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Elective caesarean section and modalities of antibioprophylaxis

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Elektivni carski rez i modaliteti antibioprofilakse

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Carski rez (CR) je neophodna operacija koja se široko primenjuje. Infektivni morbiditet je najčešća komplikacija nakon CR. Cilj ovog istraživanja je bio uporediti efikasnost primene monodoze ceftriaksona intraoperativno (2,0g) sa režimom trodnevnog ceftriaksona postoperativno (2,0g/24č) u prevenciji postoperativnih infektivnih komplikacija pri elektivnom CR. Obuhvaćeno je 68 pacijentkinja kod kojih je planiran elektivni CR. Pacijentkinje su podeljene u dve grupe po 34 ispitanica, koje su određene da primaju ili ceftriakson u vidu monodoze (2,0g) intraoperativno, ili postoperativno u trodnevnom režimu (2,0g/24č). CR je urađen standardnom tehnikom. Zabeležene su postpartalne komplikacije. Urađen je pregled, mikrobiološka dijagnostika i adekvatna toaleta rana. Na otpustu pacijentkinje su bile upućene da prijave febrilnost, promenu izgleda rane i ostale nepravilnosti. Rezultati su statistički obrađeni. Postpartalne komplikacije javile su se kod 7 pacijentkinja u prvoj grupi, 5 pacijentkinja je imalo temperaturu, a 2 pacijentkinje bez temperature su imale infekciju rane. Od 5 pacijentkinja sa temperaturom 3 su imale infekciju rane, 1 endometritis i 1 tranzitornu postpartalnu febrilnost. U drugoj grupi 9 pacijentkinja je imalo komplikacije, 6 sa temperaturom i 3 bez. Od 6 pacijentkinja sa temperaturom, 3 su imale infekciju rane, 1 endometritis, 1 urinarnu infekciju i 1 tranzitornu postpartalnu febrilnost. Studija je pokazala da ne postoji smanjenje incidence postoperativnog morbiditeta bilo koje etiologije kod pacijentkinja koje su primale ceftriakson u trodnevnom režimu. Trodnevna upotreba antibiotika je neopravdana jer ne smanjuje rizik od postoperativnog morbiditeta. Profilaktička primena antibiotika u elektivnom CR je najadekvatniji modalitet primene antibiotika. Istraživanje ukazuje na korist od primene monodoze intraoperativno nakon klemovanja pupčane vrpce.

Ključne reči: antibiotska profilaksa; carski rez; endometritis; infektivni morbiditet

Elective caesarean section and modalities of antibioprohylaxis

Abstract

Caesarean section (CS) is a necessary operation widely used. Infectious morbidity is the most common complication. Our aim was to compare the effectiveness of a single dose of ceftriaxone intraoperatively (2.0g) with a three-day regimen of ceftriaxone postoperatively (2.0g/24h) in the prevention of postoperative complications in women undergoing elective CS. This research included 68 patients for an elective CS. Patients were divided into two groups of 34 subjects, who were randomized and determined to receive ceftriaxone in the form of a single dose (2.0g) intraoperatively, or three-day ceftriaxone (2.0g/24h) postoperatively. A CS was performed using a standard-technique. Postpartum complications were recorded. An examination, microbiological diagnosis and adequate dressing of the wounds were performed. At discharge, women were instructed to report any irregularities. The results were statistically processed. Postpartum complications occurred in 7 women in the first group, 5 women had a fever and 2 didn't. Of the 5 febrile women, 3 had wound infection, 1 endometritis, and 1 transient postpartum febrility. In the second group, 9 women had complications, 6 with fever and 3 without. Of the 6 women with fever, 3 had wound infection, 1 endometritis, 1 urinary infection, and 1 transient postpartum febrility. There was no reduction in the incidence of postoperative morbidity in patients who received ceftriaxone in a three-day regimen. Results showed that the three-day use of antibiotics is unjustified because it doesn't reduce the risk of postoperative morbidity. Prophylactic administration of antibiotics in elective CS is the most adequate modality of antibiotic administration. Research indicates the benefit of intraoperative monodose administration after umbilical cord clamping.

Keywords: antibiotic prophylaxis; caesarean section; endometritis; infective morbidity

Elective caesarean section and modalities of antibioprohylaxis

Introduction

Caesarean section is the most common, largest and often necessary operation widely practiced in obstetrics. Over the past 3 decades, the cesarean rate has been steadily increasing, and can reach up to 50% in some centers (1). Infectious morbidity is the most common complication after the caesarean section with reported rates ranging from 18% to 83%, while being less than 10% for vaginal delivery (2).

Antibioprohylaxis in surgery is an effective method for preventing and reducing the risk of surgical site infections (2).

Prophylactic use of antibiotics has reduced the incidence of endometritis by two-thirds to three-quarters, and therefore their routine use in all patients undergoing cesarean section is justified. While the risk of postoperative infection after caesarean section is higher for emergency than for elective cesarean sections, prophylactic antibiotic use was shown to reduce both postoperative endometritis and wound infection after an elective cesarean delivery (3).

Penicillins, cephalosporins, metronidazole, and combinations of clindamycin and gentamicin were used for prophylaxis. There does not appear to be a clear advantage of any of these antibiotics over the others (4-6). There are data that the combination of penicillin and aminoglycosides significantly reduces febrile morbidity in a higher percentage compared to the use of penicillin alone. The duration of antibiotic prophylaxis and the modality of therapy (one or two antibiotics) are still under discussion. Which antibiotics should be used for prophylaxis and which is the best prophylactic regimen has not yet been defined and determined in detail (7).

Aim

The aim of this study was to compare the effectiveness of a monodose (2.0g) of ceftriaxone intraoperatively with a regimen of three-day administration of ceftriaxone postoperatively (2.0g/24h) in the prevention of postoperative complications (endometritis, wound infection and other febrile morbidity) in patients undergoing elective caesarean section.

Materials and methods

This research was conducted at the Department of Perinatology, Clinic for Gynecology and Obstetrics, University Clinical Center Nis. The study included 68 patients who were scheduled for elective caesarean section for various reasons. The patients were divided into two groups of 34 subjects each. The patients were excluded from the study if they received antibiotics before surgery, if they had any visible infection or fever before and during surgery, and if they were allergic to the antimicrobial medicine used.

The patients were divided into two groups, which were assigned to receive either ceftriaxone intravenously in the form of a monodose (2.0g) intraoperatively, or ceftriaxone in a three-day regimen intravenously postoperatively (2.0g/24h). All cesarean sections were performed using standard technique and all post-operative care followed standard clinical practice. Also, consent to participate in the study was obtained from all patients. The following postpartum complications were noted:

1. Postoperative febrile morbidity, defined as an axillary temperature of 38 degrees Celsius measured on two occasions, four hours apart.
2. Postoperative infection including:
 - Endometritis
 - Wound infection
3. Other febrile morbidity (urinary tract infection, respiratory infections)

When febrile morbidity was identified, the patients were examined to reveal a potential source of infection (upper respiratory tract, breast, abdominal and pelvic infections). A general examination of urine with urine culture, blood count with leukocyte formula and C reactive protein (CRP) were performed. Wound swabs and lochia were sent for bacteriological examination and sensitivity testing when necessary. Wound infections were treated with local cleaning, hydrogen, saline irrigation and povidone-iodine solution. Upon releasing from the hospital, the patients were advised to contact their chosen doctor (gynecologist) immediately if they develop a high temperature, notice a change in the appearance of the wound, pain or discomfort in the lower abdomen or wound area, or feel foul-smelling lochia.

The obtained results were statistically processed using X, Student's T-test and Fisher's test. A p-value <0.05 was considered statistically significant.

Results

A total of 68 patients included in the study were divided into two groups: the first group of 34 patients received ceftriaxone as a monodose (2.0 g) intraoperatively, and the second group of 34 patients who received the same drug (ceftriaxone) for three days (2.0 g/24h). The groups were similar in terms of age, parity, gestational age, weight, preoperative hemoglobin, and body temperature (Table 1).

Table 1. Reproductive and biohumoral characteristics

	Ceftriaxone monodose intraoperatively (2.0g) n = 34				Ceftriaxone postoperatively for three days (2.0g/24h) n = 34			
Age (years)	28.6 ± 1.35				28.1 ± 1.44			
Parity	Primipara		Multipara		Primipara		Multipara	
	12	35.29%	22	64.7%	9	26.47%	25	73.53%
Gestational age (weeks)	38.6 ± 1.12				38.67 ± 1.15			
Body weight (kg)	78.8 ± 5.34				79.1 ± 6.17			
Preoperative HgB (g/L)	95.6 ± 7.49				95.9 ± 7.19			
Body temperature	36.6 ± 0.12				36.7 ± 0.11			

Indications for caesarean section were similar in both groups. The patients who had a previous caesarean section made up more than half of the subjects in both groups (Table 2).

Table 2. Indications for caesarian section

	Ceftriaxone monodose intraoperatively (2.0g) n = 34		Ceftriaxone postoperatively for three days (2.0g/24h) n = 34	
Previous caesarian section	24	70.59%	25	73.52%
Fetal distress	3	8.82%	2	5.88%
Maternal Distress	1	2.94%	2	5.88%
Malpresentation	5	14.7%	3	8.82%
Other	1	2.94%	2	5.88%

The approach to opening the abdomen, duration of the operation, intraoperative complications, intraoperative blood loss, as well as the abdominal closure technique were practically the same in both examined groups and without statistical significance (Table 3).

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Table 3. Surgical data

	Ceftriaxone monodose intraoperatively (2.0g) n = 34				Ceftriaxone postoperatively for three days (2.0g/24h) n = 34			
Pfanennstiel section	31		91.17%		32		94.12%	
Median section	3		8.83%		2		5.88%	
Duration of surgery (min)	48.55 ± 8.31				51.12 ± 5.42			
Adhesions	5		14.7%		3		8.82%	
Abdominal closure	Single suture		Dermodermal suture		Single suture		Dermodermal suture	
	3	8.82%	31	91.18%	2	5.88%	32	94.18%
Atony	0		0%		1		2.94%	
Blood loss	1		2.94%		1		2.94%	

Postpartum complications occurred in 7 patients who received a monodose of ceftriaxone intraoperatively (2.0 g): out of these 7, 5 patients had a fever and 2 did not. Out of 5 patients with fever, 3 had wound infection, 1 had endometritis and 1 had transient postpartum fever. While 2 patients without fever had a wound infection.

Considering the second group, that is, the group of patients who received ceftriaxone three days postoperatively (2.0g/24h), 9 of them had postoperative complications. There were 6 patients with fever, while 3 of them were without it. Out of 6 patients who had fever, 3 had wound infection, 1 had endometritis, 1 had urinary infection and 1 had transient postpartum febrility (Table 4).

Table 4. Postpartal morbidity

	Ceftriaxone monodose intraoperatively (2.0g) n = 34				Ceftriaxone postoperatively for three days (2.0g/24h) n = 34			
Postpartum morbidity	n = 7 (20.58%)				n = 9 (26.47%)			
	Sa t°		Bez t°		Sa t°		Bez t°	
	5	14.7%	2	5.88%	6	17.65%	3	8.82%
Wound infection	3	8.82%	2	5.88%	3	8.82%	3	8.82%
Endometritis	1	2.94%	0	0%	1	2.94%	0	0%
Urinary infection	0	0%	0	0%	1	2.94%	0	0%
Transient postpartum fever	1	2.94%	0	0%	1	2.94%	0	0%

Wound infection was the most common type of postoperative morbidity in both groups, with a prevalence of 14.7% in group I and 17.64% in group II. Microbiologically confirmed wound infection in group I was 8.82%, and in group II 11.76%. Staphylococcus aureus was the most frequently isolated bacterium, while Enterococcus faecalis, Streptococcus B and Escherichia coli were isolated in a smaller number of patients. Although there was no difference in morbidity, patients who received a single dose of ceftriaxone intraoperatively (2.0g) were hospitalized one day less, which is statistically significant (Table 5).

Table 5. Maternal outcome

	Ceftriaxone monodose intraoperatively (2.0g) n = 34		Ceftriaxone postoperatively for three days (2.0g/24h) n = 34	
Resuture	1	2.94%	1	2.94%
Days of hospitalisation*	4		5	
Microbiologically diagnosed wound infection	3	8.82%	4	11.76%
Change of antibiotics	1	2.94%	1	2.94%

*p-value <0.05- statistically significant

Discussion

According to the Centers for Disease Control and Prevention (CDC) in Atlanta, surgical site infections are considered an important global problem. Surgical site infections are associated with a longer duration of treatment, the need for additional surgical procedures, and a higher rate of postoperative mortality and morbidity. International guidelines and National Clinical Practice Guides provide clear guidelines and recommendations for the proper implementation of antibiotic prophylaxis. Irrational and inadequate use of antibiotics is one of the main drivers of the development of bacterial resistance with the appearance of numerous side effects of antibiotics and increased overall treatment costs (6, 8).

Although prophylactic antibiotic administration has been shown to reduce the incidence of postoperative infectious morbidity after cesarean delivery, the most effective administration regimens have not been determined (7). This study on the prophylactic use of antibiotics in elective caesarean section included 68 patients with the aim of comparing the risk of postoperative morbidity in two different modalities of antibiotic use. Our research compared two regimens of prophylactic antibiotic administration: intraoperative administration of ceftriaxone monodose (2.0g) versus three-day administration of the same drug in a dose of 2.0g/24h.

The prevalence of febrile morbidity in 35.29% after elective caesarean section was comparable to the data from the literature (8,9). Febrility can occur after any surgical procedure, and a subfebrile temperature after elective caesarean section is not necessarily an indicator of infection. Febrility with the presence of infection would require initiation of an

empiric regimen of antibiotic therapy before the results of wound swabs or lochia are available (10).

Endometritis is another indicator of postoperative cesarean infection. In most studies as in this one, it is clinically diagnosed based on elevated temperature, uterine tenderness, compromised uterine involution, and abnormal lochia. The low rate of endometritis in this study can be explained by the fact that patients who delivered by elective caesarean section had intact fetal membranes and did not have cervicovaginal infection or, if they did, there was not a sufficient number of pathogenic microorganisms in the vagina to colonize the endometrium (11-13).

Wound infection was the most common postpartum complication in both groups. Although the prophylactic application of antibiotics did not reduce the rate of wound infection, the patients from the first group stayed one day shorter in the hospital. Wound infection and endometritis contributed to prolonging the hospital stay by more than one week in all cases (14). Surgical preparation of the surgical field and failure in surgical technique and hemostasis can affect wound infection. The majority of infected wounds did not require the application of additional antibiotics, but were treated with a local cleaning with hydrogen, irrigation with saline and povidone-iodine solution (15).

Conclusion

The study showed that there was no reduction in the incidence of postoperative morbidity of any etiology in patients who received ceftriaxone in a three-day regimen. Adequate surgical technique and adequate surgical hemostasis are probably of greater importance in reducing postoperative morbidity than the therapeutic use of antibiotics. Accordingly, it is important to emphasize that the three-day use of antibiotics is unjustified because it does not reduce the risk of wound infections, postoperative endometritis, urinary infections and other causes of febrility. Prophylactic administration of antibiotics in the form of a single dose intraoperatively in elective caesarean section is the most adequate modality of antibiotic administration and is therefore recommended as a routine practice. This study indicates the benefit of intraoperative monodose administration after umbilical cord clamping.

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