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Research Article

Effects of Intraoperative 'Changing Glove Technique' on Post Cesarean Infectious Morbidity

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Abstract: Following cesarean section, wound infections are frequent causes of postpartum morbidity, complicating 5-15% cases. With prophylactic antibiotics, this morbidity has been reduced, but it still persists. Hence, the other factors which can influence the post cesarean wound infection may be the seedling of vaginal bacteria through the patient's abdominal wall incision by the surgeon's gloves. Hence this study was undertaken, to assess whether the "changing glove technique" by the entire surgical team intraoperatively, after delivery of fetus or after delivery of placenta would reduce the rate of post cesarean wound infection. Total 150 pregnant women undergoing cesarean section were selected for this study and randomized into three groups of 50 each. In study group A, gloves were changed intraoperatively by the entire surgical team after delivery of the placenta; in study group B, gloves were changed intraoperatively by the entire surgical team after the delivery of the fetus; while in the study group C, gloves were not changed at all. Statistical analysis was done by chi-square test and Fisher's exact test. The overall incidence of post cesarean morbidity was 4%, 8% and 18% in group A, B and C respectively. The comparison between the group A and C was statistically significant i.e., introperative glove changing technique by the entire surgical team has a significant decrease in post cesarean wound infection. *E.coli* was the most common organism isolated in infectious cases. With the results of this study, it is concluded that the obstetricians may decrease the number of post cesarean wound infection by having the entire team change surgical gloves after delivery of the placenta.
Keywords: Cesarean section, Wound infection, Surgical gloves.

INTRODUCTION

Over the past few decades, there has been a progressive increase in the number of cesarean sections performed. The risk of developing an infection after cesarean section has been demonstrated to be approximately seven to ten times than after a vaginal delivery. In spite of present standards of preoperative techniques and prophylactic antibiotics, post operative wound infections, still remains a serious problem of any surgery. The use of prophylactic antibiotics has gained wide acceptance, but the indiscriminate use has evolved in multi-resistant organisms.

This has resulted in many investigators attempting to identify the factors that may predispose patients undergoing cesarean section to post operative infection. There has not been consistent agreement in defining these factors. The development of post operative infections after obstetric surgery is frequently caused by endogenous micro flora of the lower genital tract. This was documented by some workers. During labor or cesarean section these bacteria gain entrance to the upper genital tract and pelvic cavity. The lower genital tract is colonized by large number of aerobic and anaerobic gram negative and gram positive bacteria included in this bacterial milieu are staphylococci, streptococci, members of enterobactericea, bacteroids and other aerobes [1].

It was documented by few workers about the frequent surgical glove contamination during extraction of fetal head. The dorsal aspect of surgeons' gloves was cultured after extraction of fetus; non staphylococcal bacteria were significantly present [2]. They suggested during the process of extraction, the dorsal aspect of the surgeons hand usually comes in contact with either the vaginal wall or the endocervical canal, and thus bacteria are inoculated directly into the surgeons' glove. The contaminated glove is again reintroduced into the endometrial cavity and the hence gloved hand directly touches the endometrial lining if the placenta is separated and delivered manually. This maneuver may

also increase the risk for bacterimia because the bacteria may be inoculated directly into the highly vascularised placental bed [3]. Hence, the concept of intraoperative glove changing technique has been studied here.

The objective of the study was to assess whether the "changing glove technique" by the entire surgical team intraoperatively, during cesarean delivery, after delivery of the fetus or after delivery of the placenta, would reduce the rate of post operative wound infection.

EXPERIMENTAL SECTION

A total of 150 cases were selected for this study among the pregnant women who underwent emergency or elective cesarean section at Chigateri general hospital, affiliated to J.J.M medical college Davangere. The selected cases were randomized into three groups.

Group A: Where gloves will be changed by the entire operating team after delivery of the placenta.

Group B: Where gloves will be changed by the entire operating team after delivery of the fetus.

Group C: Where gloves will not be changed during the procedure.

In this study, all the cesareans were done using similar surgical techniques. All the patients received intra operative antibiotic prophylaxis i.e., inj cefotaxim 1gm after cord clamping. All the cases were monitored during the postoperative period till the removal of sutures for,

Infectious morbidity

a. Febrile morbidity: defined as 2^0C temperature elevations ≥38. 2^0C observed 24hrs after surgery on 2 occasions 6 hrs apart.
b. Wound infection: defined as presence of
    i. Cellulitis (hyperemeia, induration, tenderness)
    ii. Purulent discharge from the incision site
    iii. Fluctuant tender, erythematous incision margins.
c. Foul smelling lochia.

Post operative patients were observed for febrile episodes and for evidence of infection by clinical examination of patients, routine investigations and special investigations like pus culture & sensitivity if needed.

Inclusion criteria

- Intact membranes prior to surgery
- Rupture of membranes <4 hrs prior to surgery
- Pregnant women with either maternal or fetal indication for cesarean delivery
- Undergoing less than 3 vaginal examinations prior to surgery

Exclusion criteria

- Morbid obesity(BMI >35)
- Rupture of membranes >4hrs prior to surgery.
- Pre-pregnancy diabetes
- Immuno-compromised status

Demographically there were no significant differences among the three groups.

The ethical clearance had been obtained from the institution for the study.

Statistical analysis

Descriptive data were presented as number and percentages with means and standard deviation wherever required. Chi-square test was used for analyzing categorical data. Fischer's exact test was used for comparing mean between two groups.

A p-value of 0.05 or less was considered statistically significant.

RESULTS

The following parameters were observed to evaluate post cesarean infectious morbidity.

- Temperature of 2^0C elevations ≥38. 2^0C observed at least 6hrs apart after 24hrs of surgery.
- Wound infection
- Urinary tract infection
- Foul smelling vaginal discharge.

In this study it was observed that the incidence of post cesarean infectious morbidity was quite less in the study group A than the study group B and the control group C.

The mean age of the study groups being 25.0±4.0, 23.0±3.3, 24.0±4.1 years for group A, B and control group C respectively.

Table 1: Age distribution in study group A, B and control group C

	Group A (n=50)	Group B (n=50)	Group C (n=50)
Mean age(yrs) ±SD	25.0±4.0	23.0±3.3	24.0±4.1
Age range	19-39	19-36	18-32

Table 2: Comparison of infectious morbidity in elective & emergency cesareans among the 3 groups

LSCS	Group A		Group B		Group C	
	n (%)	Morbidity %	n (%)	Morbidity %	n (%)	Morbidity %
Elective	28(56)	-	16(32)	2(12.5)	20(40)	2(10)
Emergency	22(44)	2(9.1)	34(68)	2(5.9)	30(60)	7(23.3)

Out of the fifty cases among the group A, in 28(56%) cases were taken as elective cesarean section, none had any morbidity, while in 22(44%) cases taken for emergency cesarean section in that group 2(9.1%) had infectious morbidity.

In group B out of 16(32%) cases were taken as elective cesarean section, 2(12.5%) had infectious morbidity, while out of 34(68%) cases taken for emergency cesarean section in that group 2(5.9%) had infectious morbidity.

In group C out of 20(40%) cases were taken as elective cesarean section, 2(10%) had infectious morbidity, while out of 30(60%) cases taken for emergency cesarean section in that group 7(23.3%) cases had infectious morbidity.

Table 3: Comparison of post operative morbidity in all three groups

Morbidity	Group A (n=50)	Group B (n=50)	Group C (n=50)
Fever	-	2(4)	3(6)
UTI	-	-	-
Induration	2(4)	2(4)	4(8)
Gaping(resuturing)	-	1(2)	-
Pus	-	1(2)	5(10)
Abd. Distension	-	-	2(4)
Lochia	-	-	-
RTI	-	1(2)	-
Overall morbidity	2(4)	4(8)	9(18)

Comparison of overall morbidity A vs. B p= 0.68 (NS); A vs. C p<0.05 (S); B vs. C p=0.23 (NS)

Post cesarean infectious morbidity were seen more in control group C where gloves were not changed throughout the procedure, than in those cases where gloves were changed after the delivery of the fetus(group B) while significantly low in cases where gloves were changed after the delivery of the placenta(group A). Fever was noted in 2(4%) and 3(6%) cases in group B and group C respectively while none in group A. UTI was seen in none of the groups. Wound induration was seen in 2(4%), 2(4%), 4(8%) cases in group A, B, and C respectively. Wound gaping was seen in only 1(2%) case under group B who underwent resuturing. Pus was obtained from the cesarean wound in 1 (2%) and 5(10%) cases among group B and group C respectively which was sent for culture and sensitivity. Lochia was healthy in all cases in all groups and RTI was seen in only 1(2%) case under group B.

Table 4: Causes for febrile morbidity in 3 groups

Causes	Group A (n=0)	Group B (n=2)	Group C (n=3)
Induration	-	-	-
Pus	-	1	2
Induration+pus	-	1	1

In group A, none of the cases had febrile morbidity, 2 cases in group B had febrile morbidity in that one had pus discharge from the wound alone, and the other had both induration and pus discharge from the wound. In group C 3 cases had febrile morbidity, 2 were due to pus discharge and one had both induration and pus discharge.

Table 5: Microorganisms isolated from morbid patients

Organisms	Group A	Group B	Group C
E. coli	-	1	3
Klebsiella	-	-	1
Pseudomonas	-	-	1

E.coli was the commonest organism isolated in our study. Other organisms isolated were *Klebsiella* and *Pseudomonas*.

Overall post cesarean infectious morbidity was seen only in 2(4%), 4(8%) and 9(18%) cases in group A, B and C respectively. Comparison of overall morbidity among the 3 groups revealed that the infectious morbidity is significantly less in group A which is statistically significant (p<0.05).

DISCUSSION

Wound infection remains a frequent cause of post-cesarean morbidity. 'Prevention is better than cure', it is far more practical also. It is better to find ways of

reducing infections than treating when the infection is already established.

There are many factors contributing for wound infections. Some factors cannot be altered e.g. the patient characteristics but few other factors can be altered. A potentially important source of post cesarean wound infection may be seeding of vaginal bacteria through the patient's abdominal wall incision by the surgeon's gloves.

Previous studies of the effect of intraoperative changing of the surgeons gloves after delivery of fetus, failed to show a decrease in the incidence of post cesarean infectious morbidity [4, 5]. Previous some studies included women who were in labor and those amniotic membranes had been ruptured [4, 6]. Although women with overt chorioamnionitis were excluded from these studies, some of the women who were included might have had subclinical infection prior to surgery [7].

In one study only the primary and assistant surgeons [4] changed their gloves after delivering the neonate but prior to removal of the placenta; in other words, they inserted their freshly gloved hands back into the uterine cavity, which in some cases, contained lower genital tract organisms [8]. Other members of the surgical team who handled tissue and instruments might have continued to carry bacteria on their gloves.

The close interaction of surgical team members other than the surgeons in the surgical procedures was demonstrated in another study of surgical glove perforation during obstetrical surgical procedures [5].

In a recent study by some workers, laboring patients and women with ruptured membranes were excluded. They pretended to study only 1 aspect of post cesarean infectious morbidity, wound infection. The entire surgical team changed their gloves after delivery of the placenta. They found that the wound infection were significantly less in group where gloves were changed after delivery of placenta than the control group i.e. 2 vs. 9 cases 5.5% to 25% $p=0.05$[8].

The current study was different in following aspect in following respects from previous ones.

- The entire surgical team's gloves were changed.
- The gloves were changed after delivery of placenta in group A and after delivery of fetus in group B (2 study groups)
- Laboring patients and women with ruptured membranes of 4 hrs or less duration were included because risk of chorioamnionitis increases more after 4hrs of ROM.

The results were comparable with that of the recent study by Ventolini G and coworkers [6]. The overall morbidity was significantly less in the group where gloves were changed after delivery of the placenta than the control group i.e. 2 vs. 9 cases, 4% to 18% $p< 0.05$. But the comparison between the group where gloves were changed after delivery of the fetus and the control had no statistical significance i.e. 4 vs. 9 cases 8% to 18% $p>0.05$.

CONCLUSION

In conclusion, it is suggested that the risk of post operative wound infection is increased by the introduction of lower genital tract organisms through the peritoneal cavity and the patients' abdominal wall by the surgeon's gloved hand. Changing gloves after delivery of the fetus by the entire surgical team does not reduce the post operative wound infection because the freshly gloved hands are again reinserted back into the uterine cavity which contained lower genital tract organisms. Changing gloves after delivery of the placenta by the entire surgical team participating in the operative procedure significantly reduces the rate of post operative wound infection. Excluding from the study women who were at high risk of developing post cesarean infectious morbidity may be one of the study's limitations.

The present study introduces few questions to be answered,

- What is the risk of post cesarean wound infection from the instruments and especially mops which continue to be in use even after glove changing for rest of the procedure?
- Will the dipping of gloved hands into the effective antiseptic solution e.g chlorhexidine after the delivery of the placenta will give the similar or better results than the present study?

Answer for the first question may be ideally to change the mop which was used till the delivery of placenta. The second question needs some prospective randomized controlled trials.

Finally it can be concluded, till further studies find answers for the above questions, that obstetricians may decrease the number of post cesarean wound infections significantly by having the entire team change surgical gloves after delivery of the placenta.

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