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Original Research Article

An observational study to evaluate and compare the role of bilateral internal iliac artery ligation with uterine compression sutures for arresting postpartum haemorrhage in a tertiary care hospital in West Bengal

Rumpa Das^{1*}, Malay Sarkar¹, Palas Halder²

¹Department of Obstetrics and Gynecology, Burdwan Medical College and Hospital, Burdwan, West Bengal, India

²Department of Anaesthesiology, Calcutta National Medical College and Hospital, Kolkata, West Bengal, India

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***Correspondence:**

Dr. Rumpa Das,

E-mail: rumpadas23.rd@gmail.com

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ABSTRACT

Background: Postpartum haemorrhage is the most important cause of maternal mortality which is near about 13% in developed countries and 34% in developing countries. When postpartum haemorrhage is not controlled even after aggressive medical management, immediate surgical intervention is needed which includes bilateral internal iliac artery ligation, B-Lynch compression sutures, hysterectomy as a last resort. Bilateral internal iliac artery ligation is much quicker and having lesser risk of uterine necrosis as compare to B-Lynch suture. That's why a study was conducted to evaluate and compare the role of bilateral internal iliac artery ligation with B-Lynch compression sutures.

Methods: A prospective observational study was conducted in the department of obstetrics and gynaecology in Burdwan medical college and hospital for a period of 3 years from 1st July 2019 to 30th June 2022. Out of total 62 cases of intractable postpartum haemorrhage, 31 cases underwent bilateral internal iliac artery ligation (group A) and another 31 cases underwent B-Lynch compression sutures (group B).

Results: In this study, most of the women were in the age group of 21-30 years. both in group A and group B. Risk factors for postpartum haemorrhage in both groups were pre-eclampsia, abruption, placenta previa, nonprogress of labour, multiple pregnancy. Blood products requirements were much more in group B than group A. Hysterectomy needed in 12.9% cases of group A and 29.03% cases of group B. In terms of maternal outcome, out of total maternal death, 37.5% cases were under group A, 62.5% cases were under group B.

Conclusions: In our study, need for hysterectomy was less in cases of bilateral internal iliac artery ligation compared with B-Lynch compression sutures. So, bilateral internal iliac artery ligation should be early resort to prevent hysterectomy in cases of atonic postpartum haemorrhage with low parity. As bilateral internal iliac artery ligation is a life saving procedure, every obstetrician must be able to perform it and should have proper knowledge of retroperitoneal anatomy to avoid injury of iliac veins and ureter.

Keywords: Bilateral internal iliac artery ligation, B-Lynch compression sutures, Hysterectomy, Postpartum haemorrhage

INTRODUCTION

Postpartum haemorrhage is the most important cause of maternal mortality which accounts for 1,25,000 maternal

death each year and maternal morbidity of about 20 million women per year.¹ Postpartum haemorrhage accounts for maternal mortality near about 13% in developed countries and 34% in developing countries.² Major postpartum

haemorrhage i.e. blood loss more than 1000 ml occurs in 1-5% of all deliveries.³ In most of the cases, postpartum haemorrhage occurs within 24 hours of delivery. Most common cause of postpartum haemorrhage is uterine atony in 80% cases. Other causes are genital tract trauma, retained bits of placenta and coagulopathy.⁴ There are various factors for uterine atony which includes multiple pregnancy, polyhydramnios, prolonged labour, placenta previa, abruptio placentae, instrumental delivery. Assessment of risk factors of postpartum haemorrhage is very much important to prevent it but postpartum haemorrhage may occur unpredictably and no pregnant mother is immune from the risk of postpartum haemorrhage.⁵ When postpartum haemorrhage is not controlled even after aggressive medical management, immediate surgical intervention is needed which includes utero-ovarian vessel ligation, uterine compression sutures, Bilateral internal iliac artery ligation, exploratory laparotomy that may proceed to hysterectomy. The choice of surgical procedure depends on parity of mother and her desire for child bearing, extent of haemorrhage, experience and judgement of surgeon. In most catastrophic situation, hysterectomy is preferred to arrest further blood loss. Though it is a life saving procedure but may not be appropriate for women who need to preserve the uterus. In that scenario, both bilateral internal iliac artery ligation and uterine compression sutures (B-Lynch) will be an effective way of controlling intractable postpartum haemorrhage and preventing maternal deaths. The principle of bilateral internal iliac artery ligation is based on the hemodynamic study of Burchell which showed that bilateral internal iliac artery ligation reduces pelvic flow by 49% and pulse pressure by 85%, resulting in venous pressure in the arterial circuit thus prompting haemostasis.⁶ Reported success rate in case of B-Lynch uterine compression sutures is 70%. Reported success rate of bilateral internal iliac artery ligation varies from 40 to 100%.⁷ The procedure reduces the need for hysterectomy in 50% cases.⁸ Bilateral internal iliac artery ligation is much easier and quicker than hysterectomy and also reduces the risk of uterine necrosis as compare to B-Lynch suture. Failure of bilateral internal iliac artery ligation is mostly seen in atonic postpartum haemorrhage than other causes of postpartum haemorrhage.⁹

In this scenario, it is necessary to find out the role of bilateral internal iliac artery ligation and compare it with the uterine compression sutures. That's why we have decided to conduct this study.

METHODS

A prospective observational study was conducted in the department of obstetrics and gynaecology in Burdwan medical college and hospital over a period of 3 years from 1st July 2019 to 30th June 2022.

Women delivered either by vaginal route or by caesarean section with postpartum haemorrhage, would be first managed conservatively. If postpartum haemorrhage were

not controlled with medical management, then decision of bilateral internal iliac artery ligation or uterine compression sutures was taken. Out of total 62 cases 31 cases were in group A (who underwent bilateral internal iliac artery ligation) and another 31 cases were in group B (women who underwent B-Lynch uterine compression sutures). After the procedure, patient was monitored whether postpartum haemorrhage has controlled or not within 1 hour of the procedure. Patient should be monitored very carefully in cases where relaparotomy may be indicated if postpartum haemorrhage not controlled within 1 hour of the procedure. Study parameters included; age, parity, socioeconomic status, religion, antenatal registration status, gestational age at the time of delivery, any high risk factors (e.g. abruptio, pregnancy induced hypertension), time of delivery, mode of delivery, conservative management for management of postpartum haemorrhage received, surgical procedure done to control PPH (bilateral internal iliac artery ligation or B-Lynch uterine compression suture), need for relaparotomy or hysterectomy if PPH not controlled within 1 hour of surgical intervention.

Inclusion criteria

All women who delivered in our hospital with severe postpartum haemorrhage, women referred from outside and who delivered in our hospital and landed in PPH not controlled by medical management.

Exclusion criteria

Immunocompromised and infective conditions, associated medical and surgical comorbidities, coagulation disorder and bleeding diathesis.

Statistical analysis

All the relevant data was analysed by appropriate statistical tests using Statistical Package for Social Sciences (SPSS) version 22.0. Results were expressed in terms of mean with standard deviations (SD), difference of means of two groups was tested by student T test and Chi square test to find out the significant correlation. P value of <0.05 was considered as significant.

RESULTS

Among patients underwent bilateral internal iliac artery ligation (group A), 16.12% cases were in age group of under 20 years, 45.16% in the age group of 21-30, 38.70% cases in the age group of ≥ 31 years. Among patients underwent B-Lynch compression sutures, 12.9%, 54.83%, 32.25% cases were in the age group of ≤ 20 , 20-30, ≥ 31 years respectively. Mean age was 26.87 ± 1.09 in group A, 26.90 ± 1.23 in group B. In group A, 25.8% cases were primi parity, 64.51% cases were between para 2 to 4, 9.67% cases were above para 5. In group B, 32.25% cases were primi para, 61.29% cases were between 2 to 4, 6.45% cases were above para 5.

Table 1: Age distribution of cases.

Age (years)	Group A (N=31)	Group B (N=31)
≤20	5 (16.12%)	4 (12.9%)
21-30	14 (45.16%)	17 (54.83%)
≥31	12 (38.70%)	10 (32.25%)

Table 2: Parity distribution of cases.

Parity	Group A (N=31)	Group B (N=31)
1	8 (25.8%)	10 (32.25%)
2 to 4	20 (64.51%)	19 (61.29%)
≥5	3 (9.67%)	2 (6.45%)

Table 3: Distribution of cases according to high risk factors.

High risk factors	Group A (N=31)	Group B (N=31)
PIH/pre-eclampsia	10 (32.25%)	9 (29.03%)
Abruption	6 (19.35%)	5 (16.12%)
Placenta previa	4 (12.9%)	8 (25.8%)
Non progress of labour	5 (16.12%)	3 (9.67%)
Multiple pregnancy	3 (9.67%)	3 (9.67%)
Previous caesarean section	3 (9.67%)	3 (9.67%)

Table 4: Distribution of cases according to labour induction given or not.

Induction given or not	Group A (N=31)	Group B (N=31)
Given	6 (19.35%)	3 (9.67%)
Not given	25 (80.64%)	28 (90.32%)

Table 5: Distribution of cases according to labour augmentation.

Labour augmented or not	Group A (N=31)	Group B (N=31)
Augmentation	23 (74.19%)	16 (51.61%)
No augmentation	8 (25.8%)	15 (48.38%)

Mean parity was 2.48 ± 1.56 in group A, 2.29 ± 1.06 in group B. Parity distribution was almost equal in both groups. Distribution of socio-economic status in both groups are almost similar. Most of the patients were under lower socio-economic status. In group A, 45.16% cases were Hindu, 41.93% cases were Muslims. In group B, 54.83% cases were Hindu, 58.06% cases were Muslims. Distribution of cases according to religion was almost equivalent. In group A, 32.25% cases were booked, 67.74% cases were unbooked. In group B, 38.70% cases were booked, 61.29% cases were unbooked. Antenatal registration status was same in both groups. In group A, 29.03% cases were of gestational age (at the time of delivery) less than 37 weeks and 70.96% cases were above 37 completed weeks. In group B, 35.48% cases were of

gestational age less than 37 weeks and 64.51% cases were above 37 weeks at the time of delivery. Most of the cases in both groups were above 37 completed weeks at the time of delivery.

Table 6: Distribution of cases according to whether labour is prolonged or not.

Labour is prolonged or not	Group A (N=31)	Group B (N=31)
Prolonged	15 (48.38%)	10 (32.25%)
Not prolonged	16 (51.61%)	21 (67.74%)

Table 7: Distribution of cases according to mode of delivery.

Mode of delivery	Group A (N=31)	Group B (N=31)
Vaginal delivery	3 (9.67%)	5 (16.12%)
Caesarean section	28 (90.32%)	26 (83.87%)

Table 8: Distribution of cases according to requirement of blood products.

Requirement of blood products	Group A (N=31)	Group B (N=31)
PRBC	18 (58.06%)	23 (74.19%)
FFP	9 (29.03%)	16 (51.61%)
Platelets	4 (12.9%)	11 (35.48%)

Table 9: Distribution of cases according to need for hysterectomy.

Hysterectomy required or not	Group A (N=31)	Group B (N=31)
Required	4 (12.9%)	9 (29.03%)
Not required	26 (83.87%)	22 (70.96%)

Table 10: Distribution of cases according to maternal outcome.

Maternal outcome	Group A (N=31)	Group B (N=31)
Sepsis	2 (6.45%)	4 (12.9%)
Disseminated intravascular coagulation (DIC)	1 (3.22%)	2 (6.45%)
Acute renal failure (ARF)	1 (3.22%)	2 (6.45%)
Maternal death	3 (9.67%)	5 (16.12%)

In group A, risk factors associated with postpartum haemorrhage were preeclampsia in 32.25% cases, abruption in 19.35% cases, placenta previa in 12.9% cases, non-progress of labour in 16.12% cases, multiple pregnancy in 9.67% cases, post caesarean section in 9.67% cases. In group B, risk factors were preeclampsia in 29.03% cases, abruption in 16.12% cases, placenta previa in 25.8% cases, non-progress of labour in 9.67% cases, multiple pregnancy in 9.67% cases, post caesarean section in 9.67% cases. In both groups, pre-eclampsia was the

most commonly occurring high risk factors for postpartum haemorrhage. In group A, 61.29% cases were in spontaneous labour, 38.7% cases were not in labour. In group B, 74.19% cases were in spontaneous labour, 25.8% cases were not in labour. In both groups, most of the cases were in spontaneous labour. In group A, labour was induced in 19.3% cases, induction was not given in 80.64% cases. In group B, labour was induced in 9.67% cases, induction was not given in 80.64% cases. In both groups, labour was not induced in most of the cases. In group A, labour was augmented in 74.19% cases, augmentation was not done in 25.8% cases. In group B, labour was augmented in 51.61% cases, augmentation was not done in 48.38% cases. In both groups, augmentation was done in most of the cases.

In group A, labour was prolonged in 48.38% cases, labour was not prolonged in 51.61% cases. In group B, labour was prolonged in 32.25% cases, labour was not prolonged in 67.74% cases. In both groups, labour was not prolonged in most of the cases. In group A, 9.67% cases underwent vaginal delivery, 90.32% cases underwent caesarean section. In group B, 16.12% cases underwent vaginal delivery, 83.87% cases underwent caesarean section. In both groups, most of cases delivered by caesarean section. In group A, 58.06% cases received PRBC, 29.03% cases received FFP, 12.9% cases received Platelets. In group B, 74.19% cases received PRBC, 51.61% cases received FFP, 35.48% cases received platelets. Blood requirement is much more in group B than group A. Regarding need for hysterectomy, in group A, 12.9% cases required hysterectomy. In group B, 29.03% cases required hysterectomy. Total 13 cases underwent hysterectomy in the study population. Out of total 13 cases, 30.07% cases were under group A and 69.23% cases were under group B. This indicates that need for hysterectomy is significantly more in group B than group A. Regarding maternal outcome, in group A, sepsis occurred in 2 cases, DIC occurred in 1 case, ARF occurred in 1 case, maternal death occurred in 3 cases. In group B, sepsis occurred in 4 cases, DIC occurred in 2 cases, ARF occurred in 2 cases, maternal death occurred in 5 cases. Out of total 8 deaths, 37.5% cases were under group A, 62.5% cases were under group B. These data indicates that most of the complications were associated with B-Lynch compression sutures than bilateral internal iliac artery ligation.

DISCUSSION

Massive obstetric haemorrhage is a leading cause of maternal morbidity and mortality.¹¹ Emergency peripartum hysterectomy is not the only resort in case of major postpartum haemorrhage i.e. postpartum haemorrhage is not controlled with aggressive medical and obstetric measures.¹² Bilateral internal iliac artery ligation and B-Lynch uterine compression sutures are the effective surgical intervention to control refractory postpartum haemorrhage. Both these procedures are life-saving as well as preserve the fertility specially in young women with low parity, compared with emergency obstetric

hysterectomy.^{13,14} In our study, we evaluated and compared the role of bilateral internal iliac artery ligation with B-Lynch uterine compression sutures for arresting postpartum haemorrhage. In our study, patients with postpartum haemorrhage were first treated with medical management; if postpartum haemorrhage was not controlled with medical management, then prompt surgical intervention was done. Total 62 cases of postpartum haemorrhage underwent surgical intervention for massive postpartum haemorrhage. 31 cases were in each group i.e., Group A: patients underwent bilateral internal iliac artery ligation. Group B: patients underwent B-Lynch uterine compression sutures.

In our study, in both groups almost 50% cases were in the age group of 21-30 years and 60% cases were between para 2 to 4. Mean age was 26.87 ± 1.09 in group A, 26.90 ± 1.23 in group B. Mean parity was 2.48 ± 1.56 in group A, 2.29 ± 1.06 in group B. Age and parity distribution were almost same in both groups. In a study by Wankhede et al, 50% cases were in the age group of 26-30 years and most of the cases were 2nd gravida. In another study by Fahmy et al mean age was 34.6 ± 2.8 and 12.8% cases were primipara.³ In a study by Sheela et al, 45% cases were in the age group of 26-30 years, 45% cases were of gravida 2 and 31% cases were ≥ 3 gravida, 28% cases were primi gravida.¹⁵ In our study, most of the cases were under lower socioeconomic status i.e. 48.38% cases in group A and 58.06% cases in group B. Socioeconomic status of cases did not differ significantly in both groups. In our study, booked cases were 32.25% in group A and 38.70% in group B whereas 67.74% cases in group A and 61.29% cases in group B were unbooked. Booking status of cases were similar in both groups. In a study by Wankhede et al, 14.28% cases were booked whereas 85.71% cases were unbooked. In another study by Sheela et al, 21% cases were booked and 71% cases were unbooked.¹⁵ In our study, 70.96% cases in group A and 64.51% cases in group B were of term gestation at the time of delivery. Distribution of cases according to gestational age were almost same in both groups i.e. statistically not significant. In the study by Sheela et al, 72% cases were of term gestation.¹⁵ In our study, uterine atony was the most frequent cause of postpartum haemorrhage in both groups. Risk factors were as follows; group A: preeclampsia (32.25%) >abruption (19.35%) >placenta previa (12.9%) >non progress of labour (16.12%) >multiple pregnancy (9.67%) >post caesarean section (9.67%). Group B: preeclampsia (29.03%) >placenta previa (25.8%) >abruption (16.12%) >non progress of labour (9.67%) >multiple pregnancy (9.67%) >post caesarean section (9.67%). In a study by Sheela et al, most common risk factors were previous caesarean section in 23% cases, uterine rupture in 16.5% cases and anaemia in 11% cases.¹⁵ In another study by Wankhede et al, 57.14% cases were due to atonic postpartum haemorrhage, 21.42% cases were due to placenta previa, 14.28% cases were due to ruptured uterus, 7.14% cases were due to abruptio placentae. In our study, most of cases were in spontaneous onset of labour i.e., 61.29% cases in group A, 74.19% cases in group B. In our

study, induction of labour was given in 19.35% cases of group A and 9.67% cases in group B. Labour was augmented in 74.19% cases of group A and 51.61% cases of group B. This indicates that labour augmentation is an added risk factor for postpartum haemorrhage. In our study, 9.67% cases in group A and 16.12% cases in group B delivered vaginally. Most of the cases delivered by caesarean section in both groups i.e., 90.32% cases in group A and 83.87% cases in group B. In the study by Sheela et al, postpartum haemorrhage occurred after vaginal delivery in 47.5% cases and after caesarean delivery in 52.5% cases.¹⁵ In the study by Fahmy et al, postpartum haemorrhage occurred in 37.6% cases of vaginal delivery, 50.4% cases after caesarean delivery and in 11.9% cases after assisted vaginal delivery.³ In the study Gadappa et al, postpartum haemorrhage occurred in 42.11% cases after vaginal delivery and 56.14% cases after caesarean delivery. In our study, mean required blood products were as follows; mean PRBC (units) required were 2.05 ± 0.8 in group A and 3.39 ± 1.25 in group B. Mean required FFP (units) were 4.54 ± 1.46 in group A and 5.56 ± 1.66 in group B. Mean required platelets were 3.75 ± 1.23 in group A and 4.45 ± 1.43 in group B. There was significant difference in requirement of blood products between the two groups i.e., the difference was statistically significant (p value was <0.001). In the study by Gadappa et al, mean require blood products were 4.1 ± 1 units. In the study by Fahmy et al, total blood transfusion needed were 6.7 ± 5.4 units.³ In our study, good haemostasis achieved in 83.87% cases of group A and 70.96% cases of group B. Hysterectomy was needed in 12.9% cases of group A and 29.03% cases of group B. There was significant difference between the two groups regarding the need for hysterectomy i.e. p value was <0.0001 . In the study by Gadappa et al, hysterectomy was avoided in 54.38 % cases of bilateral internal iliac artery ligation. In the study by Boynukalin et al, haemorrhage was effectively controlled in 76.9% cases by bilateral internal iliac artery ligation and hysterectomy was avoided.¹⁶ In the study by Camuzcuoglu et al, by bilateral internal iliac artery ligation, hysterectomy was avoided in 75% cases and hysterectomy was needed in 25% cases.¹⁷ In another study by Evans et al, 57% cases in bilateral internal iliac artery ligation had failed to control postpartum haemorrhage necessitating hysterectomy.¹⁸ In the study of Mathlouthi et al, only bilateral internal iliac artery ligation controlled postpartum haemorrhage in 90.5% cases whereas in the study by Kone et al, bilateral internal iliac artery ligation controlled haemorrhage in 84.3% cases.^{19,20} In the study of Price and B-Lynch, postpartum haemorrhage was controlled in 99.5% cases.¹⁰ In a systemic review by Doumouchtsis et al, good haemostasis achieved by uterine compression sutures in 91.7% cases.²¹ In another study by Kayem et al, overall success rate of B-Lynch uterine compression sutures was 75%.²² In our study, sepsis occurred in 2 cases of group A and in 4 cases of group B. DIC occurred in 1 case of group A and 2 cases of group B. Acute renal failure occurred in 1 case of group A and 2 cases of group B. Out of total 62 cases, maternal death occurred in 8 cases. Among 8 deaths, 3 cases were under group A and 5 cases

were under group B. The difference of maternal outcome between two groups was statistically significant i.e. p value was <0.001 . In the study of Sheela et al, sepsis occurred in 7.2% cases, DIC occurred in 5.4% cases, acute renal failure occurred in 1.8% cases and maternal death occurred in 1.8% cases of patients underwent bilateral internal iliac artery ligation. In the study by Wankhede et al, out of 26 cases underwent bilateral internal iliac artery ligation, DIC occurred in 2 cases, ARF occurred in 2 cases and death occurred in 2 cases.

This study has some limitations. Bilateral internal iliac artery ligation requires expertise hands and proper dissection of fascia around the artery. There is risk of injury to the iliac veins and ureter during bilateral internal iliac artery ligation. Failure to follow up is high in these cases and longterm complications and fertility could not be traced in these patients.

CONCLUSION

Bilateral internal iliac artery ligation (BIIAL) is a life saving procedure which reduces maternal morbidity and mortality as well as helps to preserve the uterus in case of low parity. BIIAL is much simpler and less time-consuming procedure than B-lynch compression sutures. Every obstetrician should learn to perform this procedure. As a life saving technique, BIIAL is less applied due to fear of injury to iliac veins. For this, thorough knowledge of retroperitoneal anatomy and meticulous dissection can prevent these complications. Internal iliac vein is located directly posterior to the internal iliac artery, that's why right angled clamp should be passed in a controlled manner in close proximity to the posterior wall of artery for preventing the perforation of internal iliac veins. While passing the right-angle clamp beneath the internal iliac artery, operator should have better control at the entry point than exit point. Clamp should be passed from lateral to medial aspect of artery because if the clamp is passed from medial to lateral, there is chance of injury to the external iliac vein which is located at the lateral aspect of internal iliac artery. B-Lynch compression sutures are also helpful in case of refractory postpartum haemorrhage but there may be chance of ischemic necrosis of myometrium. In our study, need for hysterectomy was less in cases of bilateral internal iliac artery ligation compared with B-Lynch compression sutures. That's why, in women with atonic postpartum haemorrhage, bilateral internal iliac artery ligation should be the early resort to prevent hysterectomy.

Recommendations

Pelvic cadaveric dissection and demonstration of internal iliac artery dissection should be included in postgraduate curriculum so that timely decision can be taken in emergency situation for saving maternal lives. National database registry should be created for bilateral internal iliac artery ligation for further studies.

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