

Comparison of combinations of ciprofloxacin-metronidazole and ceftriaxone-metronidazole in controlling operative site infections in obstetrics and gynecological surgeries: A retrospective study

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ABSTRACT

Objective: To compare the effectiveness of the ciprofloxacin-metronidazole (CIP-MET) regimen with the ceftriaxone-metronidazole (CEF-MET) regimen for operative site infection control in women undergoing obstetrical and gynecological surgeries. **Materials and Methods:** One thousand and eighty-four case records of women who had undergone various obstetrical and gynecological surgeries who were given CIP-MET regimen and CEF-MET regimen were analyzed in predesigned and pretested proforma. Patients who were given CIP-MET regimen and CEF-MET regimen were classified as Group 1 and Group 2 respectively. The mode of administration of both the regimens was noted. Numbers of wound infections were recorded in the respective groups. Socioeconomic status and hemoglobin level of the patients were noted. Other data such as hospital stay, duration of operation were also noted. **Results:** Out of a total of 1084 case records, 31 (5.8%) and eight (0.7%) patients contracted wound infections in Group 1 and Group 2 respectively ($P = 0.0001$). **Conclusion:** The CEF-MET regimen was found superior to the CIP-MET regimen to control operative site infection in obstetrical and gynecological surgeries.

Key words: Antimicrobial regimens, obstetrical and gynecological surgeries, wound infection rate

INTRODUCTION

Operative site infection is one of the most common complications of obstetrical and gynecological surgeries such as hysterectomy and cesarean section.^[1] Perioperative antimicrobial prophylaxis has long been advocated in such

surgical procedures.^[2] The use of prophylactic antibiotics in hysterectomy and cesarean section in our hospital is not standardized and is determined by the consultant in charge of the unit. The most commonly used regimens are ciprofloxacin-metronidazole (CIP-MET) and ceftriaxone-metronidazole (CEF-MET). Considering this background, this study was performed to compare the effectiveness of the CIP-MET regimen versus the CEF-MET regimen in preventing infection following various obstetrical and gynecological surgeries.

MATERIALS AND METHODS

This retrospective study was conducted at the Obstetrics and Gynecology Department, Guru Gobind Singh Hospital,

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Jamnagar. Data of six months (June 2010 to December 2010) were collected. With prior permission, records of 1084 patients who had undergone vaginal or abdominal hysterectomy, laparoscopy, laparotomy, elective or emergency cesarean section were noted. We excluded case records of those patients who had any associated medical illness like diabetes mellitus, chronic obstructive pulmonary disease, etc., who were prescribed antibiotics during the study. We divided the patients into two groups, who were given one of the two regimens: Group 1 (n=534) was given ciprofloxacin 200 mg intravenous infusion 12-hourly plus metronidazole 500 mg intravenous infusion 8-hourly for 48 h or till oral intake by patients, followed by tablet (ciprofloxacin 500 mg 12-hourly plus metronidazole 400 mg 8-hourly) to complete five days' treatment. Group 2 (n=550) was given injection ceftriaxone 1 g intravenously daily plus injection metronidazole 500 mg intravenous infusion 8-hourly for 48 h or till oral intake by patients, followed by tablet (cefixime 200 mg 12-hourly plus metronidazole 400 mg 8-hourly) to complete five days' treatment. The records of patients were checked for occurrence of wound infection in the postoperative period. Wound infection rates were analyzed statistically by Fisher's exact test and Yates' continuity corrected chi-square test using GraphPad Prism Version 5.01 software. $P < 0.05$ was considered statistically significant. The study was approved by the institutional ethics committee.

RESULTS

Out of the total 1084 case records, the distribution of patients according to type of surgery such as cesarean section, laparoscopy, hysterectomy and laparotomy is listed in Table 1. The age for obstetrics patients in our study ranged from 18-40 years, while for gynecology patients the age was up to 60 years. The average hospital stay recorded was three to eight days in both the groups. Analysis of risk factors responsible for development of infections is summarized in Table 2. Incidence of postoperative wound infections in obstetric and gynecological surgeries is recorded in Table 3. While the overall infection rate of all the surgical procedures in both the groups was 3.6% (39 infections in 1084 patients), the infection rates in Group 1 and Group 2 were 5.81% (31 infections in 534 patients) and 0.7% (eight infections in 550 patients) respectively ($P=0.0001$, confidence interval (CI) 95% 1.90–9.17, Odds ratio 4.18). Comparative analysis of the total duration, cost and adverse events of antimicrobial therapy is summarized in Table 4.

DISCUSSION

A number of studies indicate that chemoprophylaxis can be justified in dirty or contaminated surgical procedures, where the incidence of wound infection is high and these include less

than 10% of all surgical procedures.^[3] Postoperative infection in surgical sites in obstetric and gynecological settings has been higher as compared to other specialties because of the contaminated nature of most obstetric and gynecological procedures.^[4] Consideration of prophylactic antibiotics has been suggested for all elective cesarean deliveries in which the combined incidence of endometritis and wound infection exceeds 5%.^[5] A recent review of the literature concluded that a narrow spectrum agent prior to incision or an extended spectrum regimen (with metronidazole) after cord clamp offers the best outcome for patients in cesarean deliveries.^[6] Nowadays ciprofloxacin-metronidazole and cephalosporin-metronidazole combinations are chosen by surgeons to prevent wound infection following major abdominal surgical procedures.^[7]

In our study, it was observed that the rate of postoperative infection was significantly higher in Group 1 than Group 2 ($P=0.0001$). This might be due to development of resistance to ciprofloxacin by anaerobes^[8] which are the potential pathogens in the vaginal flora. On the other hand, low incidence of postoperative infection seen in Group 2 in our study might be attributed to the effectiveness of third-generation cephalosporins in mixed aerobic-anaerobic infections.^[8]

Postoperative infection is not only dependent on antibiotic use but also on many other factors, such as age, nutritional status, hygienic condition, anemic status, duration of operation, blood loss during operation and amount of blood transfusion.^[9] In the present study a greater number of infections (26 out of 39) were observed in those operations in which the average duration of surgery was between 30-120 min ($P<0.0001$). The surgeries in which all operative wound infections were recorded (i.e. 39), were performed within 120 min. It was

Table 1: Distribution of patients according to the type of surgery

Surgery	Number of patients (n=1084)	
	CIP-MET(Group 1), n=534	CEF-MET (Group 2), n=550
Cesarean section	281	267
Emergency	267 (95.02)	252 (94.38)
Elective	14 (4.98)	15 (5.62)
Laparoscopy	168	207
Emergency	168 (100)	207 (100)
Elective	0	0
Hysterectomy	76	69
Emergency	4 (5.26)	5 (7.25)
Elective	72 (94.74)	64 (92.75)
Laparotomy	9	7
Emergency	1 (11.12)	1 (14.29)
Elective	8 (88.89)	6 (85.71)

Values in parentheses represent percentage in respective surgeries; CIP-MET- Ciprofloxacin-metronidazole; CEF-MET- Ceftriaxone-metronidazole

Table 2: Analysis of risk factors for infections (n=1084)

Risk factors	Number of patients			Number of Infections (Group 1, Group 2)	P value	Odds ratio (95% CI)
	CIP-MET (Group 1), n=534	CEF-MET (Group 2), n=550	Total			
Duration of surgery						
< 30 min	378	390	768	13 (6, 7)	<0.0001	5.21 (2.64 to 10.27)
30 to 120 min [†]	156	160	316	26 (12, 14)		
Socioeconomic status						
Upper	146	151	297	5 (2, 3)	0.043	2.64 (1.02 to 6.81)
Lower [†]	388	399	787	34 (16, 18)		
Hemoglobin level						
>10 g/dL	176	180	356	6 (3, 3)	0.023	2.77 (1.15 to 6.67)
<10 g/dL ^{†10]}	358	370	728	33 (16, 17)		

CIP-MET- Ciprofloxacin-metronidazole; CEF-MET- Ceftriaxone-metronidazole; [†] Risk factors**Table 3: Incidence of postoperative wound infections in obstetric and gynecological surgeries**

Surgery	Infection rate in CIP-MET (Group 1), (n=534)	Infection rate in CEF-MET (Group 2), (n=550)	P value	Odds ratio (95% CI)
Cesarean section	18/281 (6.4)	6/267 (2.25)	0.02	2.97 (1.16 to 7.62)
Laparoscopy	0/168	0/207	-	-
Hysterectomy	9/76 (11.84)	1/69 (1.45)	0.032	9.13 (1.13 to 74.14)
Laparotomy	4/9 (22.22)	1/7 (14.30)	0.45	4.80 (0.40 to 58.10)
Total	31/534 (5.8)	8/550 (0.7)	0.0001	4.18 (1.9 to 9.17)

Values in parentheses represent percentage in respective surgeries; CIP-MET- Ciprofloxacin-metronidazole; CEF-MET- Ceftriaxone-metronidazole

Table 4: Comparative analysis of the total duration, cost and adverse events of antimicrobial therapy

Parameter	CIP-MET (Group 1), n=534	CEF-MET (Group 2), n=550
Duration of antimicrobial therapy in days	5	5
Cost of antimicrobial therapy in Indian rupees	280	290
Adverse events of antimicrobial therapy	13	9

CIP-MET- Ciprofloxacin-metronidazole; CEF-MET- Ceftriaxone-metronidazole

also observed that the majority of the infections (34 out of 39) were found in patients of low socioeconomic status ($P=0.043$). Similarly, a higher rate of infections (33 out of 39) were noted in patients who were anemic^[10] ($P=0.023$) [Table 2]. Therefore, it could be surmised that prolonged duration of surgery, lower socioeconomic status of the patient and anemia were also responsible for development of infections in our study. Both regimens were well tolerated. Thirteen and nine cases of mild nausea and vomiting were reported in Group 1 and Group 2 respectively. These adverse events found in our study most likely could be due to metronidazole therapy.

CONCLUSIONS

Adopting a cost-effective regimen would save hospital time and days of bed occupancy. For a patient, this would prevent pain and anxiety associated with infection. It will also prevent the loss of time and the loss of daily earnings by reducing the hospital stay of the patient. This retrospective study indicates that though the CIP-MET regimen was slightly more cost-effective (difference of Indian rupees 10.00),^[11] the rate of postoperative infection which was the primary concern was

significantly higher with this regimen. This suggests that the CEF-MET regimen was better than the CIP-MET regimen to control operative site wound infection rates in obstetrical and gynecological surgeries. Hence, ceftriaxone should be a part of the essential medicine formulary of the hospital.

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