 39th w of gestation. They suggest that hormonal and other changes associated with the vaginal birth's mechanism, are most likely important for the maturation of the lungs in newborns, and that these changes may not occur in newborns born by CS. In England, obstetricians strictly recommend not to perform elective CS before 39 w of GA. However, many women do not know that an elective CS can adversely affect their infant.

Objectives of the Study

The purpose of this study was to investigate the possible complications of infants born by CS according to the GA, at which CS was performed.

Patients and Method

Infants born by CS and hospitalized at the Neonatal Intensive Care Unit (NICU) of Maternal Hospital Elena's Venizelou in Athens, from 1 July to 31 December 2015 were included In the study. The demographic and clinical characteristics related to the perinatal period and the hospitalization of all newborns, were recorded.

Statistical analysis

The birth weight of the infants included in the study was expressed as mean ± standard deviation because it followed a normal distribution. Normal distribution of continuous variables was assessedwith Kolmogorov Smirnov test. Comparison of birth weight between two groups of patients was done with the t-test, while for the comparison of more groups, the one-way ANOVA method of variance was used. The categorical variables were expressed as absolute frequencies and compared with the Pearson's chi-square test.

Results

During the study period, we had 2367 births, of which 1565 births (66.1%) were delivered by CS and 802 births (33.9%) by normal delivery. A total number of 260 newborn babies were hospitalized and treated in NICU, while the majority of these newborns (42.7%), were born at the GA of 37^{+1} - 39^{+0} w.

As far as the causes of CS were concerned, the most frequent cause was previous CS especially for deliveries with gestational age 35^{+1} - 39^{+0}w, (71/190, 37.36%) (p = 0.001), whereas for deliveries with gestational age above 39^{+0} weeks, the percentage was only 9%. Absolute indication for CS (bleeding, placenta previa, infection, abnormal NST, pre-eclapsia) was recorded in 41 cases (41/260, 15.76%), while the highest percentage was mainly recorded in pregnancies < 35^{+0} w (p = 0.034). An elective CS before the onset of labor was performed in 143/260 cases (55%) and was mainly related to pregnancies with age 35^{+1} - 39^{+0} weeks, 115/190, 60.52% (p = 0.001) (Table 1).

	GA >39^{+1} w	GA: 37^{+1} - 39^{+0} w	GA: 35^{+1} - 37^{+0} w	GA ≤ 35^{+0} w	p-value
N (number)	22	111	79	48	
Birth weight (g)	3756 ± 363	3111 ± 402	2786 ± 450	2002 ± 492	< 0.001
Gender (M/F)	6 (75%)/2 (25%)	18 (53%)/16 (47%)	17 (55%)/14 (45%)	3 (21%)/11 (79%)	0.073
Previous CS	2 (9.09%)	40 (36.04%)	31 (39.24%)	7 (14.58%)	0.001
Absolute indication CS	4 (18.18%)	14 (12.61%)	9 (11.39%)	14 (29.16%)	0.034
Elective CS	5 (22.72%)	61 (54.95%)	54 (68.35%)	23 (47.91%)	0.001
Respiratory Distress	4 (18.18%)	20 (18%)	13 (16.45%)	19 (39.56%)	0.069
Antibiotics	7 (31.82%)	34 (30.63%)	24 (30.38%)	25 (52.08%)	0.011
Parenteral Nutrition	10 (45.45%)	63 (56.76%)	43 (54.43%)	43 (89.58%)	< 0.001
Days of hospitalization (min-max)	6 (4-26)	7 (4-42)	8 (3-62)	21.5 (6-58)	< 0.001
Surfactant administration	0	7 (6.3%)	1 (1.2%)	10 (20.83%)	< 0.001

Table 1: *Demographic and clinical characteristics of the study population.*

Main Morbidity of newborns included in the study, was respiratory distress in 56 newborns (56/260, 21.5% of hospitalized infants). Although in the prematures < 35^{+0} w, the rate of respiratory distress was higher (39.56%), relatively high rates (16 - 18%) but not statistically significant (p = 0.069), were observed in the other groups.

The severity of respiratory distress was lower in the group of newborns >39^{+1} w of gestation but was not statistically significant compared to the other groups (p = 0.069). No newborn infant, with GA > 39^{+0} w, received surfactant, compared to 20.8% of premature infants with a GA of ≤ 35^{+0} w. The full term infants and late preterm infants received surfactant at 6.3% and 1.2% of cases, respectively (p < 0.001).

A significant number of hospitalized infants received antibiotics, which for full-term infants and late preterm newborns was almost the 30% of cases per group, while for premature infants was in 52% of cases (p = 0.011). Parenteral nutrition was administrated to infants with GA > 39^{+1}, 37^{+1} - 39^{+0} and 35^{+1} - 37^{+0} w, in 45.5%, 56.76%, 54.43% of cases respectively, while premature infants < 35 weeks GA were on parenteral nutrition in 89.58% of cases.

When there was an absolute indication for caesarean section, the differences in the incidence of respiratory distress, infection as well as the duration of hospitalization between the gestational age groups, were not statistically significant. Nonetheless, in the 35^{+1} - 37^{+0} gestational age group, without absolute indication for cesarean section, the duration of hospitalization was 11 days [7-12] versus the mean hospitalization of 7 days [5-8], that was found for this groups' infants with an absolute indication, and this difference was statistically significant (p = 0.008).

Prenatal corticosteroids were administered in 62 out of 259 patients (23.9%), while a statistically significant increase in the rate of corticosteroids administration was observed at earlier gestation ages (p < 0.001). In the cases that mothers (28/259) received two courses of prenatal corticosteroids, no statistically significant differences were found between gestational age groups, concerning the incidence of respiratory distress, the incidence of infection and the duration of hospitalization, except for the group of GA of 37^{+1} -39^{+0} w (p = 0.008).

Discussion

An increasing number of women choose to give birth by elective CS, without any acceptable medical evidence for it and it is believed that doctors don't oppose to their wish with certainty. This trend is most likely based on the general perception that CS is much safer as a medical intervention now than it used to be in the past and to the assumption that most studies that investigate the possible CS risks

may have systematic errors, because pregnant women with medical or obstetric problems are more likely to choose an elective CS to give birth. In addition, the incidence of an undesirable maternal or neonatal outcome may be due to the medical or obstetric problem, then to the CS as a medical intervention. The only way that a systematic error could be avoided, is to investigate possible complications of women who are randomly assigned to a scheduled CS or scheduled vaginal birth. In the present study, a particularly high percentage of planned CSs were observed in pregnancies with GA 35-39 w, which needs further investigation in a future study.

In Hannah's study, it is reported that in full-term babies, the risk of respiratory distress syndrome requiring oxygen therapy is higher in CS[12]. Mally., *et al.* [13] reported that newborns with GA: 37 0/7 - 37 6/7 weeks had higher chances to be born by elective CS (OR = 4.1, 95% CI = 2.0-8.5, P < 0.001), to be hospitalized in NICU (RR = 1.42, 95% CI = 1.07 - 1.88, P = 0.01), to have respiratory distress (OR = 5.7, 95% CI = 1.6-19.8, P < 0.01) and hypoglycemia (OR = 4.6, 95% CI = 2.0-10.4, P <0.001), compared to older gestational age groups [13]. On the other hand, Wang., *et al.* [14] conclude that in addition to very premature neonates, both full-term and late preterm infants born by CS develop neonatal respiratory distress syndrome [14].

In this study, newborns of different gestational age exhibited different clinical characteristics. They were affected by a variety of risk factors, but most likely CS increased the possibility of infants, especially in full-term and late preterm neonates, to develop respiratory distress. Terada., *et al.* [15] reported that the incidence of respiratory distress in neonates with gestational age ≤ 38^{+1} w and at 41 w, compared to full-term neonates (39 - 40 w GA), was significantly higher when they were born with CS [15].

The greatest challenge a newborn faces during delivery is the transition from a lung filled with fluid to the lung filled with air, in a very short period of time. Failure to drain the lung from fluid, which can often happen after birth by CS, is the cause of respiratory illness which can result in a critical condition in some neonates born by CS without previous labor.

It is clear that all normal changes, in the hormonal profile of the fetus and pregnant woman, which occur in the last weeks of pregnancy, are doubled with the onset of natural delivery, and as a result, they prepare the fetus for the transition to the extra uterine environment. The abrupt drainage of the lung from amniotic fluid is a crucial point for this transition.

Increased rates of CS in the USA and worldwide have a statistically significant impact on public health and medical cost because of the associated morbidity. While the incidence of perinatal asphyxia, trauma, and meconium aspiration decreases with elective CS, the risk of respiratory distress secondary to transient tachypnea, surfactant deficiency and pulmonary hypertension increases.

As mentioned above, delay to perform caesarean section at 39 w GA, seems to be the first reasonable solution to reduce prematurity and respiratory distress. The results showed that infants born after the 39^{th} w of gestation had a better prognosis in all the outcomes studied. The risk of respiratory distress and hospitalization in NICU were inversely related to GA.

In the present study, respiratory distress rates were higher in neonates < 35 w of gestation, but were equally high in late preterm and full term infants born by CS. However, the severity of respiratory distress, as assessed by surfactant administration, was recorded' higher' in preterm infants < 35 weeks gestational age, as expected. Recent studies confirm the above risk association, with a further observation that administration of prenatal corticosteroids reduce or prevent life-threatening complications, such as hyaloid membrane disease associated with prematurity. The recommended course is two doses of 12 mg of dexamethasone intramuscularly, every 12 hours or four doses of 6 mg every 4 hours. The effect of antenatal glucocorticosteroids on the newborns > 34 w of gestation has been questioned, however, a course of corticosteroids has been characterized as safe.

Conclusion

In conclusion, the final decision to perform a CS should be based only on medical indications. Our results show that infants born after the 39^{th} week of gestation had a better prognosis in all of outcomes studied.

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