

# The Comparison of Prophylactic Antibiotic Usage in Cesarean Section Before Incision and After Umbilical Cord Clamping

## SEZARYEN KESİŞİNDE İNSİZYONDAN ÖNCE VE KORDON KLEMPAJINDAN SONRA PROFİLAKTİK ANTİBİYOTİK KULLANIMININ KARŞILAŞTIRILMASI

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### Summary

**Objective:** We aimed to examine the efficacy of piperacilline use in prophylaxis of postoperative wound infection before incision and immediately after umbilical cord clamping.

**Material and Methods:** 205 pregnant women undergoing abdominal cesarean section due to various indications admitted to our clinic between February 1999 and September 2000 were randomized. 108 pregnant women were randomly assigned to receive 1gr of piperacilline (Pipraks®-Eczacıbaşı/Turkey) intravenously before incision (first group) and 1gr piperacilline (Pipraks®-Eczacıbaşı/Turkey) was administered to other 97 pregnant women intravenously, immediately after umbilical cord clamping (second group). Totally 3 doses of piperacilline were administered to women every 12 hours postoperatively. All the patients were observed for postoperative fever, urinary tract infection, wound infection and endometritis with positive aerobic and anaerobic cultures.

**Results:** No significant difference was found between the groups considering predisposing risk factors causing infection following cesarean section period. In evaluation of postoperative complications in both groups; wound induration in 11 cases (10.10%) versus 14 cases (14.40%), wound discharge in 4 cases (3.70%) versus 5 cases (5.15%), positive aerobic culture in 13 cases (18.57%) versus 12 cases (20.30%), febrile morbidity in 7 cases (6.48%) versus 7 cases (7.21%) and neonatal infection in 3 cases (2.70%) versus 4 cases (4.10%) was detected in the first and the second group; respectively.

**Conclusion:** Although, no statistically significant difference was detected for postoperative complications between the groups, it was found that the postoperative complications of the first group were less than the second group. The widely held practice in the prophylaxis of cesarean section is to give antibiotics immediately after umbilical cord clamping. We suggest that, administration of prophylactic antibiotics for cesarean section after umbilical cord clamping is as effective as before making incision.

**Key Words:** Cesarean section, Antibiotic prophylaxis, Administration time

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### Özet

**Amaç:** Postoperatif yara enfeksiyonlarının profilaksisinde insizyon yapılmadan önce ve kordon klempajından sonra kullanılan piperacilline'in etkinliğini araştırmak.

**Materyal ve Metod:** Şubat 1999- Eylül 2000 tarihleri arasında kliniğimizde çeşitli endikasyonlarla sezaryene alınan 205 gebe kadın çalışmaya alındı. Rastgele seçilen 108 gebeye insizyon yapılmadan önce 1gr piperacilline (Pipraks®-Eczacıbaşı/Turkey) intravenöz verildi (Birinci grup). Geri kalan 97 gebeye ise 1gr piperacilline (Pipraks®-Eczacıbaşı/Turkey) intravenöz yoldan kordon klempajından hemen sonra uygulandı (İkinci grup). Toplam 3 doz piperacilline 12 saat ara ile verildi. Bütün hastalar postoperatif ateş, idrar yolu enfeksiyonu, yara enfeksiyonu, aerobik ve anaerobik kültürler ile endometrit gelişimi açısından gözlemlenmiştir.

**Bulgular:** Her iki grup arasında sezaryen sonrası enfeksiyona neden olabilecek predispozan risk faktörleri açısından anlamlı bir fark saptanmadı. Her iki grupta postoperatif komplikasyonlar karşılaştırıldığında; birinci grupta yara endurasyonu 14 (%10.10), yara akıntısı 4 (%3.70), yara açılması 2 (%1.90), pozitif aerobik kültür 13 (%18.57), febril morbidite 7 (%6.48) ve neonatal enfeksiyon 3 (%2.70) vakada tespit edilirken bu oranlar ikinci grup için sırayla 14 (%14.40), 5 (%5.15), 3 (%3.09), 12 (%20.30), 7 (%7.21) ve 4 (%4.10) olarak bulunmuştur.

**Sonuç:** Her iki grup arasında postoperatif komplikasyonlar yönünden istatistiksel olarak anlamlı bir fark tespit edilmesine rağmen, birinci gruptaki komplikasyon oranı ikinci gruptan daha düşüktü. Sezaryenlerde, genel pratikte profilaktik amaçla verilen antibiyotikler kord klempajından hemen sonra uygulanmaktadır. Sezaryende profilaktik olarak, antibiyotiklerin kordon klempajından sonra yapılmasının, insizyondan önce yapılması kadar etkili olduğunu düşünmekteyiz.

**Anahtar Kelimeler:** Sezaryen seksiyonu, Antibiyotik profilaksisi, Veriliş zamanı

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Abdominal cesarean section (C/S) is the most common surgical intervention in obstetrics. As postoperative complications, endometritis, urinary tract infection and wound infection are seen more commonly in patients delivered through abdominal C/S compared to normal spontaneous vaginal delivery (1). 'Emergency' cesarean delivery, rupture of chorioamniotic membrane over more than 6 hours, operation time more than 1 hour and patient age less than 24 years are the high risk factors for the post-cesarean infections (2).

Endogenous vaginal flora are the most commonly isolated microorganisms in post-cesarean infections. These microorganisms are the primarily commensal agents as *Lactobacilli* and *Diphtheroids*. The major pathogenic microorganisms are *Streptococcus agalactica*, *Escherichia coli*, *Escherichia cloecea*, *Klebsiella pneumonia*, *Proteus spp*, *Pseudomonas aeruginosa*, *Fusobacterium* and species of *Bacteriodes* (3-5).

Antibiotic prophylaxis can be defined as the administration of an anti-microbial agent known to have minimal toxicity to the patient that is effective in reducing the risk of postoperative infection. Piperacilline is a semi-synthetic and an extended-spectrum penicilline with activity against a variety of gram positive and gram negative aerobes, and all important anaerobic bacteria including *Bacteroides fragilis* (6). Timing of antibiotic administration is of paramount importance (7).

We aimed to examine the efficacy of piperacilline use in prophylaxis of cesarean section infections before incision and immediately after umbilical cord clamping.

### Material and Methods

A randomized prospective study enrolled 205 women who underwent abdominal cesarean section for various indications in Medical Faculty of Yüzüncü Yıl University, in Obstetrics and Gynecology clinic during the period from February 1999 to September 2000. The ethics committee approved the protocol and informed consent was obtained from all women.

The socio-demographic characteristics, complaints, physical examination findings, gravid, cesarean indication, interval from amnion membrane rupture to delivery, duration of hospitalization, operating time, postoperative hospitalization of patients, physical examination findings at 48 hours of postoperative time, complete blood count, complete urine examination results of patients were recorded on previously prepared forms. To randomly assigned 108 patients, 1gr of intravenous piperacilline (Pipraks®-Eczacıbasi /Turkey) was administered 30 minutes before the incision (first group), 1gr of piperacilline (Pipraks®-Eczacıbasi /Turkey) was administered to other 97 patients immediately after umbilical cord clamping (second group) for prophylaxis and completed to 3 doses with 12 hour intervals postoperatively. All patients had an indwelling bladder catheter for 12 hours after surgery.

All the patients were evaluated for postoperative fever, urinary tract infection, wound infection and endometritis. Febrile morbidity was defined as body temperature more than 38°C lasting for two days beyond the first 24 hours of operation. A patient was considered to have urinary tract infection if she had dysuria, fever or positive urine culture. Wounds were classified as clean, indurated, discharged and wound dehiscence. While the study was going on, endometrial cultures were also added to the materials and method. Aerobic and anaerobic endometrial cultures at postoperative 72 hours were prepared. The women were considered to have post-cesarean endometritis with positive aerobic and anaerobic culture results.

All of the neonates were followed by cooperation with pediatricians in neonatal care unit and physical examination findings were recorded.

T test was used for parametric values and Mann-Whitney U test for non-parametric values.

### Results

The socio-demographic features of patients in the groups are shown in Table-1. There was no

**Table 1.** Socio-demographic features of patients.

	First group	Second group	P
Age	27.68±1.38	28.24±1.20	>0.05
Gravida	4.03±0.65	3.42±0.41	>0.05
Parite	2.3±0.49	2.15±0.34	>0.05
Abortion	0.62±0.22	0.3±0.10	>0.05
Gestational age(weeks)	38.01±1.31	37.47±0.65	>0.05
Number of vaginal examination	2.95±2.35	3.15±2.12	>0.05
Interval. Rupture of memb. to delivery (min.)	208.16±109.82	215.88±84.41	>0.05
Preoperative hospitalization (days)	1.40±0.15	1.18±0.09	>0.05
Preoperative fever (°C)	36.06±0.9	36.6±0.5	>0.05
Operating time (min.)	43.52±9.63	48.10±21.56	>0.05

The values are given as mean ± standart error of mean

statistically significant difference between the groups according to their ages and the number of gravid, parity, abortion and gestational age, number of vaginal examination, preoperative fever, interval between rupture of chorioamniotic membrane and delivery, the preoperative hospitalization time and operation time. The indications for cesarean section is shown in Table 2. The complications of pregnancy for both groups are shown in Table 3. There was no statistically significant difference between these groups.

Aerobic and anaerobic endomertial cultures were taken from 129 patients: of these patients, 70 were from the first group and 59 from the second group. Positive aerobic culture in 13 cases (13/70- 18.57%) versus 12 cases (12/59- 20.30%) was detected in first group and second group; respectively (Table 4). As postoperative complications; the wound induration in 11 cases (10.10%) versus 14 cases (14.40%), wound discharge in 4 cases (3.70%) versus 5 cases (5.15%), febrile morbidity in 7 cases (6.48%) versus 7 cases (7.21%) and neonatal infection in 3 cases (2.70%) versus 4 cases (4.10%) was found in first group and second group; respectively. The duration of postoperative hospitalization of patients was similar in both groups, 4.10 ± 0.22 and 5.26±0.45 days; respectively (Table 4). Aerobic culture results of the first group were detected as: *Escherichia coli* in 7 cases, *Streptococcus agalactica* in 4 cases, *Klebsiella pneumonia* in 2 cases. Aerobic culture results of the second group were detected as: *Escherichia*

**Table 2.** Cesarean indications.

	First group	Second group	P
Group 1	22(20.37%)	19(19.58%)	>0.05
Group 2	27(25.00%)	23(23.71%)	>0.05
Group 3	14(12.96%)	10(10.30%)	>0.05
Group 4	9(8.33%)	9(9.27%)	>0.05
Group 5	26(24.07%)	26(26.80%)	>0.05
Group 6	10(9.25%)	10(10.30%)	>0.05

Group 1: Previous abd C/S

Group 2: Fetal distress

Group 3: Arrest in labor , Cord prolapsus, hand presentation

Group 4: Placenta previa totalis, Ablatio placenta

Group 5: CPD, Transvers position, Breech primipar,

Macrosomic fetus +breech presentation,

Cervix cancer, The history of colporrhaphy anterior and posterior

Group 6: Elective

*coli* in 4 cases, *Streptococcus agalactica* in 2 cases, *Klebsiella pneumonia* in 2 cases, *Staphylococcus aureus* in 1 case, *Enterobacter agglomerans* in 1 case, *Serratia plymuthica* in 1 case, *Ruminoc productus* in 1 case. As positive anaerobic culture, one case of *gram positive coccus* was detected in both groups.

## Discussion

The rate of abdominal C/S has increased from the rate of 5.5% to 17.5% in the past 20 years (8). The postpartum morbidity and infection rates are increased in patients delivered through abdominal C/S. When the post-cesarean morbidity is evaluated, the estimated rate is found approximately 11-20% (2). Wound infection is defined in 1.5-5.5% of patients receiving antibiotic prophylaxis (9). In our study the sum of wound

**Table 3.** Pregnancy complications.

	<b>First group</b>	<b>Second group</b>	<b>P</b>
Preeclampsia-Eclampsia	20(18.50%)	17(17.50%)	>0.05
Diabetes Mellitus	2(1.90%)	3(3.09%)	>0.05
Ablatio Placenta	4(3.70 %)	4(4.10%)	>0.05
Placenta Previa	1(0.90%)	1(1.03%)	>0.05
Polyhidramnios	1(0.90%)	2(2.06%)	>0.05
Surmaturation	2(1.90%)	2(2.06%)	>0.05
Premature rupture of membrane	7(6.40%)	7(7.20%)	>0.05
Preterm labor	4(3.70%)	4(4.10%)	>0.05

**Table 4.** Post-cesarean morbidity.

	<b>First group</b>	<b>Second group</b>
Febrile morbidity	7/108(6.48%)	7/97(7.21%)
Wound induration	11/108(10.10%)	14/97(14.40%)
Wound discharge	4/108(3.7%)	5/97(5.10%)
Wound dehiscence	2/108 (1.90%)	3/97(3.09%)
Positive aerobic endometrial culture	13/70(18.57%)	12/59(20.30 %)
Positive anaerobic endometrial culture	1/70(1.40%)	1/59(1.70%)
Respiratory problems	3/108(2.77%)	5/97(5.15%)
Neonatal infection	3/108(2.77%)	4/97(4.12%)
<u>Postoperative hospitalization (days)</u>	4.10±0.45	5.26±0.45

P&gt;0.05

induration, discharge and dehiscence was found in a rate of 15.70% (17/108) and 23.40% (22/97) in the first and the second group; respectively. Another most commonly occurred post-cesarean infection is the endometritis which is seen in 40-70% of patients who were not receiving prophylactic antibiotics. The 50% reduction of this rate can be provided with antibiotic prophylaxis (10). This rate was found as 20% (14/70) and 22.03% (13/59) in the first and second group; respectively in this study. There now is substantial evidence supporting the use of prophylactic antibiotics in women undergoing cesarean delivery. There is controversy, however, about the selection of specific antibiotics for prophylaxis (11,12). Mugford et al. purposed that by the usage of prophylactic antibiotics in cesarean section routinely, reduced not only the risks for postoperative infection but also the cost of hospitalization (13).

In general, prophylactic antibiotic in cesarean section is administered immediately after umbilical

cord clamping to avoid suppression of fetal microbiologic flora (14). In our study, neonatal infection in 3 cases (2.70%) versus 4 cases (4.10%) was found in the first and the second group, respectively and no significant difference was detected between groups. Three doses antimicrobial administration was evaluated for high risk group of nulliparous women (15). Duff (1987) reviewed 25 randomized clinical trials in which it was demonstrated one or three doses of an antimicrobial given at the time of cesarean were found to decrease infection morbidity appreciably (16). We also have used three doses antibiotic for prophylaxis. The effect of administrating antimicrobial agents preoperatively versus immediately after cord clamping has been studied by Cunningham et al. Infectious complications occurred at the same rate in both treatment groups (17). In our study it was found that the postoperative complications of the first group were less than the second group. Gordon et al. evaluated antibiotic administration prior to incision and after

cord clamping. No significant difference in endometritis was observed between the treatment groups. The authors concluded that when trans-placental antibiotic passage is of concern, antibiotics can be safely and effectively administered after cord clamping (18). We suggest that trans-placental antibiotic passage is not be a concern. By Wax et al, in a randomized, double blind manner abdominal C/S planned 90 women were assigned to receive 1gr Cefazolin preoperatively or immediately after cord clamping and these two groups were evaluated with respect to the frequency of endometritis, wound infection, pneumonia, urinary tract infection, septic thrombophlebitis and occurrence of intraabdominal abscess formation. 2 cases of wound infections and one case of endometritis occurred in the second group. As a result, they detected that administration of prophylactic antibiotic preoperatively was not superior to antibiotic administration immediately after cord clamping to prevent post-cesarean infections (19). In our study, evaluation of postoperative complications in both groups, wound induration in 10.10% versus 14.40%, positive aerobic culture in 18.57% versus 20.3%, febrile morbidity in 6.48% versus 7.21% and neonatal infection in 2.70% versus 4.10% was detected in the group to which piperacilline (Pipraks®-Eczacibasi /Turkey) was administered before incision and the group to which piperacilline (Pipraks®-Eczacibasi /Turkey) was administered after umbilical cord clamping, respectively. Perioperative antibiotics effectively decrease the number of patients who develop postoperative wound infection (20). The rate of infectious complications and febril morbidity were 25 % and 42.5% respectively in the placebo group while those rates were decreased to 6.7% and 17.8% respectively, in the prophylaxis group (21). Antibiotics administered before or within the creation of the incision are much more effective than antibiotics administered for several days before or begun postoperatively (22). Classen and co-workers reported that the most effective time to administer antibiotic was within the 2 hours before incision (23).

### Conclusion

Although, no statistically significant difference was detected for postoperative complications between these two groups, it was found that the postoperative complications of the first group were less than of the second group.

Guidelines for the practical use of antibiotic prophylaxis in surgery include, effective concentration of the drug in the wound at the time of incision and effectiveness against contaminating pathogens (24). The widely held practice in the prophylaxis of cesarean section is to give antibiotics immediately after umbilical cord clamping. We suggest that administration of prophylactic antibiotics for cesarean section after umbilical cord clamping is as effective as before making incision.

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