Elektivni carski rezi po 39. tednu nosečnosti in njihov vpliv na neonatalno obolevnost: Ali stroga pravila resnično pomagajo?

Elective caesarean section after 39 weeks gestation and the influence on neonatal morbidity: Does a strict policy really help?

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Izvleček

Namen: *Z raziskavo želimo oceniti, koliko je strogo upoštevanje strokovnih priporočil, v skladu s katerimi se elektivni carski rez zaradi zniževanja stopnje dihalnih težav pri terminskih novorojenčkih opravlja po 39. tednu nosečnosti, vplivalo na odstotek posegov pred 39. tednom nosečnosti in stopnjo dihalnih težav pri novorojenčkih.*
Metode: *Analizirali smo podatke nosečnic z elektivnim carskim rezom v terminu (po 37. tednu nosečnosti) v obdobju od 1. januarja 2007 do 31. decembra 2016. Skupino smo razdelili na dve podskupini ("Pred" in "Po" ukrepu). Primerjali smo stopnjo elektivnih carskih rezov pred 39. tednom nosečnosti, stopnjo neonatalnih dihalnih težav in sprejemov novorojenčkov v neonatalno intenzivno enoto.*
Rezultati: *1.881 elektivnih carskih rezov je bilo narejenih po 37. tednu nosečnosti (1.083 (57,6%) v podskupini "Pred" in 798 (42,4%) v podsku-*

Abstract

Purpose: *The aim of the current study was to determine if the decision to strictly follow clinical guidelines recommending elective caesarean section at or after 39 weeks gestation (late–term) in an effort to reduce respiratory disorders in term neonates influence the incidence of early–term elective caesarean sections and the rate of neonatal respiratory disorders.*
Methods: *Hospital records pertaining to elective caesarean section after 37 weeks gestation from 1 January 2007 to 31 December 2016 were analyzed. Two subgroups were established ("before" and "after"). The rate of elective caesarean section before 39 weeks gestation, the rate of neonatal respiratory disorders, and admissions to the neonatal intensive care unit were compared between the subgroups.*
Results: *A total of 1881 elective caesarean sections were performed from 37 weeks gestation (1.083 [57.6%]*

pini "Po"). V "Po" skupini je bilo za 9,8% manj posegov pred 39. tednu nosečnosti (p < 0,0001). 30 novorojenčkov je imelo različne dihalne težave (3 so imeli respiratorni distresni sindrom). 22 (2,3%) in 8 (1,00%) novorojenčkov z dihalnimi težavami je bilo v "Pred" in "Po" podskupini (1,3% razlika; p = 0,08). 6 od 30 (20,0%) novorojenčkov je bilo premeščenih na neonatalno intezivno enoto (4 od 22 (18,2%) v "Pred" in 2 od 8 (25,0%) v "Po" podskupini).

Zaključek: *Ukrep je znižal stopnjo elektivnih carskih rezov pred 39. tednom nosečnosti. Videti je, da ukrep znižuje tudi stopnjo neonatalnih dihalnih težav, čeprav je njihova stopnja v naši ustanovi bila nizka že pred ukrepom.*

in the before sub–group and 798 [42.4%] in the after sub–group). In the after sub–group there was a 9.8% reduction of procedures performed before 39 weeks gestation. Of the newborns, 1.59% had various respiratory problems (2.3% and 1.00% in the before and after sub–groups, respectively; p = 0.08). Six of 30 (20.0%) newborns were transferred to the neonatal intensive unit (4/22 [18.2%] and 2/8 [25.0%] in the before and after sub–groups, respectively).

Conclusion: *The policy reduced the rate of elective caesarean sections before 39 weeks gestation and the rate of neonatal respiratory disorders, even though the incidence of these disorders was rather low, even before the new policy.*

INTRODUCTION

After 38 completed weeks of pregnancy, elective caesarean sections are generally associated with a lower incidence of immediate respiratory problems in term newborns (1). Kadour et al. reported that neonates born by elective caesarean section at 38 weeks gestation had a nearly 3–fold higher rate of neonatal respiratory morbidity then neonates born at 39 weeks gestation (5.8% vs. 2.1%) (2).

For this reason, recommendations for performing an elective caesarean section after 38 completed weeks of pregnancy have been integrated into the guidelines of the most respectable societies that are followed not only in the countries of origin where the societies operate, but also worldwide (3). With such a clear cut–off for timing of delivery in cases of elective operative delivery and noticeable advantages for the newborn, one would expect that implementation of such a simple policy would be easy and not resisted. Medicolegal issues could be additional arguments for fast implementation of these recommendations because early–term elective caesarean section could be viewed as a form of malpractice that causes otherwise avoidable neonatal respiratory disorders (4, 5).

In everyday clinical work, however, there are some important factors that influence the decision of physicians to perform elective caesarean sections earlier then recommended. These factors include impatience of the pregnant woman, distance of the mother from the hospital, non–reassuring cardiotocography, suspected pathology, and prevention of pregnancy complications (6). For these reasons it is in the direct interest of the hospital to introduce audits for the timing of elective caesarean sections in uncomplicated pregnancies and quickly evaluate the reasons responsible for early–term caesarean sections (before 39 weeks gestation).

Recently, several authors have opposed the idea that earlier elective caesarean sections are associated with increased neonatal morbidity and have emphasized the disadvantages of late–term elective caesarean sections, such as the high number of urgent caesarean sections in sub–optimal conditions (night time or weekends), and narrower time window for planned procedures, causing high–stress situations (7–9). Late–term elective caesarean sections can also create a high level of dissatisfaction for pregnant women (10).

In our hospital we introduced a policy in accordance with the guidelines that elective caesarean sections in uncomplicated pregnancies should be performed at or after 39 weeks gestation; previously, less strict rules were followed. We wanted to know if this new approach improved the health status of neonates born via elective caesarean section. We conducted a retrospective cohort analysis of pregnant women who had elective caesarean sections to determine the influence of this policy on the incidence of respiratory problems in newborns.

MATERIAL AND METHODS

The policy of strict timing of elective caesarean sections was formally introduced on 10 October 2012. After this date, all elective caesarean sections considered before 39 + 0/7 weeks of pregnancy needed approval from the team of specialists in the Department of Perinatology at the University Medical Centre Maribor before admission. This policy has been followed to the present day. The most frequent indications for earlier procedures were twins with malpresentations, placenta previa, women with various reasons for caesarean section in the present pregnancy, such as fetal malpresentation and previous caesarean section, who had an unexplained fetal demise in a previous pregnancy (especially in the third trimester) and were very anxious and eager to deliver as soon as medically acceptable to prevent the re–occurrence of the previous tragic event, and any other reasons specific for the individual patient. Based on the hospital database, the data of pregnant women who had elective caesarean sections from 1 January 2007 until 31 December 2016 were extracted. The term "elective" describes all procedures that were planned for some specific date or hour after the decision to deliver. In contrast, "urgent" caesarean sections were those procedures that were performed immediately after the decision to deliver without further delay. In accordance with this definition, elective caesarean sections were also operative procedures before 37 weeks gestation when both indications for caesarean section and indications for earlier delivery, such as fetal growth restriction or oligohydramnios, were present. All cases before 37 weeks gestation were excluded from the analysis. The study population was further divided into the two sub–groups: before the policy (before group) and after the policy (after group). The cut–off date was 10 October 2012.

Between these two sub–groups, the differences in maternal characteristics, rate of earlier elective procedures, neonatal weight, Apgar scores, number of neonates with respiratory problems after the caesarean section, and frequency and duration of admission to the neonatal intensive care unit were analyzed. The MKB–10 codes used to identify neonates with respiratory morbidity were P220 (respiratory distress syndrome of the newborn), P221 (transient tachypnea of the newborn), P228 (other respiratory distress of the newborn), P229 (respiratory distress of the newborn, unspecified), P284 (other apnea of the newborn), P285 (respiratory failure of the newborn), P2883 (other specified respiratory condition of the newborn), and P289 (respiratory condition of the newborn, unspecified).

This was a retrospective analysis of routine clinical practice, thus ethical approval for this study was not required.

For a statistical comparison of the two groups, a t–test was used for continuous variables and a chi–square test was sued for categorical variables. A p value < 0.05 was considered statistically significant. The computer program, Excel (Microsoft, Seattle, WA, USA), was used.

RESULTS

In our Department, there were 22,083 deliveries from 1 January 2006 to 31 December 2016. During this period, elective caesarean sections were performed in 2094 (9.4%) cases, 1881 (8.5%) of which were performed at > 37 weeks gestation. The "before" and "after" sub–groups included 1083 (57.6%) and 798 (42.4 %) cases with 477 (44.0%) and 273 (34.2%) elective caesarean sections before 39 weeks gestation, respectively (Table 1). This 9.8% difference was statistically significant (chi square = 18.53, $p < 0.0001$).

In both groups, pregnant women were similar with respect to height and rate of twin gestations. In the "after" sub–group, women were slightly older ($p < 0.05$) and thinner ($p < 0.05$) with fewer admissions to the hospital ($p < 0.05$; Table 2).

The average weight of the newborns was 3285 g (SD = 941 g) with no difference between the sub–groups. There were 5.1% more girls in the "after" sub–group ($p = 0.03$). The Apgar score in the 1st min < 7 ($p = 0.04$) was less frequent in the "after" sub–group. In this group, the Apgar scores in the 5th min were > 7 in all newborns. There was no difference in the rates of transfer to the neonatal intensive care unit (Table 3).

The cohort of 1881 cases had 30 newborns with respiratory conditions. Respiratory distress syndrome (RDS) was present in 3 newborns and the majority

Table 1. *Rate of elective caesarean sections before and after 39 0/7 weeks of pregnancy for "Before" and "After" group – before and after new policy (N – number of cases, % – percentage of cases, p – p value).*

Weeks of gestation	Before N (%)	After N (%)	All N (%)	
Before 39 0/7	**477 (44.0)**	**273 (34.2)**	**750 (39.9)**	9.8% difference p < 0.0001
37 weeks	100 (9.2)	103 (12.9)	203 (10.8)	
38 weeks	377 (34.8)	170 (21.3)	547 (29.1)	
After (included) 30 0/7	**606 (56.0)**	**525 (65.8)**	**1131 (60.1)**	
39 weeks	477 (44.0)	480 (60.2)	957 (50.9)	
40 weeks	104 (9.6)	28 (3.5)	132 (7.0)	
41 weeks	23 (2.1)	13 (1.6)	36 (1.9)	
42 weeks	2 (0.2)	4 (0.5)	6 (0.3)	
Total	**1.083 (100,0)**	**798 (100.0)**	**1.881 (100.0)**	

had transient tachypnea. There were 22 (2.3%) newborns with respiratory conditions in the "before" sub–group, and 8 (1.00%) newborns in the "after" sub–group. The 1.3% difference was close to statistical significance (p = 0.08; Table 4).

The number of respiratory disorders was less frequent (8 vs. 22 cases) in the "after" sub–group, but with an almost equal distribution according to the gestational age at which caesarean section was performed (before and after 39 weeks gestation). Of 30 newborns with neonatal respiratory disorders, 6 (20.0%) were transferred to the neonatal intensive unit (4/22 [18.2%] and 2/8 [25.0%] in the "before" sub–group and the "after" sub–group, respectively; Table 5).

DISCUSSION

Our analysis of the 10–year period with 1881 elective caesarean sections after 37 weeks gestation showed that the rate of respiratory problems in neonates in our Department was rather low (1.59%) in comparison to other studies (2). Terada et al. who reviewed a similar number of cases in a 9–year period, reported

Table 2. *Maternal characteristics of pregnant women having elective caesarean section for "Before" and "After" group – before and after new policy (N – number of cases, SD – standard deviation, % – percentage of cases, p – p value).*

Characteristics	Before (N = 1.083) N (%)	After (N = 798) N (%)	All (N = 1.881) N (%)	
Average maternal age (SD) (years)	31.3 (4.8)	32.1 (4.5)	31.6 (4.7)	p = 0.000123
Average height (SD) (cm)	166.0 (6.2)	166.3 (6.1)	166.1 (6.1)	p = 0.28
Average weight (kg)	82.7 (15.2)	81.1 (14.8)	82.0 (15.0)	p = 0.024
Admission to the hospital during pregnancy				
No	723 (66.8)	633 (79.3)	1356 (72.1)	p < 0.001
Yes	360 (33,2)	165 (20,7)	525 (27,9)	
Number of deliveries				
Nulliparous	455 (42.0)	307 (38.5)	762 (40.5)	p = 0.12
Multiparous	628 (58.0)	491 (61.5)	1119 (59.5)	
Number of babies				
Single	991 (91.5)	728 (91.2)	1719 (91.4)	p = 0.84
Twins	92 (8.5)	70 (8.8)	162 (8.6)	
Twins bichorionic	84 (7.8)	64 (8.0)	148 (7.9)	
Twins monochorionic biamniotic	8 (0.7)	6 (0.8)	14 (0.7)	

Table 3. *Neonatal characteristics of pregnant women having elective caesarean section for "Before" and "After" group – before and after new policy (N – number of cases, SD – standard deviation, % – percentage of cases, p – p value).*

	Before (N = 1.083)	After (N = 798)	All (N = 1.881)	
Average weight (SD)	3269 (487)	3306 (496)	3285 (941)	p = 0.11
Gender N (%)				
Boy	560 (51.7)	372 (46.6)	932 (49.5)	p = 0.03
Girl	523 (48.3)	426 (53.4)	949 (50.5)	
Apgar 1 minute N (%)				
Less then 7	83 (7.7)	42 (5.3)	125 (6.6)	p = 0.04
Equal or more then 7	1000 (92.3)	756 (94.7)	1881 (93.4)	
Apgar 5 minute N (%)				
Less then 7	3 (0.3)	0 (0.0)	3 (0.2)	
Equal or more then 7	1080 (99.7)	798 (100.0)	1878 (99.8)	
Trasfer to neonatal intesive care N (%)	8 (0.74)	6 (0.75)	14 (0.74)	p = 0.8
Less or equal 7 days	3	4	7	
More then 7 days	5	2	7	

the rate of respiratory disorders requiring oxygen supplementation to be 7% (11).

Even in the period when strict policy for timing of elective caesarean sections was non–existent. the rate was just 2.03% and decreased thereafter (1.00%). These rates included all respiratory disorders combined, while in other studies similar rates were just for RDS alone with a 2–3–fold higher incidence of transient tachypnea (12).

Furthermore, during both evaluated periods, neonatal respiratory disorders occurred evenly before and after 39 weeks gestation (59.1% and 50.0 % for the "before" and "after" sub–groups, respectively), which increased the discrepancies with data in the literature (13). The reasons for such a low incidence of neonatal respiratory problems are very difficult to explain. Underreporting could be one reason, but in our opinion, this scenario was rather unlikely. In Slovenia, every physician working at in a perinatology unit is obliged by law to fulfil the forms for each delivery and each baby and these data are then sent to the perinatal national registry. Because of this regulation, there is a negligible risk that respiratory problems of neonates are overlooked. This is especially valid for neonates transported to the neonatal intensive care unit.

In our cohort, only 0.74% of neonates were transferred to a neonatal intensive care unit, and this rate was similar in both groups. The incidence of neonate transfer was much lower than reported in another study [3.7%] (14). In the current study, a significant percentage (20.0%) of neonates with respiratory problems were transferred to a neonatal intensive care unit, with higher rates in the "after" sub–group (18.2% vs. 25.0%). This finding is consistent with data in the literature (15).

With such a small number of neonatal respiratory disorders in our cohort, it is difficult to argue that prophylactic administration of corticosteroids before early–term elective section is reasonable, as some authors suggest (16). Because corticosteroids target respiratory distress syndrome, which was in rather rare in our cohort, the use of corticosteroids is even more questionable.

There was a trend toward a reduction in the incidence of neonatal respiratory disorders (2.03% vs. 1.00%; p = 0.08) that was of borderline statistical significance. The introduction of policy for elective caesarean section after 39 weeks gestation could be responsible for this change; however, even with such a strict policy there was a relatively modest reduction in the rate of early–term elective caesarean section before 39 weeks gestation (9.8% difference; $p < 0.05$). These results show that even with a strict formal policy, there will always be exceptions to the rule. In our population after 2012, this exception existed in 32.2% of the cases.

Table 4. *Newborns with respiratory disorders – specific diagnosis (IDC–10) for "Before" and "After" group – before and after new policy (N – number of cases, SD – standard deviation, % – percentage of cases, p – p value, IDC – International disease classification).*

		Before N (% of this group) (N = 1.083)	After N (% of this group) (N=798)	All N (% of all) (N=1.881)	
All respiratory conditions of newborn		22 (2.03)	8 (1.00)	30 (1.59)	p = 0.08
P220	Respiratory distress syndrome of newborn	1 (0.09)	2 (0.25)	3 (0.16)	
P221	Transient tachypnea of newborn	18 (1.66)	3 (0.38)	21 (1.12)	
P228	Other respiratory distress of newborn	1 (0.09)	0 (0.00)	1 (0.05)	
P229	Respiratory distress of newborn, unspecified	1 (0.09)	0 (0.00)	1 (0.05)	
P284	Other apnea of newborn	1 (0.09)	0 (0.00)	1 (0.05)	
P285	Respiratory failure of the newborn	0 (0.00)	0 (0.00)	0 (0.00)	
P2883	Other specified respiratory condition of newborn	0 (0.00)	3 (0.38)	3 (0.16)	
P289	Respiratory condition of newborn, unspecified	0 (0.00)	0 (0.00)	0 (0.00)	

Table 5. *Distribution of the newborns with respiratory conditions according to the gestational age for "Before" and "After" group - before and after new policy (N – number of cases, SD – standard deviation, % – percentage of cases, p – p value).*

	Before group (N = 22)	After group (N = 8)	All (N = 30)	
Before 39th week of pregnancy N (%)	13 (59,1)	4 (50,0)	17	
After 39th week of pregnancy N (%)	9 (40,9)	4 (50,0)	13	p < 0,0001 (stat. significant if three times difference is expected)

Our results were more consistent with the opinion of authors who recently conducted a randomized controlled study in Denmark, which showed that there was not a significant difference in the rate of admission to the intensive care unit in the group with elective caesarean section at 38 weeks gestation in comparison to the group with elective caesarean section at 39 weeks gestation (7); however, the rates of respiratory morbidity were also higher than in our cohort.

Based on a review of the literature in 2015, the authors of the Denmark randomized controlled trial confirmed that differences in neonatal morbidity with timing of elective caesarean sections were present, but significantly less than previously anticipated (17).

CONCLUSIONS

We confirmed that a formal policy of performing elective caesarean sections reduces the rate of elective caesarean sections before 39 weeks gestation in comparison to the time when this policy was not in force. It appears that such a policy also reduces the rate of neonatal respiratory disorders, even though the incidence of these disorders was already rather low before the new policy. We expect that the difference will be more noticeable with time and with a larger number of cases; however, the rate of admission to a neonatal intensive care unit in cases of neonatal respiratory disorders did not change and remained evenly distributed across the groups before and after 39 weeks gestation.

Conflict of interest

The author declares that he has no competing interests.

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