

MANUAL VERSES SPONTANEOUS REMOVAL OF PLACENTA DURING CAESAREAN SECTION ON OPERATIVE BLOOD LOSS AND POST OPERATIVE ENDOMETRITIS: A COMPARATIVE STUDY

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Abstract

Background: The average blood loss in caesarean delivery is approximately 01 litre. Many techniques had been tried to reduce the intra operative blood loss. Clinicians agree that a faster closure of uterine incision will result in lesser blood loss. But that is not possible till placenta is delivered completely. Our study aimed to compare the intra op blood loss with spontaneous and manual removal of placenta during caesarean section and incidence of post operative endometritis. **Materials and Methods:** The study was conducted at a tertiary care hospital of Pune. Patients undergoing caesarean delivery were randomized into two groups by using a computer generated number table. Group 1 consists of patients in whom placenta was spontaneously and in Group 2 placenta was manually separated. Blood loss estimation was done by using quantitative method. Statistical analysis was done for various factors such as pre op hemoglobin/hematocrit, WBC, duration of surgery, intra op blood loss, factors affecting intra op blood loss; post op hemoglobin/hematocrit, WBC and hospital stay in both the groups. The association between parameters such as maternal age, parity, maternal weight, and gestational age at LSCS and its indication (elective/emergency LSCS), incidence of endometritis and association between meconium and PROM with endometritis in both the groups. Probability value of $p \leq 0.05$ was taken as the level of statistical significant. **Result:** A total of 840 patients (420 in each group) were included in the study. The mean duration of surgery was lesser in group 2 (32.5 min) as compared to group1 (38.5 min) and the difference was significant ($p < 0.001$). The blood loss was lesser in group 1 as compared to group 2 and the difference was significant ($p < 0.001$). A total of 26 patients had endometritis and the incidence is 3.132 in our study. The cases of endometritis were 09 in group1 and 17 in group 2 with incidence of 2.16 and 17 in group 2 with incidence of 4.09. Meconium stained liquor was clearly associated with endometritis in both groups (OR 39.56, OR 61.66). Premature rupture of membrane (PROM) was another factor having direct bearing over incidence of endometritis particularly in cases where placenta was manually removed (OR 6.04, OR 10.1). **Conclusion:** Manual removal of placenta was associated with reduced operative time, increased intra op blood loss, reduced post op hemoglobin and hematocrit, increased incidence of endometritis and prolonged hospital stay. In cases of meconium stained liquor (MSL) and PROM, a manually removed placenta caused increased endometritis in post op period.

INTRODUCTION

Caesarean delivery is defined as birth of the fetus via laparotomy and then hysterotomy.^[1] The term

caesarean delivery was first used by James Guillimeau and was documented in 1020 AD.^[2] In 1982, the German gynecologist Max Sanger introduced classical caesarean and advocated closure of the uterine incision using gut sutures. He

has been rightly called as the father of modern caesarean section.^[3] It was Munro Kerr in 1926 that first described the lower segment transverse uterine incision and popularized the procedure.^[4]

According to a WHO statement published in 2015, the ideal rate for caesarean section in a given population should be 10-15 %.^[5] But on the contrary; the incidence of caesarean delivery is rising in many parts of the world including India. In the United States the caesarean delivery rate rose from 4.5 % in 1970 to 32.9 % in 2009. Following this peak, the rate trended downward slightly, and it was 32 % in 2015.^[6] In our country the National Family Health Survey (NFHS) 4 of 2015 found that the caesarean rate is 17.2 %, higher than the WHO recommended limit.^[7] The Government of India released the NFHS-5 data on Dec 20 which shows alarming level of increased rate of caesarean section in states & UTs. Telangana has reported the most C-section deliveries in the past half-decade - a stunning 60.7% of all deliveries. The northeastern states of Manipur (8.2%), Mizoram (10.8%) and Nagaland (5.2%) have the lowest C-section rates and have also reported the smallest increases, of 1-2% since NFHS-4. NFHS-5 also reveals an interesting urban-rural difference in Caesarean deliveries. It may not be surprising that urban areas report more C-sections than rural ones except in Goa and Lakshadweep, where it's the other way around.^[8] It is a well-known fact that caesarean delivery is the commonest performed surgery worldwide. Modern day caesarean delivery is being done by Pfannenstiel method or Misgav Ladach technique. In both the methods the placenta can be delivered by spontaneous separation or manual removal. There is a diversity of published opinion regarding recommended method for removal of placenta during caesarean delivery. Should it be expelled spontaneously or manually extracted? Multiple studies have done regarding the methods of placental delivery and its effects on maternal blood loss, duration of surgery and postpartum infective morbidity (endometritis and wound infection).^[9,10,11,12,13,14,15,16]

Endometritis is the most common post operative infection after caesarean delivery. An elevation of maternal temperature more than 38 degree C (100.4 F) in the post op period associated with uterine tenderness and foul smelling lochia is the characteristic of endometritis.^[17] Although fever is a hallmark of pelvic infection but other causes of fever such as UTI, respiratory tract infections, tropical infections (malaria, dengue etc), drug or IV fluid reaction and perineal lacerations should be ruled out in first 48 hrs.^[18] Spiking fever of 39° C occurring within 24 hrs of surgery is uncommon but may be associated with virulent pelvic infection.^[19] Fever because of breast engorgement typically occurs after 48 hours. There is leucocytosis in the range of 15,000 to 30,000/cmm but delivery itself increases the leukocyte count.^[20] Uterine tenderness alone is not sacrosanct of pelvic infection as 'After

pains' which is physiological and all patients have some degree of post op uterine tenderness and sometimes become more pronounced during breast feeding because of release of Oxytocin by the pituitary gland. The endometrial culture report is also uncertain because of contamination of specimen while collected transcervically.^[21] The purpose of the study was to evaluate the impact of the methods of placenta removal during caesarean delivery on operative time, maternal blood loss and incidence of endometritis during post op period and length of hospital stay after caesarean delivery.

MATERIALS AND METHODS

The Study Design, Area and Duration

This prospective randomized study was conducted at department of obstetrics & gynecology in a tertiary care centre of Pune. The duration of the study was between Dec 18 to June 21.

Population

Source Population

All antenatal patients who is a booked case and visiting antenatal OPD at our centre.

Study Population

The study population comprises of all antenatal patients who were at term and underwent elective or emergency LSCS at our centre. The indication of emergency LSCS was mainly fetal distress, non progress of labour, cord prolapse, severe preeclampsia and IUGR pregnancies. Elective LSCS was done mainly for post caesarean pregnancy, breech presentation and maternal request.

Eligibility

Inclusion Criteria

All antenatal patients who underwent elective or emergency LSCS at term at our centre were included in the study.

Exclusion Criteria

Patients who underwent preterm LSCS, having Hb levels <10 g/dL at the time of LSCS, morbidly adherent placenta, PPRM cases with or without fever, cases of Post partum hemorrhage because of atonic uterus and cases where spinal anaesthesia was failed and general anaesthesia was administered were excluded from the study.

Sampling Method

The patients were randomized into two groups by using a computer-generated random number table and the allocation of the group was done according to the number. The even and odd numbers was allotted for group 1 and group 2 respectively. These numbers were placed in a closed opaque envelope. Just before the LSCS the surgeon or the assistant opens the envelope and the placenta was delivered according to the specified group. A written informed consent was obtained from the participants.

Group 1: In this group during LSCS, we waited for spontaneous separation of the placenta after delivery of baby and gentle traction was given. The uterus was exteriorized and repaired.

Group 2: In this group during LSCS, just after the delivery of baby the placenta was removed manually without waiting for spontaneous separation. The uterus was exteriorized and repaired.

RESULTS

Surgical Procedure

Surgery was performed mainly by the faculty/ third year Obs & Gyn resident and assisted by trained operating room assistants (ORAS) and scrub matron. All patients received perioperative prophylactic antibiotics in the form of Inj Cefotaxime 1 gm IV before skin incision. The sensitivity was checked in the ward, before sending the patient to OT. An electronic watch was placed inside the OT to record the duration of surgery of which the functionality was checked before surgery. Just after delivery of the baby, we added 10 U of inj Oxytocin to ringer lactate and infused @ 10 ml/min as an uterotonic agent as per hospital policy. After uterine incision the amniotic fluid was suctioned completely to avoid any mixing with the blood. After delivery of the baby, the placenta was either removed spontaneously or manually as per the allotted group. After delivery of the placenta, the uterus was exteriorized and sutured by Vicryl no 1 in single layer. The rectus sheath was sutured by prolene and skin with monocryl by subcuticular technique. After completion of procedure, vaginal toileting was done and Tab Misoprostol 600mcg was given by rectal route. Every LSCS procedure was assessed for its duration and blood loss after completion of the procedure by the scrub matron. In the post op period, they were put on three doses of prophylactic antibiotics in the form of Inj Cefotaxime and Inj Gentamicin.

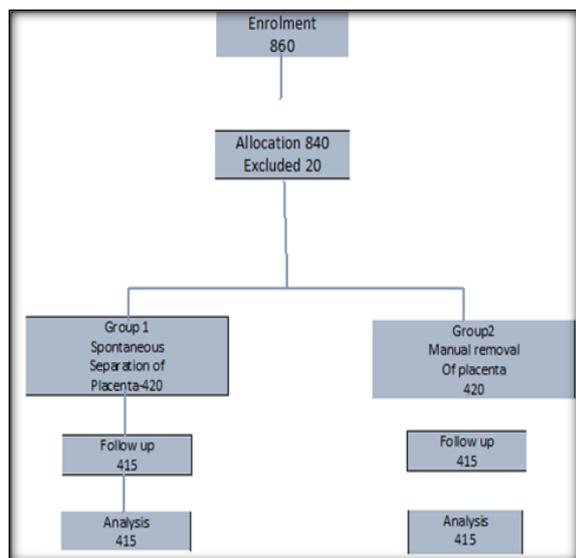


Figure 1: Flow chart

05 cases excluded from each group because of loss to follow up post-partum hemorrhage and peripartum hysterectomy.

Table 1: Maternal & Neonatal demography of both groups.

S No	Maternal & Neonatal Parameter	Group 1 (N=415)	Group 2 (N=415)	p-value
1	Maternal age (Years) < 25 25-35 >35	78 201 36	75 198 42	0.762
2	Parity 0 1 & beyond	165 250	158 257	0.618
3	Maternal weight (Kg) < 60 60-90 >90	52 340 23	49 339 27	0.002*
4	Gestational age < 40 weeks >40 weeks	303 112	309 106	0.946
5	LSCS Elective Emergency	165 250	158 257	0.618

Table 2: Pre operative maternal haematological parameters of both groups

S No	Parameters	Group 1	Group 2	P- Value
1.	Pre op Hb (g/dl)	11.2 ± 0.8	11.1 ± 0.9	0.091
2.	Htc	33.68 ± 3.8	33.21 ± 3.9	0.079
3.	WBC	12240 ± 965	12450 ± 976	0.458

Table 3: Intra operative parameters of both groups

S No	Parameters	Group 1	Group 2	p-value
1	Duration of Surgery (Min)	38.5±4.5	32.5±3.8	< 0.001*
2	Blood Loss	405±45	435±60	< 0.001*
3	Birth weight <3.0 Kg 3.0-4.0 kg >4.0 Kg	219 185 11	226 179 10	0.880

Table 4: Statistical evaluation of parameters affecting intra op blood loss.

S No	Parameters	Group 1 (N=415)	Group 2 (N= 415)	P value
1	Maternal age			
	< 25	463 ml ± 55.4ml	496 ml ± 80 ml	< 0.001
	25-35	435 ml ± 37.4 ml	465 ml ± 47.8 ml	< 0.001
	>35	428 ml ± 70.8 ml	432 ml ± 98.7 ml	0.052
2	Parity			
	0	470 ml ± 65.4 ml	504 ml ± 89.6 ml	< 0.001
	1& beyond	445 ml ± 46.5 ml	475 ml ± 65.6 ml	< 0.001
3	Maternal weight (Kg)			
	< 60	410 ml ± 35.3 ml	425 ml ± 45.8 ml	< 0.001
	60-90	478 ml ± 70.4 ml	502 ml ± 89.9 ml	< 0.001
	>90	495 ml ± 104.4 ml	560 ml ± 165.8 ml	< 0.001
4	Gestational age			
	< 40 weeks	454 ml ± 68.4 ml	465 ml ± 85.4 ml	0.049
	>40 weeks	465 ml ± 75.3 ml	505 ml ± 98.6 ml	< 0.001
5	LSCS			
	Elective	456 ml ± 55.6 ml	472 ml ± 65.6 ml	< 0.001
	Emergency	476 ml ± 75.8 ml	520 ml ± 89.8 ml	< 0.001
6	Birth weight			
	<3.0 Kg	445 ml ± 34.8 ml	462 ml ± 38.6 ml	< 0.001
	3.0-4.0 kg	468 ml ± 68.8 ml	496 ml ± 82.5 ml	< 0.001
	>4.0 Kg	475 ml ± 85.6 ml	535 ml ± 134.5 ml	< 0.001

Table 5: Comparison of post operative parameters of both groups

S No	Parameters	Group 1(N=415)	Group 2 (N=415)	p-value
1	Post op Hb	10.5 ± 0.8	10.2 ± 1.0	< 0.001*
2	Post op Htc	31.2 ± 3.6	30.4 ± 3.7	0.001*
3	Post op WBC	13644 ± 1676	14890 ± 2086	< 0.001*
4	Endometritis	09	17	0.111
5	Hospital stay	5.2 ± 0.6	5.8 ± 1.4	< 0.001*

Estimation of Blood Loss

Blood loss during surgery was measured by Quantitative method.^[22] During each surgery we took two packs of 06 sponges each (01 sponge-mean weight 30 gm, SD 2 gm, and diameter 30x20 cm). Mopping of blood was done from skin incision and throughout the surgery except after uterine incision where suction catheter was used to suck the amniotic fluid before delivery of the baby avoiding mopping of amniotic fluid. The scrub matron aspirated the amniotic fluid in the suction canister and its volume was measured by graduated marking over the canister and recorded as amniotic fluid volume. Subsequently blood and clots were aspirated. The sponge weight was converted to blood volume by using a 1.0 gm/ml mean density conversion formula (1 Gm of wet sponge = 1 ml of blood loss). To measure the blood loss during the surgery, all individual wet sponge and suction canister measurements were added and dry weight of the sponges and the amount of amniotic fluid volume was subtracted.

Total QBL = Σ V wet sponge QBL + V canister QBL - Σ V dry

Sponge - V amniotic fluid

Operational definitions & Conventions

In order to maintain uniformity across the cases the following definitions and conventions were adopted.

Duration of Surgery

The surgical time was taken from the skin incision to closure of the skin and vaginal toileting.

Pre op Hemoglobin

The Hb and Htc were done within 12 hours prior to procedure.

Post op Hemoglobin

The post operative Hb, Htc and TLC were done after 12 hours of completion of surgery.

Endometritis

An elevation of maternal temperature more than 38 degree C (100.4 F), in post op period associated with uterine tenderness on bimanual palpation and foul smelling lochia and leucocytosis after ruling out other causes of fever such as fever UTI, respiratory tract infections, tropical infections (malaria, dengue etc), drug or IV fluid reaction, perineal lacerations and breast engorgement. Any episode of fever after ruling out the above differential diagnosis was treated as a case of pelvic infection. The antibiotics were upgraded to Inj Ceftriazone IV 1 gm 12 hrly, Inj Gentamicin IV 60 mg 12 hrly and Inj Clindamycin IV 600 mg 8 hrly without waiting for the endometrial culture report and worsening of uterine tenderness. The leucocytosis was a better marker and generally correlates with infection and patients were followed up with daily count.

Length of Hospital Stay

The length of hospital stay was taken from the time of caesarean section till discharge from the hospital.

Statistical Analysis

Statistical analysis of the study was done by SPSS 16.0 software. Mean and standard deviation were calculated for pre op hemoglobin/hematocrit, WBC, duration of surgery, intra op blood loss, factors affecting intra op blood loss; post op

hemoglobin/hematocrit, WBC and hospital stay in both the groups. Unpaired t-test was used to find out the association between the above-mentioned parameters in both the groups. Chi-square test was done to find out the association between parameters such as maternal age, parity, maternal weight, and gestational age at LSCS and its indication (elective/emergency LSCS) and incidence of endometritis in both the groups. The statistical evaluation of factors related to endometritis was also done by Chi-square test. Spearman's correlation coefficient was used to find out the association between meconium and PROM with endometritis in both the groups. Probability value of $p \leq 0.05$ was taken as the level of statistical significant.

For the duration of the particular study, a total of 860 patients underwent caesarean delivery. We included 840 patients and excluded 20 patients from the study based on the inclusion & exclusion criteria. These patients were allocated in two groups 1 & 2 with 420 patients each based on computer generated random numbers. We excluded 05 patients again from each group for loss to follow up; postpartum hemorrhage and peripartum hysterectomy and finally 415 patients were analyzed in each group [Figure 1].

The maternal data of both groups were compared for the maternal age, parity, gestational age in weeks, weight of the mother at the time of C-section and elective or emergency nature of caesarean. There was no significant difference among these parameters [Table 1]. The Pre-op maternal parameters in terms of hemoglobin (Hb), hematocrit (Hct) and total leukocyte count (TLC) were also evaluated and no significant difference was found in respect to the above parameters in both groups [Table 2].

The intra operative data of both groups were compared in respect to duration of surgery (in minutes), blood loss (ml) and birth weight of the neonates (kg). The mean duration of surgery was lesser in group 2 (32.5 min) as compared to group 1 (38.5 min) and the difference was significant ($p < 0.001$). The blood loss between groups were compared, it was lesser in group 1 as compared to group 2 and the difference was significant ($p < 0.001$). There was no difference between the birth weights of neonates between the groups [Table 3].

We did a statistical evaluation of the parameters having a bearing on the intra operative blood loss [Table 4]. Primigravida of lesser than 25 yrs of age had more intraoperative blood loss as compared to higher order parity of 25-35 yrs of age and the difference was significant ($p < 0.001$). An increased blood loss was found in mothers of increased weight. We analyzed the weight in three categories (<60 kg, 60-90 kg & >90 kg) and blood loss was found more in group 2 in each category with statistically significant difference ($p < 0.001$). In gestational age lesser than 40 weeks, there was no difference in blood loss in both group whereas in

gestational age more than 40 weeks, the difference of blood loss was significant (465 ml vs. 520 ml, $p < 0.001$). The blood loss was more in group 2 in both elective and emergency caesarean delivery and the difference was significant ($p < 0.001$). We compared the birth weight of the baby in respect to the placenta removal method and found that the blood loss was more in cases in which placenta was manually removed ($p < 0.001$).

The post operative parameters were compared in respect to post operative hemoglobin (Hb), hematocrit (Hct) and total leukocyte count (TLC), incidence of endometritis in each group and length of hospital stay [Table 5]. The post operative Hb was more in group 1 (mean 10.5 g/dL, SD 0.8) as compared to group 2 (mean 10.2 g/dL, SD 1.0) and the difference was significant ($p < 0.001$). The post op hematocrit was also corroborating to Post op Hb and it was more in group 1. The post op TLC was more in group 2 (mean 14890/cmm, SD 2086) as compared to group 1 (mean 13644/cmm, SD 1676) with statistically significance difference ($p < 0.001$). A total of 26 patients had endometritis and the incidence is 3.132 in our study. The cases of endometritis were 09 in group 1 and 17 in group 2 with incidence of 2.16 and 17 in group 2 with incidence of 4.09. The length of stay in the Hospital because of post op morbidity was lesser in group 1 as compared to group 2 (5.2 days, SD 0.6, vs. 5.8 days, SD 14) and this difference was also significant ($p < 0.001$). We did an analysis of various parameters related to endometritis (Table 6) in our study in both groups but none has statistically significant association. The incidence of endometritis was more in cases where maternal age was lesser than 25 yrs and extreme i.e. >35 yrs. Nulliparity has more endometritis as compared to high order parity. It was more when maternal weight at the time of caesarean was more than 90 kg (18 Vs 08 cases). Emergency caesarean done at >40 weeks and birth weight of neonates >4.0 Kg were associated with endometritis. The effect of meconium detected during labour over incidence of endometritis is shown in Table 7. Meconium stained liquor was clearly associated with endometritis in both groups (OR 39.56, OR 61.66). Premature rupture of membrane (PROM) was another factor having direct bearing over incidence of endometritis particularly in cases where placenta was manually removed (OR 6.04, OR 10.1), [Table 8].

DISCUSSION

Most of the caesarean section is done by Pfannenstiel method or Misgav Ladach technique or its variants.^[23] Earlier studies done between 1975-1993,^[24,25,26,27,28] have suggested that spontaneous removal of placenta is superior to manual removal during caesarean delivery. During this time the use of oxytocics to prevent post partum haemorrhage were not routinely used. A Cochrane Database

systemic review done by Anorlu RI et al,^[13] suggested that delivery of the placenta with cord traction during caesarean section has more advantages compared to manual removal in terms of lesser blood loss, less decrease in hematocrit levels post operatively and shorter duration of hospital stay. Studies done by Morales et al,^[29] in 2004, Baksu et al in 2005,^[12] Waqar et al in 2008,^[30] and recent studies done by Kanwal et al,^[31] and Ashraf et al,^[32] in 2020 also supports spontaneous removal of placenta during caesarean delivery. In line with the information of review of the literature and recent studies, our study also suggests that the spontaneous removal of placenta (Group 1) was superior to manual removal (Group 2) in terms of intra op blood loss which was measured by quantitative method of blood loss in the study.^[22] The mean intra op blood loss in our study was 405 ml (Group 1) and 435 ml in (Group 2) and this difference was statistically significant ($p < 0.001$). We did an evaluation of multiple parameters affecting the intra op blood loss and found it was more where placenta was manual removed. The blood loss was more in primary caesarean as compared to post caesarean pregnancies. Cases taken as emergency caesarean was associated with more blood loss as compared to elective caesarean. Lesser age was associated with more blood loss as compared to increases age. In our study, majority of patients of younger age group were postdated (>40 weeks) Primigravida had induced labour and underwent primary caesarean section as emergency procedure after failed trial of labour of many hours. The uterus was flabby in many of them resulting in increased intra op blood loss and additional use of oxytocics. The intra op blood loss was directly proportional to the maternal weight as duration of surgery was more in such patients to achieve hemostasis. In these cases also, the blood loss was more in patients where placenta was manually removed (Mean 495 ml, 560 ml, $p < 0.001$). Blood loss was more in cases where neonatal birth weight was more. It was maximum when the neonatal birth weight exceeded > 4.0 Kg as the uterus remains flabby for a longer duration. Although the blood loss was more in all parameters where placenta was manually removed, still there was no difference between the numbers of swabs used during surgery in both groups. We did a review of literature regarding intra op blood loss during caesarean delivery and found that in modern day caesarean delivery the intra op blood loss and Post partum hemorrhage (PPH) is in decreasing trend (Dehbashi et al and Morales et al in 2004).^[33,34] This is because of lesser duration of surgery, improved technique and routine use of intra and post op oxytocics during and after C-section.^[35] In our study, the maximum blood loss in both groups was 630ml and 724 ml respectively which were far behind from the permissible limit of 1000 ml which is traditionally accepted.^[36] Manual removal of placenta is considered inferior in comparison to spontaneously removal in terms of blood loss in

both old and recent studies but still it is widely practiced by obstetrician world wide as evident by multiple research papers because of lesser surgical time.^[12,13,16,24,25,26,31,32] In the index study, the mean duration of surgery was lesser in patients where placenta was manually removed (Mean 32 min) as compared to spontaneous removed group (Mean 38 min) and the difference was statistically significant ($p < 0.001$). In our teaching hospital most of the faculty practices manual removal of placenta during caesarean section but for the post graduates teaching it is other way round. Overall the acceptance of manual removal of placenta is more because of lesser surgical duration. The post operative parameters of both groups were compared for post op hemoglobin (Hb), hematocrit (Hct), and total leukocyte count (TLC), endometritis and hospital stay. We found that the post op Hb & Hct were more in group where placenta separation was spontaneously (Mean Hb group 1- 10.5 g/dL, Mean Hb group 2- 10.2 g/dL) and this difference was statistically significant ($p < 0.001$) for both Hb & Hct. This finding was collaborating with the lesser intra op blood loss. Multiple studies have similar findings.^[12,13,16,24,25,26,31,32] The minimum post op Hb was 9.8 g/dL and 9.2 g/dL in both the groups and none of the patient received post op blood transfusion. Another reason of no blood transfusion is widely use of Inj Ferric Carboxymaltose in the antenatal period which increases Hb > 10 g/dL at the time of delivery. Another parameter which was studied between the groups is the incidence of post operative endometritis and factors associated with it. Earlier studies had increase incidence (20-40 %) of endometritis when prophylactic antibiotics were not routinely given in every case.^[24,25,37] With the advent of prophylactic antibiotics and supported by multiple guidelines the incidence of endometritis is drastically reduced.^[38,39] The endometritis was diagnosed in 09 cases in Group 1 with incidence of 2.16 % and 17 cases in group 2 with incidence of 4.09 % with p value of 0.111. Most of the studies done recently have similar findings with incidence of post op endometritis ranging between 2-3%.^[31,32] We did a statistical evaluation of multiple parameters in relation to endometritis and found that ante/intra partum meconium stained liquor (MSL) and premature rupture of membrane (PROM) were associated with increased incidence of post op endometritis even with prophylactic antibiotics in our study. The cases of MSL were 40 and 42 in group 1 & 2 respectively. In group 1, Endometritis was diagnosed in 07 and 14 cases in group 2 which gives an Odd ratio of 39.56 and 61.66 respectively. These were the cases in which mother were overweight, blood loss was more, Primigravida in labour and MSL detected in early labour and trial of labour continued and second stage caesarean section was done. In our study we encountered 64 cases of PROM, out of which 34 were in group 1 and 30 were in group 2. The Odd ratio of endometritis in PROM cases was 6.04 and 10.01 in group 1 & 2

respectively. The duration of membrane rupture (> 16 hrs), increased numbers of per vaginum examination, emergency caesarean and maternal obesity were the factors associated with endometritis in such cases. The post op TLC was more in manually separated group (Mean 14890/cmm vs. 13644/cmm) and this difference was statistically significant ($p < 0.001$). Similar findings were present in multiple studies.^[16,31,32] A study done by Buie et al in 2010,^[40] suggests that for uncomplicated caesarean delivery, the average hospitalization length is 3-4 days. Data from other studies as Tan et al.^[41] and Bayoumi et al.^[42] suggest that earlier discharge is feasible after caesarean for properly selected patients. The mean duration of hospital stay is 4 days in our study except for cases of endometritis which was 5.2 days (SD-0.6) in group 1 ND 5.8 days (SD-1.4) in group 2 and this difference was statistically significant ($p < 0.001$).

CONCLUSION

Caesarean delivery is one of the commonest performed obstetrics surgeries worldwide. The steps of performing C-section are well defined except the method of placental removal which is still controversial because of uncertain and heterogenous results. With the modern technique of caesarean delivery and use of prophylactic antibiotics and intra/post op Oxytocin drip the blood loss is reduced. The manual removal of placenta is associated with more intra operative blood loss as compared to spontaneous removal of placenta. Caesarean delivery is a major risk factor of post op endometritis. The risk is more in cases where placenta is manually removed. It is also associated with meconium stained liquor and PROM which are independent risk factor for endometritis. Although prophylactic antibiotics had reduced the incidence of endometritis to a great extent, still it is a matter of concern. As the number of caesarean delivery in our country is increasing and ranges between 30 % to 35 %, a large number of patients with post operative endometritis will have prolonged hospital stay which may result in increased chances of getting hospital acquired infections, exposure to higher antibiotics which have its own serious side effects, delayed breast feeding, increased post partum depressive disorders which may have adverse effect on long term overall maternal health.

Limitations

The limitation of the study was the variation in the surgical technique of the surgical team performing LSCS. The surgery was done mainly by the third year residents and assisted by faculty. In some cases it was vice versa. The steps of the surgery which they followed were more or less the same. However the skill to minimize the intra operative blood loss and achieving hemostasis was different among the surgeons. A relatively inexperienced surgeon took more time as compared to the faculty. Although

blood loss estimation was done by the quantitative method in the study, however it was not possible to measure the exact quantity of blood absorbed by the drapes. Utmost precaution was taken to prevent the mixing of amniotic fluid with the blood before delivering the baby. However some degree of mixing of amniotic fluid with blood is unavoidable.

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