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Original Research Article

Comparison of single dose cefuroxime and multiple dose ceftriazone in elective caesarean section

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ABSTRACT

Background: Caesarean section is a major life saving surgical procedure for mother and baby. The objective of this study to evaluate the efficacy of single dose of 1.5 gm of cefuroxime as prophylactic antibiotic compared to multiple doses of ceftriaxone in elective caesarean section in reducing postoperative morbidity.
Methods: This is an observational study conducted at tertiary care teaching hospital. A total of 434 cases were included from January 2017 to September 2018. One group of patients were given single dose cefuroxime 1.5 gm intravenously 30 minutes before the surgery as prophylactic antibiotic. Other group include those patients who have been operated for elective caesarean section before this existing antibiotic policy, where multiple doses of ceftriaxone 1 gm intravenously 12 hourly for 7 days were given as per policy of that time. A data collection forms were designed to record information about every patient including comprehensive history, examination, investigations, intra-operative events and post-operative follow-up course.
Results: In cefuroxime group 3.7% and in ceftriaxone group 4.6% had wound discharge. Both the groups had 2.8% of wound dehiscence. In cefuroxime group, 0.9%had other infections like upper respiratory tract infections/urinary tract infections (URTI/UTI), whereas in ceftriaxone group 2.3% patients had other infections. In cefuroxime group 4.1% patients and in ceftriaxone group 6% patients had extended hospital stay.
Conclusions: This study supports that single dose of cefuroxime can replace multiple doses of other antibiotics as prophylaxis for post caesarean section infection with reducing infectious morbidity in a cost-effective manner.

Keywords: Caesarean section, Cefuroxime, Antibiotic prophylaxis, Postpartum infection, Sepsis

INTRODUCTION

Caesarean section is an abdominal operation by which the fetus is delivered through an incision on the abdomen and the uterus after 28 weeks of pregnancy.[1,2] It is a lifesaving procedure, both for the mother and the fetus. It is indicated either for the sake of the mother or the baby. The most common indications are cephalo-pelvic disproportion, obstructed labour, malpresentations, severe oligohydramnios, fetal and maternal distress, severe pre-eclampsia, placenta previa and intrauterine growth retardation.[3] The two most frequent complications of this surgery are fever and surgical site infection.[4] Although serious infectious complications are uncommon, other complications associated with caesarean section are hemorrhage, paralytic ileus, pulmonary embolism and anaesthesia related complications.[4] Sepsis is the state of being infected with pus producing organisms.[1] The principal sites of puerperal infection to be investigated are chest, pelvic organs, surgical wounds, legs and breast.[4] The chances of infection are increased because during delivery normal protective barriers against infection are temporarily broken down and this gives opportunity for potential pathogens to pass in the normally sterile environment of the uterus. Once virulent organism has reached the decidua, they can readily spread to the

myometrium, the parametrium, the peritoneum and the peripheral circulation. The most common organisms are *Streptococci*, *Staphylococci*, *Coliform*, *Anaerobes* and *Chlamydia*.[5] The diagnosis is clinical and confirmed by culturing the infecting organisms from wound, vaginal swab and blood sample.[5] Therefore one of the possible and increasingly promoted ways of reducing and preventing these infectious complications after surgery is to use prophylactic antibiotics.[6] Hence, it is justified to study the use of prophylactic antibiotics in the elective caesarean section.[6] The choice of prophylactic antibiotics depends on the factors that should be considered in the risk benefit equation including potential for reducing surgical infection, cost, adverse reactions and ease of administration of antimicrobial agents. The drugs used must be effective against the prevalent organisms, broad spectrum with minimal toxicity and easy to administer. Therefore, prophylaxis should meet the following demands: it should be of short term, bactericidal and non-toxic. These demands are met by many drugs, one of them is second generation cephalosporin namely cefuroxime. Single dose antimicrobial prophylaxis for major surgery, including but not limited to elective caesarean section, is a widely accepted principle and recommendations have been based on laboratory studies and numerous clinical trials.[7,8]

In the present study, as per the existing antibiotic policy of the study institute, patients included in the study were given 1.5 gm of single dose of cefuroxime and posted electively for caesarean section. This group of patients were compared with those patients who have been operated for elective caesarean section before the existing antibiotic policy, where multiple doses of ceftriaxone were given. In this study, the efficacy and safety of single dose of cefuroxime is compared with the multiple doses of ceftriaxone.

METHODS

This was an observational study conducted at tertiary care center teaching hospital (Government Medical College and Hospital, Miraj, Maharashtra) to evaluate the efficacy of single dose cefuroxime compared to multiple doses of ceftriaxone in prophylaxis of postoperative infection following elective caesarean section. A total of 434 cases were included in the study from January 2017 to September 2018. One group of patients were given single dose cefuroxime 1.5 gm intravenously 30 minutes before the surgery as prophylactic antibiotic. Other group included those patients who had been operated for elective caesarean section before this existing antibiotic policy, where multiple doses of ceftriaxone 1gm intravenously 12 hourly for 7 days were given as per policy of that time.

Inclusion criteria

All patients undergoing elective caesarean section in whom single dose cefuroxime was given during that period who are willing to participate in the study; and patients not showing any clinical signs or symptoms of infection were included in the study.

Exclusion criteria

Patients with preexisting or pre-operative focus of infection at any site; patients exposed to antimicrobial agents within last 7 days; those with known hypersensitivity to drugs under the study; and patients who are in labor were excluded from the study.

Data collection

Written informed consent was elicited from all the participants before enrollment in the study. A data collection form was designed and validated to record information about every patient including comprehensive history, proper examination, appropriate investigations, intra-operative events and post-operative follow-up course. A detailed history was taken and obstetrical examination done as per proforma. The hospital stay was calculated by including the day of the operation and excluding the day of discharge. Data was entered into Microsoft excel and was analyzed using statistical package for the social sciences (SPSS) (version 22). Chi-square test was employed to test for statistical significance.

RESULTS

This was an observational comparative study done at a tertiary care government center. A total 434 patients are included in the study, out of which 217 patients received single dose cefuroxime as a prophylactic antibiotic before elective cesarean section compared with 217 patients who had received multiple doses of ceftriaxone as prophylactic antibiotic previously. The study demonstrates the effectiveness of single dose of cefuroxime as prophylactic antibiotic compared to multiple doses of ceftriaxone in reducing postoperative morbidity and mortality in patients undergoing elective caesarean section. The incidence of post caesarean section morbidity was very low. In cefuroxime group 3.7% had wound discharge whereas in ceftriaxone group 4.6% had wound discharge. Both the groups had 2.8% of wound dehiscence, patients managed with antibiotic and resuturing of wound gape. One patient in ceftriaxone group had endometritis with peritonitis. The encountered infections responded to the prompt antibiotic therapy with no apparent increased risk of major postoperative complication. In cefuroxime group, 0.9% had other infections like URTI/UTI, whereas in ceftriaxone group 2.3% patients had other infections. Cefuroxime group had 4.1% patients with extended hospital stay and ceftriaxone group had 6% patients with extended hospital stay. The results of this study confirm that single dose of cefuroxime is as effective as multiple doses of ceftriaxone as prophylactic antibiotic in prevention of post caesarean section maternal morbidity.

Table 1: Post-operative fever distribution comparison between two groups.

Post-operative fever	Group					
	Cefuroxime		Ceftriaxone		Total	
	Count	%	Count	%	Count	%
No	214	98.6	208	95.9	422	97.2
Yes	3	1.4	9	4.1	12	2.8
Total	217	100.0	217	100.0	434	100.0

χ^2=3.085, df=1, p=0.079

Table 2: Wound discharge distribution comparison between two groups.

Wound discharge	Group					
	Cefuroxime		Ceftriaxone		Total	
	Count	%	Count	%	Count	%
No	209	96.3	207	95.4	416	95.9
Yes	8	3.7	10	4.6	18	4.1
Total	217	100.0	217	100.0	434	100.0

χ^2=0.232, df=1, p=0.63

Table 3: Wound dehiscence distribution comparison between two groups.

Wound dehiscence	Group					
	Cefuroxime		Ceftriaxone		Total	
	Count	%	Count	%	Count	%
No	211	97.2	211	97.2	422	97.2
Yes	6	2.8	6	2.8	12	2.8
Total	217	100.0	217	100.0	434	100.0

χ^2=0.000, df=1, p=1.000

Table 4: Hospital stay distribution comparison between two groups.

Hospital stay	Group					
	Cefuroxime		Ceftriaxone		Total	
	Count	%	Count	%	Count	%
Extended	9	4.1	13	6.0	22	5.1
Regular	208	95.9	204	94.0	412	94.9
Total	217	100.0	217	100.0	434	100.0

χ^2=0.766, df=1, p=0.381

Table 5: Infection distribution comparison between two groups.

Infection	Group					
	Cefuroxime		Ceftriaxone		Total	
	Count	%	Count	%	Count	%
No	215	99.1	212	97.7	427	98.4
Yes	2	0.9	5	2.3	7	1.6
Total	217	100.0	217	100.0	434	100.0

χ^2=1.307, df=1, p=0.253

DISCUSSION

In the present study, a prophylactic single dose of cefuroxime was studied for comparison with multiple doses of ceftriaxone. The objective of the study was to evaluate whether a single dose of prophylactic antibiotic is equally helpful in reducing infectious morbidity, hospital stay in a cost-effective manner with ease of administration, in comparison to the multiple doses of another antibiotic.

Only elective caesarean sections were included in the present study. The study by Parulekar et al had included both elective and emergency caesarean section in their study, whereas studies by Chelmow et al, Ahmed et al and Baqratu et al included only elective caesarean section in

their studies.[9-12] The present study and all other previously similar studies showed single dose appropriate antibiotic to be more efficacious in prevention of postoperative complications, except for the study by Saltzman et al, which showed better results with multiple doses antibiotic therapy compared to the single dose antibiotic therapy.[13]

Patients in both the groups were compared on the basis of factors like age, booking status, parity, body weight, preoperative hemoglobin (Hb), previous lower segment caesarean section (LSCS), risk factors like diabetes, hypertension, indication of caesarean section, duration of operation, amount of blood loss and postoperative Hb. This evaluation revealed no statistically significant differences in these factors in both the groups except for parity, previous section and indication of caesarean section and blood loss. Postoperative outcome such as postoperative fever, wound discharge, wound dehiscence and other infections like upper respiratory tract infections/urinary tract infections (URTI/UTI) were considered. There were no statistically significant differences between both the groups regarding all these parameters, except for one patient from ceftriaxone group who was diagnosed to have endometritis with paralytic ileus and was managed with prompt antibiotic coverage and fluid management.

In this study, in cefuroxime group 1.4% had febrile morbidity and while 4.1% had the same in ceftriaxone group. Vukomanovic et al observed 4.65% patients with fever in single dose group and 2.32% in multiple dose regime group.[14] In Bhattachan et al, single dose group had 2% cases of febrile morbidity whereas it was comparatively higher at 6% in multiple dose group.[15] In the study conducted by Shivamurthy et al, 3 patients in multiple dose group had postoperative fever, as compared to no patient with fever in single dose group.[16] In the study by Mugisa et al, no febrile morbidity was observed in both the groups.[17]

In the present study, 3.7% patients had wound discharge in cefuroxime group and 4.1% in ceftriaxone group. The incidence of wound dehiscence was same in both the groups with 2.8% incidence. As per Vukomanovic et al, 13.9% cases had wound infection including discharge and dehiscence in single dose group, whereas 18.6% case in multiple dose group had reported same.[14] In the study by Bhattachan et al, 2% patients in single dose group had wound infection with no case of wound infection reported in multiple dose group.[15] Mugisa et al study showed 1.3% patients having wound infection in single dose group and 2.4% in multiple dose group.[17] The present study reported incidence of other infections like UTI/URTI at 0.9% in cefuroxime group and 2.3% in ceftriaxone group. In the study by Shivamurthy et al, 4 patients in single dose antibiotic group had UTI as compared to 6 patients in multiple dose group; while 4 patients had RTI in single dose group, with equal number of incidences in multiple dose group.[16] Study by Bhattachan et al showed 4% case of UTI in single dose group and 2% in multiple dose group.[15] Vukomanovic et al reported no case of UTI in single dose group and 1 case in multiple dose group.[14]

There was one case of endometritis in this study in ceftriaxone group. In the study by Vukomanovic et al, both the groups had one case of endometritis each.[14] The study by Shivamurthy et al reported 4 cases of endometritis in multiple dose group against no case in single dose group, the difference being statistically significant.[16] Mugisa et al had no case in both the groups.[17] The incidence of resuturing for wound dehiscence was 6 patients (2.8%) in both the groups. Similar observations were reported by Vukomanovic et al, with incidence of 2 patients in both the groups.[14] The present study had no statistically significant difference in hospital stay of patients across both the groups. In cefuroxime group 4.1% cases and in ceftriaxone group 6% cases had extended hospital stay. Similar findings were in study by Vukomanovic et al, with no statistical significance in hospital stay in both the groups studied.[14]

Major limitations of the present study were the relatively smaller numbers to achieve statistical significance during sub-group analyses and the fact that the study was conducted at a tertiary care government teaching hospital, and hence the results may not be generalizable to other dissimilar facilities.

CONCLUSION

Caesarean section is a major life saving surgical procedure for mother and baby. Use of prophylactic antibiotic can help in reducing the postoperative infectious morbidity. Single dose of 1.5 gm of cefuroxime as prophylactic antibiotic has almost equal antimicrobial activity as compared to multiple doses of ceftriaxone. That is, single dose cefuroxime is as effective as multiple doses with dual advantage of single dose and lower cost. Therefore, the major finding of this study is that the single dose preoperative antibiotic coverage is safe, useful, easy to administer, cost effective and provided the benefit of minimal toxicity with decrease in risk of chemo-resistance. The data available from this study support that single dose of cefuroxime can replace multiple doses of other antibiotics as prophylaxis for post caesarean section infection with reducing infectious morbidity in a cost-effective manner.

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