



## Cesarean section under spinal anesthesia in General Hospital of Dubrovnik; A decade after

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### INTRODUCTION

Anesthetics approach to Caesarean section has considerably changed during last decades particularly in countries with advanced health care system. The changes are primarily related to the choice of anesthesia, so that the percentage of Cesarean section performed under general anesthesia is in a steady decline with a simultaneous significant increase in Cesarean section performed under spinal anesthesia. For example, in USA in year 1981. over 40% of Cesarean section were performed under general anaesthesia compared to 17% in 1992. In some hospitals that trend was far more expressed, as in Brigham and Women's Hospital, where percentage of Cesarean section performed under general anaesthesia decreased from 7,6% in 1990. to merely 3,6% in 1995. What is the main reason for these changes? Above all, maternal safety. Considering that 3 to 12% of total maternal mortality is accountable to anaesthesia, and the vast majority of such cases occur during general anaesthesia (failed intubation, inability to ventilate, aspiration of gastric content into the lungs, etc.), most anesthesiologists recommend regional – spinal anesthesia whenever possible, and general anaesthesia only when absolutely necessary. When it comes to neonatal safety most studys assert that Apgar score after first minute is higher when Cesarean section is performed under spinal than in general anesthesia (1). The choice of anesthesia for Cesarean delivery depends on the indication for the surgery, the degree of emergency and affinities of pregnant woman. It implies that proposed method of anesthesia provides good operating conditions and that is safer for both mother and child. Indications for Cesarean section performed under general anesthesia are: refusing of spinal anesthesia by mother, massive hemorrhage, uterine rupture, umbilical cord prolapse with fetal bradycardia, agonal fetal distress, significant coagulopathy and inadequate regional anesthesia (2).

Advances of regional – spinal anesthesia to general anesthesia are: greater safety of mother and child, consciousness of mother during birth, better postoperative analgesia and earlier mobilization of mother. Anesthesiologist can safely apply subarachnoidal block – spinal anesthesia in majority of urgent Cesarean section because of known benefits of spinal compared to epidural anesthesia; simplicity and promptness of procedure, lower dose of local anesthetic, faster onset of anesthesia and better obstetric conditions. For all this reasons, spinal anesthesia using hyperbaric solution of local anesthetic is most commonly performed technique of regional anesthesia for Cesarean section, not just as an alternative to general anesthesia, but as a method of choice (3). However, Cesarean section under spinal anesthesia manifests certain

side-effects, larger risk of hypotension, different degree of adverse visceral effects and very unpleasant postpunction headaches. Benefit of spinal anesthesia in emergency situations remains dubious (4). The frequency and intensity of hypotension depends on the puncture site, the type and volume of local anesthetic, additives, preoperative and intraoperative optimizing of crystalloid and / or colloid volume, application of vasopressors and position of uterus (5, 6, 7, 8).

A decade ago, on our first International Symposium of regional anesthesia and analgesia, we presented the results of retrospective study and concluded that by introducing spinal anesthesia for Cesarean section in General hospital of Dubrovnik, with a lack of understanding and resistance of obstetricians, nevertheless we managed to perform 25% Cesarean section under spinal anesthesia and that we have in our hospital affirmed subarachnoid block as a safe, efficient and reliable method of anesthesia for Cesarean section.

We report the results of performing spinal anesthesia for Cesarean section in General hospital of Dubrovnik after a decade of experience and offset from the first analysis of this issue. In particular, we would like to compare the spinal anesthesia for emergency Cesarean delivery compared to the elective operations and review our earlier results.

## MATERIALS AND METHODS

This is a retrospective study in which we use data from medical records and the results obtained from the telephone survey.

Our study included all mothers who had Cesarean section under spinal anesthesia during the calendar year 2012. in General Hospital of Dubrovnik both in regular operating program and as emergency operation. There were no excluded subjects.

The subjects were divided into two groups, the test Group H – emergency and control Group P – planned, elective operations. In this study, we used the methods of descriptive and inferential statistics. We have analyzed and compared the objective and subjective indicators of quality of spinal anesthesia for scheduled and urgent Cesarean section and Cesarean delivery.

We compared the hemodynamic parameters of our groups and the necessity to administer colloids and vasopressors due to hypotension induced by spinal anesthesia and the need for the addition of analgesics and / or sedatives for unsatisfactory subarachnoid block. We have processed the information about the most common indications for Cesarean section, puncture site, the volume of local anesthetic, additives, preloading, and the total volume of crystalloids and the baseline hemodynamic parameters and values of blood pressure and pulse rate after 5 and 15 minutes from the initiation of subarachnoid block.

We compared the results of a telephone survey, which are indicators of subjective assessments of spinal ane-

sthesia by our patients who had cesarean section under spinal anesthesia. Our questionnaire was related to the numerical evaluation of spinal anesthesia from 1 to 5, the incidence of side-effects and complications, and the dilemma of choosing spinal versus general anesthesia for possible new caesarean section.

We started from the hypothesis that there is no difference in the quality of spinal anesthesia for scheduled and urgent Cesarean delivery. In this study, we expected that there will be differences of objective and subjective indicators of quality of spinal anesthesia for Cesarean section in elective and emergency regime. We expected that the spinal block for emergency Cesarean section is confirmed as safe and reliable method of anesthesia, of course respecting the protocols of pre and intraoperative fluid volume optimization and application of vasopressors by our expecting mothers.

This study examines whether spinal anesthesia for Cesarean delivery in the emergency room is safe and reliable method of anesthesia (hypothesis). The main goal of this study is to identify spinal anesthesia as the method of choice, not just an alternative to general anesthesia for emergency Cesarean section.

## RESULTS

According to the medical records, in General hospital of Dubrovnik in year 2012. 1094 births were carried out. Of this number, 212 births (19.38%) were carried out by Cesarean section, 59 mothers (27.83%) had Cesarean section under general anesthesia, of which 42 were urgent, and only 17 women had scheduled operation.

Most Cesarean sections, 152 of them (71.69%) of 212, were performed under spinal anesthesia. All these interviewed mothers made our sample, which we divided in the Test group H and the Control group P. In Group H there were 85 (56%) of respondents who had an emergency Cesarean section, and in Group P, 67 (44%) of respondents who had planned Cesarean section under spinal anesthesia.

## DISCUSSION

In last decade the number of Cesarean section performed in General Hospital of Dubrovnik has been constantly increasing. This trend has enabled us to fully affirm spinal anesthesia as the method of choice for Cesarean delivery in our hospital. That is, until a decade ago, when we were the promoters of the systematic introduction of spinal anesthesia for Cesarean section in Croatia, spinal anesthesia was merely an alternative to general anesthesia and was only administered to every fourth pregnant women. These results indicate that spinal anesthesia has become the method of choice in our hospital and is performed in almost three-quarters (71.69%) of patients who went under Cesarean section. It has also become the method of choice in an emergency Cesarean section and in such cases is performed two times more frequently than the general anesthesia. Analysis of results

**TABLE 1**

Displaying the comparative data on spinal anesthesia for planned and emergency Caesarean section.  $p < 0,05$   $n =$  number of subjects.

pre-hydration	Group P		Group H		Quincke needle	Group P		Group H	
	n	%	n	%		n	%	n	%
1L crystalloid	45	67,16	54	63,53	G 25	23	34,33	30	35,29
0,5L colloid	11	16,42	7	8,24	G 27	44	65,67	55	64,71
0,5L crystalloid	11	16,42	24	28,24	Total	67	100,00	85	100,00
Total	67	100,00	85	100,00					
punction site*	n	%	n	%	baricity	n	%	n	%
L 2/3	35	52,24	11	12,94	hyperbaric	51	76,12	73	85,88
L 3/4	32	47,76	74	87,06	isobaric	16	23,88	12	14,12
Total	67	100,00	85	100,00	Total	67	100,00	85	100,00
aditives*	n	%	n	%	local anesthetic	mg	%	mg	%
fentanyl	60	89,55	58	68,24	average	11,43		11,29	
no aditives	7	10,45	27	31,76	Standard deviation	1,27		1,46	
Total	67	100,00	85	100,00	Coeffitient of variation		11,13		12,94

**TABLE 2**

Displays hydration, correction of hypotension and supplementation of spinal anesthesia for CS \* $p < 0,05$   $n =$  number of subjects.

Crystalloids	Group P		Group H		Colloids	Group P		Group H	
	ml	%	ml	%		n	%	N	%
Average	1212,68		1223,53		Yes	30	44,78	38	44,71
Standard deviation	391,74		329,93		No	37	55,22	47	55,29
Coeffitient of variation		32,30		26,97	Total	67	100,00	85	100,00
Vasopressor*	n	%	n	%	Supplemented*	n	%	N	%
Yes	34	50,75	61	71,76	analgesed.	31	46,27	18	21,18
No	33	49,25	24	28,24	no sedation	36	53,73	67	78,82
Total	67	100,00	85	100,00	Total	67	100,00	85	100,00

allows us to conclude that in the past ten years we have standardized spinal anesthesia for both planned and emergency Cesarean section. It is obvious that two-thirds of our patients in both groups received standard prehydration of 1000 ml crystalloids and a similar dose of local hyperbaric anesthetic solution using needle G27. There was no statistically significant difference between the groups.

However, we have registered that L<sub>2/3</sub> and L<sub>3/4</sub> spaces were equally chosen for puncture site when procedure was planned. When emergency occurred, space L<sub>3/4</sub> was more likely to be puncture site. Fentanyl was frequently added to local anesthetic when Cesarean section was programmed because there was enough time for medicament preparation.

During the procedure, both groups of our patients received equal volumes of crystalloids and at the same

percentage amount of colloids. However, in an emergency Cesarean section vasopressors were statistically significantly more added, which can be explained by the occasional lack of time for optimal preoperative hydration of our patients. When it comes to the hemodynamic profile of our subjects, we can conclude that clinically significant difference among the groups didn't exist, while statistically lower systolic blood pressure after 15 minutes is within anticipated limits during emergency operations.

More frequent analgesation during planned operations is considered likely to be conformity more than the objective need for additional analgesia and sedation because throughout the 2012th year, as opposed to earlier, we didn't have any conversion of spinal to general anesthesia.

TABLE 3

Displays trends in systolic blood pressure and heart rate compared to baseline.  $p < 0.05$ 

Group	BP 0 Blood pressure before anesthesia	HR 0 Heart rate before anesthesia	BP 5 Blood pressure after 5 minutes	HR 5 Heart rate after 5 minutes	BP 15* Blood pressure after 15 minutes	HR 15 Heart rate after 15 minutes
P	135,50+/-14,52	97,13+/-17,28	103,76+/-20,08	85,62+/-16,81	119,12+/-13,55	93,58+/-14,13
H	136,28+/-14,20	111,46+/-18,15	98,34+/-17,34	82,76+/-16,01	114,85+/-11,21	98,13+/-17,01

The above values represent measurements just before the puncture of spinal area, and then after 5 and after 15 minutes following the applying a local anesthetic.

Results of a telephone survey which included two thirds of respondents of both groups did not differ between groups. Rating of spinal anesthesia for Cesarean section was about 4.5. One in ten respondents had post-puncture headache, while the other side-effects were rare. Approximately 80% of subjects in each group were prone to choose spinal anesthesia for eventual Cesarean section again.

Table 1 shows comparative data on preanesthesia hydration of our respondents, the thickness and type of puncture needle, about site of puncture, baricity of solution applied, additive to solution of local anesthetic and the average dose of local anesthetic administered in sub-arachnoid space to our expectant mothers.

Table 2 shows comparative data of the control and the test group that describes overall crystalloid hydration during surgery, the necessity to administer colloids and vasopressors in hypotensive subjects and the need for supplementation of spinal anesthesia with analgesics and/or sedatives after clamping the umbilical cord of newborn.

Analyzed hemodynamic parameters, systolic blood pressure (BP) in mmHg and heart rate (HR) are shown in Table 3.

## CONCLUSION

The results of this study didn't determine any clinically significant differences in objective and subjective

indicators of quality of spinal anesthesia for Cesarean section in elective and emergency regime. Urgent Cesarean section performed under spinal anesthesia is confirmed as safe and reliable method of anesthesia with recommendation to follow pre and intraoperative volume optimization protocol and application of vasopressors.

So we recommend spinal anesthesia as the method of choice, not just as an alternative to general anesthesia for the large number of emergency Cesarean section.

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