



# Bilateral Internal Iliac Artery Ligation, a Rational Choice of Surgery in Placenta Previa, a Hospital-Based Retrospective Study on the Prevention of Hysterectomy and Control of Postpartum Hemorrhage

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## Abstract

**Background** Placenta previa is one condition, where the bleeding is from the thinned out lower segment, which faces difficulty in contracting as compared to the upper uterine segment. To combat postpartum hemorrhage and hysterectomy, there were various techniques adopted in obstetric practice. Here the aim is to study the bilateral internal iliac artery ligation (BIL) as a technique to minimize postpartum bleeding and preserve the uterus for future pregnancy.

**Methods** This retrospective study was conducted in 31 patients with abnormal placentation. They underwent BIL during LSCS. The surgery was elective in non-bleeding patients and as an emergency in bleeding patients. The primary outcome is to minimize blood loss and postpartum blood transfusion. The secondary outcome is the prevention of hysterectomies after delivery and preservation of the uterus for the mother to have future pregnancies.

**Results** Out of 31 women, 19 underwent elective surgery (61.3%) and 12 underwent emergency surgery (38.7%). Out of 12 emergency surgeries, 8 needed blood transfusion due to blood loss. Out of 19 elective surgeries, none required the blood transfusion. Blood transfusion was required in 50% of the patient in emergency BIL surgery, whereas none required blood transfusion in elective BIL surgery. Postpartum hysterectomy was avoided in all study participants except one elective surgery patient.

**Conclusion** BIL surgery can be an effective procedure for handling high-risk obstetric hemorrhage in addition to the chances of future fertility through the preservation of uteri.

**Keywords** Placenta previa · Bilateral internal iliac artery ligation · Uterus preservation · Future pregnancy · Postpartum blood transfusion · Postpartum hysterectomy

## Introduction

Placenta previa is the leading cause for major obstetric hemorrhage among developed and developing countries and a potential factor for increased maternal mortality rate in pregnancy. Obstetric hemorrhage as a result of abnormal

placenta, viz. placenta previa (accreta, increta and percreta), has increased the need for blood transfusion and postpartum hysterectomy. This also increases the risk and complication rate in delivery particularly in LSCS. The maternal morbidity due to postpartum hemorrhage is extensive among the placenta previa population [1, 2].

The average blood loss in patient undergoing hysterectomy in placenta previa cases demands unavoidable blood transfusion. Among the placenta previa types—accreta, increta and percreta—the accrete patients are likely to have high amount of blood loss [1]. Many procedures are used to minimize blood loss through surgical options like arterial embolization, prophylactic balloon occlusion of the abdominal aorta, common iliac, internal iliac or uterine arteries [3].

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Hysterectomy was performed in hemodynamically unstable patients in order to have control over bleeding risk and other complications associated with it [4]. Cesarean hysterectomy as emergency was performed in more than 50% of the abnormal placenta. Elective hysterectomies were planned in some selected patients, and emergency hysterectomy was also performed to prevent morbidities [5]. There were many etiological factors that had contributed to the abnormal placentation.

The frequency of placenta previa particularly placenta accrete has increased which is largely contributed to increasing cesarean deliveries. The incidence is 2.7–12.2 per 1000 pregnancies [6, 7].

Burchell has come up with a pelvic hemorrhage controlling procedure, namely internal iliac artery ligation. The ligation of internal iliac has contributed to the decrease in the pulse pressure to a great extent, thereby transforming the pelvic artery into a venous-like system with minimal blood flow. The sluggish blood flow at the slow rate prevents blood loss [8].

In this study, an attempt has been made to enumerate possible measures to control blood loss, thereby minimizing postpartum blood transfusions and hysterectomy in patients with placenta previa with the help of bilateral internal iliac artery ligation (BIL).

## Methodology

This retrospective study was conducted in a tertiary care obstetrics and gynecology hospital at Tirunelveli, South Tamil Nadu. Data was collected from December 2015 to April 2018; cases with placenta previa were enrolled in this study. Of 31 women with H/O placenta previa who required BIL, two groups were formed: group 1—elective surgery—in 19 deliveries and group 2—emergency surgery—in 12 deliveries.

Laboratory criteria for hemoglobin levels in pre-partum and postpartum were included in the study.

Generally in normal placentation, the placenta grows in upper portion of uterus, and therefore, enough space is available for the fetus to grow. In abnormal placentation, the placenta shall grow in the lower region of uterus or even covering the cervix and this obstructs the normal vaginal delivery.

There are four types of placenta previa [9].

- Type 1 Low-lying placenta: lower placental edge not covering the internal OS.
- Type 2 Marginal placenta: lower placental edge covering the internal OS.

- Type 3 Incomplete central previa: asymmetrical overlapping of the placental edge and the internal OS.
- Type 4 Complete central previa: symmetrical overlapping of the placental edge and the internal OS.

The routine ultrasonography (USG) performed for the pregnant women screening between December 2015 and April 2018 showed 41 women with placenta previa. Only 31 out of 41 patients underwent BIL as elective or emergency surgery.

All patients with placenta previa were identified; they were educated about the condition right from the 26th week of pregnancy after identifying the placental position. They were asked to report to the hospital any time if there was even a minor episode of bleeding which was noticed. These patients' files had an emergency code in the form of a red sticker paper attached to the front of the file, with their blood group on it, so that no time was wasted on their arrival as an emergency. They were also advised to search for similar blood group people in their family for help.

Patients with placenta previa having the following criteria were considered for the study:

1. All patients with placenta previa, irrespective of parity, were taken into the study.
2. Patients were taken for elective surgery when there was no bleeding and after the patients attained term pregnancy, i.e., after 37 weeks and/or minor episode of bleeding with trepidation of further bleeding risk even before term pregnancy, i.e., before 37 weeks.
3. Patients posted for emergency LSCS, when they land up with heavy bleeding, irrespective of the gestational age.

When the patient reported to the center for delivery, 31 out of 41 patients underwent BIL procedure to prevent postpartum hemorrhage and hysterectomy.

The eligible patients and her relatives were informed about the BIL procedure, and informed consent was obtained. The need for blood transfusions is explained to them, if needed. The consent for the hysterectomy was also obtained if needed.

Steps of BIL procedure:

- The abdomen is opened.
- Uterus is everted after the delivery of the baby. The placenta is kept in situ without removal, and uterus is everted to look at the bifurcation of the iliac artery by palpating the pulsations.
- The round ligament is identified.
- The fallopian tube is identified.

**Table 1** Blood transfusion between BIL surgery types

BIL surgery type	Blood transfusion				Total	P value
	No		Yes			
Elective	19	100%	0	0%	19	<0.0001
Emergency	4	33%	8	67%	12	

**Table 2** Hemoglobin level—3 days post-surgery in elective and emergency cases

	Difference in preoperative and postoperative hemoglobin (mg/dl)			Hemoglobin level (3 days post-surgery)		P value
	<1.0	1.1–2.0	2.1–3.0	Mean	SD	
Elective (N=19)	9 (47.36%)	6 (31.57%)	4 (21.05%)	9.06	0.94	0.863
Emergency (N=12)	5 (41.66%)	6 (50.0%)	1 (8.33%)	9.13	0.99	

- About a 1-cm incision is made on the peritoneum posterior on the bifurcation, and the internal and external iliac arteries are identified.
- Open and enter the retroperitoneal space bluntly with fingers.
- The ureter remains with the medial fold of peritoneum and quite away from the vessels.
- Directly one will be over the division artery with little dissection.
- Pass the right angle hemostat forceps from lateral to medial (about 3–4 cm away from the division) beneath the internal iliac artery and ligated with Vicryl 1-0 delayed absorbable sutures. This prevents injury to external iliac vein.
- Ligate the vessel with three knots.
- Palpate the femoral artery for pulsations.
- Ensure perfect hemostasis.
- If there is minor bleeding, it can be arrested with pressure with mop.
- It will stop with pressure.
- Close the abdomen as usual.

## Result

Out of 31 women enrolled in this retrospective study, elective surgery was performed in 19 women and emergency surgery in 12 women. Types of placenta previa distribution were: central placenta – 8 (26%), low-lying placenta – 10 (32%) and marginal placenta – 11 (35%). Both placenta accrete and placenta percreta had one (3%) each. Seventeen (55%) women had undergone LSCS for the first time. Twelve (39%) women had one previous LSCS, one (3%) woman had two previous LSCSs and one woman had three previous LSCS. Gestational age for 31 women is: 10 women were term and 21 women preterm. Gravidity: primi = 7 and

**Table 3** Blood units used among blood transfused patients

Blood transfusion	Frequency	Percentage
No transfusion	23	74
<2 units	2	6
2–4 units	2	6
>4 units	4	13

multi = 24. Out of 31 women, six had pregnancy-induced hypertension and two had gestational diabetes mellitus.

The primary outcome was the postpartum blood transfusion for peripartum blood loss. Out of 31 women, 19 were on elective surgery (61.3%) and 12 were on emergency surgery (38.7%). Out of 12 emergency surgeries, 8 needed blood transfusion due to blood loss. Out of 19 elective surgeries, none required the blood transfusion. *P* value is significant with the blood transfusion and the type of BIL surgery (Table 1).

Emergency BIL surgery had no incidence of the hysterectomy, and elective BIL surgery had one postpartum hysterectomy in a placenta percreta patient.

Regarding the average hemoglobin level of pre- and 3 days post-surgery between two surgery groups, in elective surgery group mean hemoglobin was 9.06 g%, whereas in emergency surgery group mean hemoglobin was 9.13 g%. There was no significance in hemoglobin levels of pre- and post-surgery data between elective surgery and emergency surgery group (Table 2).

Eight cases in emergency surgery group had blood loss and required the blood transfusion. Four patients were transfused with >4 units of blood. Two patients were transfused with 2–4 units of blood. Two patients were transfused with <2 units of blood (Table 3).

Average hospital stay after the surgery was 4.5 days in elective surgery and 5.5 days in emergency surgery. *P* value

**Table 4** Hospital stay duration between elective and emergency surgery cases

BIL surgery type	Hospital stay duration (days)		<i>P</i> value
	Mean	SD	
Elective	4.47	0.51	0.021
Emergency	5.42	1.56	

**Table 5** Morbidity between elective and emergency surgery of BIL cases

BIL surgery type	Morbidity		Total	<i>P</i> value
	No	Yes		
Elective	18	1	19	0.296
Emergency	10	2	12	

**Table 6** Comorbid conditions and baby's birth weight

Comorbid (PIH, GDM)	Baby weight		Total	<i>P</i> value
	<2.5 kg	>2.5 kg		
No	10	15	25	0.447
Yes	4	4	8	

is significant with the number of hospital stay days and the type of BIL surgery (Table 4).

The morbidity analysis between two surgery methods was shown. One out of 19 elective surgery cases had fever. Among 2 out of 12 emergency surgery cases, one had fever and another had a bladder rent repair (Table 5).

Comorbid conditions such as pregnancy-induced hypertension, gestational diabetes mellitus and birth weight of the baby had shown no significance (Table 6).

## Discussion

Placenta previa was seen 1 in 200 pregnancies [7]. Previous history of LSCS, abortion, termination of pregnancy, gynecological surgeries such as tumor or PCO removal have increased the placenta previa incidence [10–14]. Such placenta previa has postpartum complications of PPH and hysterectomy [15]. The morbidity rate and mortality rate of mother were increased in placenta previa cases as a result of severe blood loss [16]. An immediate intervention is needed to prevent blood loss and to avoid the hysterectomy, preserving uterus for future pregnancy. BIL surgery was considered achieving the prevention of blood loss and also preserving the uterus for pregnancy ahead.

The increase in cesarean sections in developed and developing countries has contributed to a major factor

for rise in abnormal placentation. The frequency of dangerous and complex pregnancies like placenta previa has increased multifold in recent years. This complexity has impacted the mortality rate of mother and fetus. A comprehensive management of such abnormal pregnancies requires an evidence-based practice. The placenta previa has more chance of reporting the clinic with emergency conditions such as bleeding and painless bleeding, and this involves a multidisciplinary medical team in place to manage it [17]. The early diagnosis of such abnormal placentation is required in keeping the patient and the family members informed about the condition [18, 19].

Results suggest that BIL surgery performed as both elective and emergency surgeries in placenta previa is an effective management option. Although the incidence rate of placenta previa was low, with the limited data reported in the clinical setup, methods were utilized in determining an effective choice of surgery in preventing blood loss and preserving uterus. Placenta previa patients, irrespective of parity, were taken into the study.

The primary outcome of the study was minimizing the blood loss and blood transfusion which occurs as a result of hemorrhage. Out of 31 women enrolled in the study, 61.3% (19 cases) underwent elective surgery and 38.7% (12 cases) underwent emergency surgery. Blood transfusion required in 50% of the patient in emergency BIL surgery, whereas none required blood transfusion in elective BIL surgery.

The secondary outcome was preserving the uterus or avoiding postpartum hysterectomy. Out of 31 placenta previa women, 19 were considered for elective BIL surgery based on the clinical conditions. Twelve underwent emergency BIL surgery as they reported to emergency with bleeding. The data suggest no incidence of the hysterectomy in emergency BIL surgery. One postpartum hysterectomy was done in elective surgery for a placenta percreta patient, and blood transfusion was not required. The placenta percreta was diagnosed by MRI and planned for elective LSCS with hysterectomy.

Irrespective of the surgery type, the data related to the comorbid conditions (PIH, GDM) of mothers and the gestational term at the time of surgery were found to show no statistical or clinical significance.

There were no postpartum complications in elective BIL surgery. In emergency BIL surgery, one patient with placenta accreta with three previous LSCS received the blood transfusion <2–4 units and hysterectomy avoided. Another patient in emergency BIL surgery with marginal previa, profuse bleeding, IUD and previous LSCS had the blood transfusion. The hysterectomy was avoided and intraoperative bladder rent repair was done, which was incidental. The data suggest that the morbidity rate was higher in emergency surgery in comparison with elective surgery.

The BIL surgery had reduced the postpartum mortality and morbidity and preserved the uterus [20]. BIL surgery through elective planning had minimized the blood loss and prevented the chance for the patient to undergo the blood transfusion and hysterectomy [21].

Strength of the study is that it is purely a clinic-based study. However, the bleeding emergency cases had shown a reduction of 50% of blood transfusion requirement. The BIL surgery performed with one postpartum hysterectomy case in elective surgery with no such case in emergency surgery. Hence, BIL surgery option in both the study groups had saved the uterus for future pregnancy of the patients and also avoided post-hysterectomy complications except one electively planned placenta percreta case.

Although the smaller sample size reduces the precision of the findings, we can confirm the hypothesis that the BIL surgery in placenta previa cases may prevent unwanted blood loss and hysterectomy, thus reducing considerable postpartum mortality and morbidity with the uterus conserved for future pregnancy.

## Conclusion

BIL is safe and effective in controlling blood loss in life-threatening postpartum hemorrhage in placenta previa. Severe blood loss in low-parity young women is well controlled, and in addition to this, BIL also preserves uterus for future fertility. The next-generation obstetricians are to be trained to perform BIL, so that a lot more uteri are saved.

## Compliance with Ethical Standards

**Conflict of interest** The author declares no conflict of interest.

**Ethical Standard** The study was approved by the Institutional Ethics Committee.

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