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Major risk factors of maternal adverse outcome in women with two or more previous cesarean sections

Faktori rizika sa najvećim uticajem na maternalni morbiditet kod žena sa dva ili više ponovljenih carskih rezova

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Abstract

Bacground/Aim. Maternal morbidity is defined as any condition that is attributed to or aggravated by pregnancy and childbirth that has a negative impact on the woman's wellbeing. In recent years, a growing trend of cesarean section rates can be seen throughout the world. The aim of this study was to assess factors that might have major impact on maternal adverse outcome in women with two or more previous cesarean sections. **Methods.** This retrospective study included women with single term pregnancy after two or more cesarean deliveries in a 10-year period (2004−2013) in the University Clinic "Narodni front" in Belgrade, Serbia. Medical records were reviewed for clinical data for maternal intraoperative and early postoperative complications regarding gestational age at delivery, the number of previous cesarean sections and mode of surgery (elective or emergency). **Results.** A total of 551 patients were included in the study. At 37 completed weeks delivered 14.1%, at 38 delivered 45.2% and at 39 completed weeks 40.7% patients. Women younger than 35 years more often delivered after 39 completed weeks compared with those over 35 years (69.2% *vs* 30.8%, $p < 0.05$). The overall rate of maternal complications in the study group was 16.5% with no statistical difference by gestational age at delivery. The overall rate of maternal adverse outcome was significantly less in the patients with three as compared with those with four or more cesareans (10.4% *vs* 66.7%, $p < 0.05$). There was a statistically significant difference between these groups of women regarding complications: scar dehiscence, the presence of adhesions, blood transfusion and admission in intensive care unit. Elective cesarean delivery was with less maternal complications compared with emergency cesarean deliveries (12.9% *vs* 27.3%, $p < 0.05$). **Conclusion.** Termination of pregnancy before completed 39 weeks does not decrease maternal morbidity. The major impact on maternal complications has the number of previous cesarean deliveries (≥ 3), as well as emergency cesarean section. Patients should be informed about potential risks for maternal health with increasing number of cesarean deliveries, especially after the first cesarean section when counseling in elective repeat cesarean *vs* trial of labor.

Key words:
cesarean section; morbidity; risk factors; obstetric labor complications; fetal development.

Apstrakt

Uvod/Cilj. Maternalni morbiditet se definiše kao svako stanje koje se pripisuje ili je otežano trudnoćom i porođajem i ima negativan uticaj na blagostanje žene. Poslednjih godina može se uočiti rastuća tendencija stope carskih rezova širom sveta. Cilj rada bio je procena faktora koji najviše utiču na maternalni morbiditet kod žena koje su imale dva ili više carskih rezova. **Metode.** Retrospektivnom studijom obuhvaćene su žene sa jednoplodnom, terminskom trudnoćom posle 2 ili više carskih rezova u desetogodišnjem periodu (1. 1. 2004 − 31. 12. 2013) na Univerzitetskoj ginekološko-akuserškoj klinici "Narodni front". Iz protokola i istorija porođaja dobijeni su podaci o intraoperativnim i ranim postoperativnim komplikacijama u odnosu na gestacijsku starost na porođaju, broj prethodnih carskih rezova i hitnost operacije. **Rezultati.** Ulazne kriterijume ispunila je 551 žena. Sa navršenih 37 nedelja gestacije završeno je 14,1% trudnoća, sa 38 nedelja gestacije 45,2%, a posle navršenih 39 nedelja gestacije 40,7% trudnoće. Žene mlađe od 35 godina značajno češće su porađane posle 39. nedelje nego žene starije od 35 godina (69,2% *vs* 30,8%, $p < 0,05$). Ukupna incidencija svih maternalnih komplikacija u ispitivanoj grupi iznosila je 16,5%. Nije bilo statistički značajne razlike u morbiditetu u odnosu na gestacijske nedelje u vreme porođaja. Žene sa trećim carskim rezom imale su značajno ređe komplikacije u odnosu na žene sa četvrtim ili više carskih rezova (10,4% *vs*

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66,7%, $p < 0,05$), a najčešće komplikacije bile su: dehiscencija ožiljka, prisustvo adhezija, transfuzije krvi i prijem na intenzivnu negu ($p < 0,05$). Elektivni carski rez bio je udružen sa značajno manje komplikacija nego hitni carski rez (12,9% *vs* 27,3%, $p < 0,05$). **Zaključak.** Završavanje trudnoće pre navršenih 39 nedelja ne snižava značajno maternalni morbiditet. Faktori sa značajnim uticajem na zdravlje majke su broj prethodnih carskih rezova (≥ 3) i hitnost operacije. Trudnice bi trebalo informisati o potencijalnim rizicima po njihovo zdravlje koji se dramatično povećavaju sa brojem carskih rezova, posebno kada se posle prvog carskog reza donosi odluka o ponovnoj operaciji ili probnom vaginalnom porođaju.

Ključne reči:
carski rez; morbiditet; faktori rizika; porođaj, akušerski, komplikacije; trudnoća, razvoj fetusa.

Introduction

The increasing number of cesarean sections (CS) in the last decade (up to 30%) and the decreasing one of vaginal births after CS (less than 10%) emphasize the problem of multiple cesarean deliveries impact on maternal morbidity [1, 2].

There are several significant maternal complications such as: uterine rupture, scar dehiscence, hysterectomy, thromboembolic disease, transfusions, wound infection, maternal death, etc, most of which increased as a trend with increasing number of repeated operations. Even half of cesarean hysterectomies are in women with one or more prior CS [3]. Besides that, as early or immediate complications, more difficult to quantify are late risks for bowel obstructions and pelvic pain from peritoneal adhesive disease, both of which increase with each successive CS [4].

The aim of this study was to determine the impact of scheduled gestational age for planned CS, the number of previous CS and unplanned, emergency CS on short-term maternal adverse outcome in women with two or more previous CSs.

Methods

This retrospective study included all patients who had repeated three or more CS in a 10-year period, from January 1st 2004 to December 31st 2013 in the tertiary medical center, University Obstetric and Gynecology Clinic "Narodni Front" in Belgrade, Serbia. We analysed the data from the patients medical records that included maternal age, parity, gestational age at delivery, neonatal birth weight and 5-minute Apgar score. Adverse maternal outcome included maternal death, the presence of adhesiones, scar dehiscence, uterine rupture, hysterectomy, placenta previa, transfusions, urinary bladder lesions, wound complications and intensive care unit (ICU) admission. Gestational age on delivery was determined in completed weeks of gestation confirmed by early ultrasound, elective CS was planned the day before and unplanned, emergency CS was performed short time after admission in patients who were admitted in labor. Hospital department policy dictated that all patients with two or more CS are ended with CS. Maternal death included only those resulting from complications related to childbirth. Uterine rupture was defined as a complete disruption or tear of the uterine muscles and serosa, while scar dehiscence was defined as uterine muscle disruption but with intact serosa. Wound infection was based on the diagnosis of superficial or deep infection involving the cesarean incision site. Placenta previa, bladder injury and adhesiones were intraoperative findings. Excluded criteria were labor before completed 37 weeks and twin pregnancies. The study group included patients with single, term pregnancies with previous two or more CS. All these patients were divided into 3 groups according to gestational age at birth: 37 to 37 + 6/7 weeks, 38 to 38 + 6/7 weeks, > 39 weeks, to assess the best timing of elective repeat CS at term on the basis of maternal adverse outcome. Maternal complications were assessed on the basis of the number of previous CS and mode of surgery (elective or emergency), as well.

All the patients had transverse, lower segment uterine incision, exept one case of classical incision in the patient with accrete placenta previa followed by hysterectomy.

The data were coded, tabulated and entered into an IBM compatibile computer. The incidence of adverse maternal outcome was calculated for each completed week of gestation at the time of cesarean delivery. Continuous variables were expressed as mean with standard deviation and compared by using the indepedenant Student *t*-test. Discrete variables were expressed as percentages and compared by χ^2 test. The test of significance was set at the 0.05 level. The statistical programs SPSS 17.0 (SPSS Inc., Chicago, IL) and Medcalc (Medcalc Software, Mariakerke, Belgium) were used for the data analysis.

The study has been approved by the Institutional Ethical Commitee.

Results

In a 10-year period, from January 1st, 2004 till December 31st, 2013, there were 67,639 deliveries in the University Obstetrics and Gynecology Clinic "Narodni front" Belgrade. In this period of time the incidence of cesarean deliveries increased from 18% in 2004 to 32% in 2013. At the same time the incidence of vaginal births after CS decreased from 13% to 8%. Out of 67,639 deliveries in this period, 16,597 (24.5%) women had cesarean delivery out of which 639 had two prevoius CS (3.85%). Excluded criteria met 76 (11.9%) women with preterm labor and 12 (1.9%) with twin pregnancies. The incidence of premature labor (< 37 weeks) was 12.1% (76/626). The study group was 551 patients with single, term pregnancy after 2 or more previous CS.

Some maternal and neonatal characteristics by gestational age are listed in Table 1. All term pregnancies were divided into 3 groups according to gestational age. In the first group (37–37+6/7) there were 78 (14.1%), in the second (38−38+6/7) 249 (45.2%) and in the third group 224 (40.7%)

Table 1

Maternal and perinatal characteristics of the study population by gestational age at cesarean delivery

Characteristics	Gestational weeks				
	37 – 37+6/7 (n = 78, 14.1%)	38 – 38+6/7 (n = 249, 45.2%)	> 39 (n = 224, 40.7%)	Total (n = 551, 100%)	*p* value χ^2 test
Maternal age (years)					
< 35	44.9 (35)	39.8 (99)	69.2 (155)	52.5 (289)	< 0.05
≥ 35	55.1 (43)	60.2 (150)	30.8 (69)	47.5 (262)	< 0.05
$\bar{x} \pm SD$	34 ± 4.3	38 ± 3.8	31.8 ± 5.4		< 0.05
Emergency cesarean section	21.8 (17)	22.5 (56)	29.5 (66)	25.2 (139)	ns
Prior cesarean delivery					
2	71.8 (56)	73.5 (183)	85.7 (192)	89.1 (491)	ns
≥ 3	23.1 (18)	8.8 (22)	8.9 (20)	10.8 (60)	ns
Birth weight (g)					
≤ 2,499	20 (16)	5 (14)	7 (16)	9 (46)	ns
2,500–3,999	67 (52)	88 (219)	81 (182)	82 (453)	ns
≥ 4,000	13 (10)	7 (16)	12 (26)	10 (52)	ns
Fetal death	0	0.5 (1)	0.5 (1)	0.3 (2)	ns
Apgar 5'					
≤ 7	6.4 (5)	4.8 (12)	2.7 (6)	4.2 (23)	ns
≥ 8	93.6 (73)	95 (244)	97 (218)	95.5 (526)	ns

Data are presented as percentage (number); $\bar{x}$ − mean value; SD – standard deviation; ns – no significant difference.

patients. There were no statistically significant differences among the 3 groups in perinatal characteristics like parity, emergency CS, birth weight, macrosomia, 5 min Apgar score, fetal death, except for maternal age. The patients under 35 years of age were significantly more often delivered after 39 completed weeks compared with those over 35 years (69.2% *vs* 30.8%, $p < 0.05$). The incidence of individual and composite adverse maternal outcomes by gestational age at delivery is shown in Table 2. There were no maternal death and only one hysterectomy in 37 plus weeks due to the accrete placenta previa with excessive bleeding. Overall incidence of maternal adverse outcome was 16.5% and there was no significant difference in composite or individual complications by gestational age at delivery. The incidence of adverse maternal outcome by the number of CS is presented in Table 3. Three or more CS had 60 (10.9%) of the patients: 54 with 3, 5 with 4 and 1 with 5 previous CS. The incidence of all adverse outcomes was much higher in the group with 3 or more CS and the difference was statistically significant (66.7% *vs* 10.4%, $p < 0.05$). Almost all individual complications were more frequent in ≥ 3 group, but a statistically significant difference was obtained in: scar dehiscence, the presence of adhesiones, blood transfusion and ICU admission. The incidence of emergency and elective CS regarding maternal adverse outcome is presented in Table 4. Emergency CS was performed in 139 (25.2%) of the patients and elective in 412 (74.8%) of the patients. The incidence of the composite adverse maternal outcome was higher in the emergency CS group and the difference was statistically significant, but no other individual outcome showed any significant difference.

Table 2

Incidence of adverse maternal outcome by gestational age at cesarean delivery

Maternal complications	Gestational weeks				
	37 – 37+6/7 n = 78	38 – 38+6/7 n = 249	> 39 n = 224	Total n = 551	*p* value χ^2 test
*Composite of all adverse outcome	15.4 (12)	16.5 (41)	17.0 (38)	16.5 (91)	ns
Maternal death	/	/	/	/	/
Hysterectomy	1.3 (1)	/	/	0.28 (1)	ns
Rupture of the uterus	/	0.4 (1)	0.4 (1)	0.4 (2)	ns
Scar dehiscence	1.3 (1)	1.6 (4)	2.7 (6)	1.9 (11)	ns
Placenta previa	1.2 (1)	0.4 (1)	0.4 (1)	0.5 (3)	ns
Bladder injury	/	0.8 (2)	0.4 (1)	0.5 (3)	ns
Blood transfusion (intra- or postpartum)	3.8 (3)	2.1 (5)	3.1 (7)	2.7 (15)	ns
Wound complication	2.6 (2)	2.1 (5)	2.7 (6)	2.3 (13)	ns
Adhesions	3.8 (3)	3.6 (9)	3.1 (7)	3.4 (19)	ns
ICU admission	5.2 (4)	3.6 (9)	4.5 (10)	4.2 (23)	ns
Deep vein thrombosis	/	0.4 (1)	0.4 (1)	0.4 (2)	ns

Data are presented as percentage (number). *Composite of all adverse outcomes: maternal death, hysterectomy, rupture of the uterus, scar dehiscence, placenta previa, bladder injury, blood transfusion, wound complication, adhesions, ICU admission, deep vein thrombosis; ns – no significant difference; ICU − intensive care unit.

Table 3

Incidence of adverse maternal outcomes by number of previous cesarean sections

Maternal complications	Previous cesarean section, % (n)		
	2 89% (491)	≥ 3 10.9% (60)	*p* value χ^2 test
*Composite of all adverse outcome	10.4 (51)	66.7 (40)	< 0.05
Emergency cesarean section	26.7 (131)	13.3 (8)	ns
Maternal death	/	/	/
Hysterectomy	/	2 (1)	/
Rupture of the uterus	0.2 (1)	1.7 (1)	ns
Scar dehiscence	0.8 (4)	11.7 (7)	< 0.05
Placenta previa	0.2 (1)	3.3 (2)	ns
Bladder injury	0.2 (1)	3.3 (2)	ns
Blood transfusion (intra- or postpartum)	2.0 (10)	8.3 (5)	< 0.05
Wound complication	2.2 (10)	5.0 (3)	< 0.05
Adhesions	2.4 (12)	11.7 (7)	< 0.05
ICU admission	2.2 (11)	20 (12)	< 0.05
Deep vein thrombosis	0.2 (1)	1.7 (1)	ns

Data are presented as percentage (number). *Composite of all adverse outcomes: maternal death, hysterectomy, rupture of the uterus, scar dechiscence, placenta previa, bladder injury, blood transfusion, wound complication, adhesions, ICU admission, deep vein thrombosis;
ns – no significant difference; ICU – intensive care unit.

Table 4

The incidence of emergency and elective caesarean section

Maternal complicatins	Cesarean section, % (n)		*p* value χ^2 test
	emergency 25.2% (139)	elective 74.8% (412)	
*Composite of all adverse outcome	27.3 (38)	12.9 (53)	< 0.05
Maternal death	/	/	/
Hysterectomy	/	0.2 (1)	/
Rupture of the uterus	1.4 (2)	/	/
Scar dechiscence	2.8 (4)	1.7 (7)	ns
Placenta previa	0.7 (1)	0.5 (2)	ns
Bladder injury	0.7 (1)	0.5 (2)	ns
Blood transfusion (intra- or postpartum)	3.6 (5)	2.4 (10)	ns
Wound complication	6.5 (9)	1.0 (4)	ns
Adhesions	4.3 (6)	3.1 (13)	ns
ICU admission	6.5 (9)	3.4 (14)	ns
Deep vein thrombosis	0.7 (1)	0.2 (1)	ns

Data are presented as percentage (number). *Composite of all adverse outcomes: maternal death, hysterectomy, rupture of the uterus, scar dechiscence, placenta previa, bladder injury, blood transfusion, wound complication, ddhesions, ICU admission, deep vein thrombosis;
ns − no significant difference; ICU – intensive care unit.

Discussion

The timing of repeated CS after two or more previous CS has to be not too soon for the baby and not too late for the mother. Some studies show that neonatal morbidity associated with elective CS at term increases as gestational age at delivery decreases from 39 to 37 weeks [5, 6]. Despite these recommendations, over the third of pre-labor elective repeat CS, in a US multicenter cohort study, were delivered prior to 39 weeks [7] and this figure is as high as 50−80% in some European cohort studies [6, 8]. Concern that delivery at 39 weeks, among women with repeated CS, compared to earlier deliveries may be associated with adverse maternal outcome has been suggested as one reason for elective delivery prior to 39 weeks [9, 10]. For the last ten years, at our Clinic, 59.3% delivered prior to 39 and 40.7% after 39 completed weeks. Maternal age influenced the time of elective repeated CS, because in the third group (> 39 weeks) 70% of the patients were aged under 35 and only 30% was 35 or more years old. The highest incidence of emergency CS was in the 39 weeks group, but the difference was not statistically significant. Different results were obtained in some other studies where elective CS deliveries > 39 weeks were associated with a significant increase in the number of emergency CS [10, 11]. Among

neonatal characteristics there were no significant differences even for the 5-minute Apgar score less than 7 which was the highest rate in the 37 weeks group.

The lowest incidence of maternal adverse outcome was in the 38 weeks group, but the difference was not statistically significant. The study, that comparing maternal adverse outcome at 38 and 39 weeks in women after 2 or more CS, revealed that the lowest rate of any adverse outcome was observed when CS scheduled to 38 + 1 weeks [12]. Much bigger study revealed that elective repeat CS at 37 or 38 weeks as compared with delivery at 39 (for neonatal benefit) is not associated with decreased maternal morbidity with no apparent maternal benefit compared to elective delivery in the 39th week [13, 14]. The severe complications of repeat CS include maternal death, uterine rupture and hysterectomy [13]. In our study these complications were rare: no maternal death, two complete uterine rupture (0.4%) and one hysterectomy (0.2%) that is similar with other bigger studies [13, 15].

The overall incidence of adverse maternal outcome by the number of previous CS showed a significant difference ($p < 0.05$). Almost all individual maternal complications were more frequent in the group ≥ 3 CS, but a significant difference was obtained in scar dehiscence, the presence of adhesions, blood transfusion and ICU admission. In our study the fourth CS was associated with more potential risks for adverse maternal outcome. Cook et al. [16], from the United Kingdom Obstetric Surveillance System (UKOSS), comparing fifth or bigger number of CS with those from the second to the fourth procedure, concluded that those having five or more CS had significantly increased rates of morbidity, such as major hemorrhage rate increased 18-fold, mostly due to 18% with placenta previa or accrete syndrome, visceral damage 17-fold, critical care admission 15-fold and delivery < 37 weeks 6-fold [16]. The risk for uterine rupture after two CS was 0.2% and it was similar in patients with one previous CS (0.3%) [17]. In our study the patients with 3 or more CS incidence of uterine rupture was 1.6% and scar dehiscence 11.7%. In one previous review even 27% of patients with 3 or more previous CS had fenestration of uterine scar [18], but recent studies describe the rates ranging from 1% to 10% in women undergoing anywhere from a fifth to a ninth CS [15, 19, 20]. A systematic review and meta-analysis of 21 observational studies revealed that maternal morbidity increases in a dose-response fashion with each additional CS, especially for women with ≥ 3 CS who are at statistically significant increased risk of previa, accrete placentan and hysterectomy [2, 21]. The incidence of placenta previa in our study was 3.3% in the group ≥ 3 CS compared with 0.2 in the group 2 SC without significant difference, but the number of cases was small, although similar results were obtained in some other studies [8].

The highest rate of emergency CS was after 39 weeks, although there were no statistically significant difference. In some other studies, despite improvement in neonatal outcome, scheduling elective CS deliveries at ≥ 39 weeks is associated with a significant increase in the number of emergency CS [11, 12, 22]. In our study the rate of composite maternal complications in emergency (27.3%) compared with elective CS (12.9%) showed significant difference ($p > 0.05$), as it was obtained in the study of intraoperative surgical complications during CS [23, 24]. Possible explanation of this could be the reason for emergency CS such as uterine contractions, rupture of membranes or low station of the presenting part.

Despite the limitations of our study, the obtained data suggest that optimal timing for elective CS regarding maternal complications may be the 39th week. Since USA National Institute of Child Health and Human Development (NICHD) Maternal-Fetal Medicine Units Network (MFMU) published that elective repeat cesarean delivery at 37 or 38 weeks compared to 39 completed weeks of gestation is associated with adverse neonatal outcomes [5, 7], therefore elective delivery prior to 39 weeks is discouraged, unless fetal lung maturity has been confirmed [25], the question is that it maybe too late for the mother regarding her complications. Our study, also, did not revealany decrease in maternal morbidity if patients delivered prior 39 weeks. Among all women undergoing pre-labor elective repeat Cesarean at term, our findings apply directly to the majority who maintain this elective status at the actual time of delivery [13].

Conclusion

The obtained data show that the factors that directly influence the adverse maternal outcome are the number of previous CS and emergency CS. The fourth CS and more are associated with more risks for maternal complications and they might be delivered prior to 39 weeks.

Because of serious complications, patients should be informed about any potential risks for their health with increasing number of CS, especially after the first CS, when counseling regarding elective repeat CS *vs* trial of labor.

REFERENCES

1. *Hamilton BE, Martin JA, Ventura SJ.* Births: preliminary data for 2011. Natl Vital Stat Rep 2012; 61(5): 1−18.
2. *Marshall NE, Fu R, Guise J.* Impact of multiple cesarean deliveries on maternal morbidity: a systematic review. Am J Obstet Gynecol 2011; 205(3): 262.e1−8.
3. *Hernandez JS, Wendel GD, Sheffield JS.* Trends in emergency peripartum hysterectomy at a single institution: 1988-2009. Am J Perinatol 2013; 30(5): 365−70.
4. *Mankuta D, Mansour M, Alon SA.* Maternal and fetal morbidity due to abdominal adhesions after repeated cesarean section. Abstract No 792. Am J Obstet Gynecol 2013; 208(1 Suppl): S332.
5. *Zanardo V, Simbi AK, Franzoi M, Soldà G, Salvadori A, Trevisanuto D.* Neonatal respiratory morbidity risk and mode of delivery at term: influence of timing of elective caesarean delivery. Acta Paediatr 2004; 93(5): 643−7.
6. *Hansen AK, Wisborg K, Uldbjerg N, Henriksen TB.* Risk of respiratory morbidity in term infants delivered by elective caesarean section: cohort study. BMJ 2008; 336(7635): 85−7.

7. *Tita AT, Landon MB, Spong CY, Lai Y, Leveno KJ, Varner MW,* et al. Timing of elective repeat cesarean delivery at term and neonatal outcomes. N Eng J Med 2009; 360(2): 111−20.
8. *Hansen AK, Wisborg K, Uldbjerg N, Henriksen TB.* Elective caesarean section and respiratory morbidity in the term and near-term neonate. Acta Obstet Gynecol Scand 2007; 86(4): 389−94.
9. *Salim R, Zafran N, Shalev E.* Timing of elective repeat cesarean delivery at term. N Eng J Med 2009; 360(15): 1570; author reply 1570−1.
10. *Clark SL, Miller DD, Belfort MA, Dildy GA, Frye DK, Meyers JA.* Neonatal and maternal outcomes associated with elective term delivery. Am J Obstet Gynecol 2009; 200(2): 156−9.
11. *Mohammed AF, Bayo AI, Abu-Jubara MF.* Timing of elective repeated cesarean delivery in patients with previous two or more cesarean section. J Matern Fetal Neonatal Med 2013; 26(1): 10−2.
12. *Melamed N, Hadar E, Keidar L, Peled Y, Wiznitzer A, Yogev Y.* Timing of planned repeat cesarean delivery after two or more previous cesarean sections-risk for unplanned cesarean delivery and pregnancy outcome. J Matern Fetal Neonatal Med 2014; 27(5): 431−8.
13. *Tita AT, Lai Y, Landon MB, Spong CY, Leveno KJ, Varner MW*, et al. Timing of Elective Repeat Cesarean Delivery at Term and Maternal Perioperative Outcomes. Obstet Gynecol 2011; 117(2 Pt 1): 280−6.
14. *Nisenblat V, Barak S, Griness OB, Degani S, Ohel G, Gonen R.* Maternal complications associated with multiple cesarean deliveries. Obstet Gynecol 2006; 108(1): 21−6.
15. *Sobande A, Eskandar M.* Multiple repeat caesarean sections: complications and outcomes. J Obstet Gynaecol Can 2006; 28(3): 193−7.
16. *Cook JR, Knight M, Dhanjal M*K. Multiple repeat caesarean section in the UK: incidence and consequences to mother and child. A national, prospective cohort study-authors' reply. BJOG 2013; 120(9): 1155.
17. *Spong CY, Landon MB, Gilbert S, Rouse DJ, Leveno KJ, Varner MW,* et al. Risk of uterine rupture and adverse perinatal outcome at term after cesarean delivery. Obstet Gynecol 2007; 110(4): 801−7.
18. *Kirkinen P.* Multiple caesarean sections: outcomes and complications. Br J Obstet Gynaecol 1988; 95(8): 778−82.
19. *Rashid M, Rashid RS.* Higher order repeat caesarean sections: how safe are five or more. BJOG 2004; 111(10): 1090−4.
20. *Juntunen K, Mäkäräinen L, Kirkinen P.* Outcome after a high number (4-10) of repeated caesarean sections. BJOG 2004; 111(6): 561−3.
21. *Silver RM, Landon MB, Rouse DJ, Leveno KJ, Spong CY, Thom EA*, et al. Maternal morbidity associated with multiple repeat cesarean deliveries. Obstet Gynecol 2006; 107(6): 1226−32.
22. *Salim R, Shalev E.* Health implications resulting from the timing of elective cesarean delivery. Reprod Biol Endocrinol 2010; 8: 68−74.
23. *Rahman MS, Gasem T, Al Suleiman SA, Al Jama FE, Burshaid S, Rahman J.* Bladder injuries during cesarean section in a University Hospital: a 25-year review. Arch Gynecol Obstet 2009; 279(3): 349−52.
24. *Bergholt T, Stenderup JK, Vedsted-Jakobsen A, Helm P, Lenstrup C.* Intraoperative surgical complication during cesarean section: an observational study of the incidence and risk factors. Acta Obstet Gynecol Scand 2003; 82(3): 51−6.
25. *American College of Obstetricians and Gynecologists.* ACOG Committee Opinion No. 394, December 2007. Cesarean delivery on maternal request. Obstet Gynecol 2007; 110(6): 1501.

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