



## Original Research Article

## Bilateral Internal iliac artery ligation: A life saving conservative management to control postpartum haemorrhage- clinical experiences

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## ABSTRACT

**Background:** It has been since long, that severe postpartum haemorrhage (PPH) was surgically treated by peripartum hysterectomy. Bilateral ligation of Internal iliac artery is an emerging technique by which we can control PPH efficiently and can conserve uterus.

**Aim:** The aim of our study, is to estimate the effectiveness of bilateral Internal iliac artery ligation (IILA) for conservation of uterus in the management of postpartum haemorrhage and outcome on the patients.

**Materials and Methods:** This observational study was carried out on the admitted patients in between March, 2016 and February, 2020 in a hospital having a tertiary obstetric care. Internal iliac artery ligation done to control postpartum haemorrhage of hospital admitted patients, was our study subject. Collected data were analysed in mean, median, percentage and proportion as applicable by using of SPSS version 24<sup>th</sup> statistical software.

**Results:** In the study population, out of forty-one patients, uterine conservation was possible in thirty-six (87.8%) patients. Most commonly sixteen (39%) patients had an indication of uterine atony for Internal iliac artery ligation. Caesarean section, thirty-four (82.9%) was the most common mode of delivery and general anaesthesia was used most commonly, thirty-seven (90.2%) for Internal iliac artery ligation. Procedure related complications were e.g. relaparotomy one (2.4%), Internal iliac vein injury two (4.9%) and wound infection two (4.9%).

**Conclusion:** Internal iliac artery ligation is an effective means to control PPH. It can effectively preserve reproductive potential of women by avoiding peripartum hysterectomy in many cases.

**Key Messages:** Postpartum hemorrhage is a life threatening complication of child birth. Peripartum hysterectomy is the last resort to tackle such complications. Our study, confirmed that bilateral internal iliac artery ligation can be a good alternative to tackle such disaster from postpartum hemorrhage and also conserve uterus of women for future reproduction.

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## 1. Introduction

Postpartum haemorrhage (PPH) is an obstetric emergency and a major cause of maternal morbidity and mortality following child birth worldwide. It is responsible for

13% maternal death in developed countries and 34% in developing countries. It is also reported that PPH is responsible for 1,25,000 maternal deaths and 20,000 morbidities in each year.<sup>1,2</sup>

Commonly, blood loss in excess of 1000 ml during caesarean section and 500 ml in vaginal delivery is regarded as PPH.<sup>1</sup> Few authors, alternatively describe it as 10%

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decrease of haematocrit from previous value. A clinical definition has been suggested by Coomb as 'need for blood transfusion'.<sup>3</sup> Hence, these definitions of PPH remains subjective and largely depends on clinical assessment and judgement regarding the haemodynamic instability from blood loss.

PPH is of two types e.g. primary and secondary; blood loss in first 24 hours is defined as primary PPH and excluding first 24 hours, bleeding of up to 6 weeks from child birth is considered as secondary PPH.<sup>1,4</sup>

PPH is an obstetric nightmare, may be result of uterine atony, placental abnormality i.e. placenta praevia, placenta accrete and placental abruption or from obstetric trauma or coagulation disorders, that may be acquired or congenital. Uterine atony is the single most important (80%) cause of PPH.<sup>5,6</sup> But no pregnant women are exempted from the risk of PPH. If bimanual compression with uterotonic drugs fail to control blood loss, then surgical intervention is the only available lifesaving option. Hysterectomy is potentially useful in this dire situation but with a drawback of stopping the future reproduction and menstrual function.

To control PPH, ligation of internal iliac artery (IILA) was first extensively investigated in 1968 by Burchell RC, which introduced a new era for the management of PPH by conserving reproductive potential of women.<sup>1,7,8</sup>

Bilateral internal iliac artery ligation decreases 45% pelvic blood flow and decreases 85% pulse pressure<sup>9</sup> that result in transformation of pelvic artery into venous like system, thereby converting to the venous pressure in the arterial circuit and that promotes haemostasis. It is reported that success of internal iliac artery ligation varies from 42% to 100% and it proves useful to avoid hysterectomy in substantial number of cases.<sup>1,10,11</sup>

There is paucity of data to evaluate usefulness of IILA for conservation of uterus. It is thought to be technically difficult and due to the fear of complications it is practised less frequently.<sup>12</sup> As a component of effective treatment for PPH, IILA is needed to be reviewed to maximise its use. In this study, our aim was to evaluate the usefulness for conservation of uterus and to evaluate the clinical outcome of bilateral internal iliac artery ligation (IILA) to control blood loss in PPH in our study subject.

## 2. Materials and Methods

Forty-one admitted pregnant women of the hospital for tertiary obstetric care, from March 2016 to February 2020 were recruited retrospectively in this observational study. During this four-year period, total sixty-four admitted women had undergone IILA. Among them, IILA was done in seventeen cases during the gynaecological operation or oncosurgery for gynaecological malignancy. With caesarean section it was done prophylactically in six cases of major degree placenta praevia. In forty-one cases, IILA done as an emergency obstetrics procedure to control bleeding from

PPH, was our study subject. IILA was done in cases of medical and also other modalities of surgical treatments e.g. bilateral uterine artery ligation or in cases where modified B-lynch sutures had failed. (Figure 1)

The Institutional Ethics Committee approved the study, and the study was performed in accordance with its recommendations and that of Helsinki Declaration of 1975 that was revised in 2000. All the selected patients had undergone bilateral internal iliac artery ligation (IILA) as a part of PPH management. According to cause, the patients were divided categorically. Women who had undergone IILA due to other causes were excluded from the study. Data were collected from patients file, OT register and available operative notes.

The obstetric history, clinical examination and case history of patient was collected in a proforma made by authors. Permission from institutional ethics committee has been obtained to collect and evaluate the patient data retrospectively for the study. Demographic profile regarding age, parity, gestational age and haematological parameters were incorporated in the proforma. In our study, PPH were defined as blood loss of 500 ml for vaginal delivery and 1000 ml for caesarean section.

In the management of patients with PPH, bimanual compression, aortic compression were applied simultaneously with uterotonic agents. As a uterotonic agent oxytocin used intravenous infusion, methylergonovine maleate (0.2 mg) and carboprost tromethamine (250 mcg) used intra-muscularly at appropriate interval and doses and misoprostol (1000 µg) single dose by rectal route used in standard regimen.

Patients were planned for surgical intervention when medical treatment had failed to achieve effective haemostasis with these optimum regimens of uterotonics. Decision for IILA was taken in cases of substantial intraoperative or post-operative bleeding even after bilateral uterine artery ligation and modified B-lynch sutures.

As a standard surgical procedure, in high risk settings, for quick access, abdomen was preferably opened by midline infra-umbilical incision or otherwise pfannenstiel incision was used. Broad ligament dissected at the base of the infundibulopelvic ligament to get access to the retroperitoneal vasculatures. In retroperitoneal space was entered by blunt dissection and ureter was identified and dissection was done in such a way that it remains in the medial flap of peritoneum. Internal iliac artery was identified after tracing below the bifurcation of common iliac artery. A delayed absorbable suture (Vicryl I) was passed in double about 0.5 cm apart from lateral to medial side, about 4 cm below the bifurcation of common iliac artery. Similar procedure was also done on the other side. Procedure was declared successful, if bleeding remained stopped even after waiting of 3-4 minutes. Hysterectomy was a last resort of obstetric treatment in case of failure of

the procedure.

### 2.1. Statistical analysis

Data were analysed in mean, median, percentage and proportion as applicable. Collected data were entered in MS Excel and were analysed by using of IBM SPSS version 24<sup>th</sup> statistical software. The results were presented as mean, standard deviation for quantitative data and frequencies for qualitative data.

## 3. Results

To control bleeding from PPH and saving life of women, IILA was done when other modalities of conservative treatment became ineffective in the patients. Forty-one patients fulfilled the criteria as a subject and were enrolled for the study.

Uterine atony was the single most common sixteen (39%) indication for IILA. Other indications were placenta praevia with uterine atony present in eleven (26.8%), placental abruption with atony in six (14.6%) patients. IILA was done in each of three (7.3%) patients of broad ligament haematoma that developed from lateral extension of tear during caesarean section and also rupture uterus/scar dehiscence. In two (4.9%) patients of coagulation abnormalities, IILA was also done, out of these two patients, one had a viral hepatitis and another had ITP. (Table 1)

Out of the forty-one women, thirty had multigravidas (73.2%) were most of them and eleven (26.8%) others had primigravida. Mean age of women were 24.8±3.21 years. Most of the child e.g. twenty-eight (68.3%) had preterm birth and the mean gestational age was 35.5±1.92 weeks.

Thirty-four (82.9%) caesarean section was the commonest mode of delivery and in thirty-seven (90.2%) patient's general anaesthesia was most commonly used for the procedure of IILA.

Bilateral internal iliac artery ligation (IILA) was accomplished in a patient with central placenta praevia in combination with caesarean section for excessive intraoperative blood loss. But it was required to re-open abdomen due to intractable PPH in post-operative period. For securing haemostasis, peripartum hysterectomy was done in relaparotomy. There was no maternal mortality in our study group. Infection in the surgical site wound occurred in two (4.9%) patients of IILA and were treated by broad-spectrum antibiotics and secondary suturing. The birth weight of twenty-one (51.2%) neonate was in between 2500 and 3500 gm that was most common finding. (Table 1)

Out of all categories, maximum number that was three patients out of eleven required hysterectomies for placenta praevia with uterine atony. In this category, conservation of uterus was possible in eight (72.7%) patients. Hysterectomy was needed in one patient among the patient category of

uterine atony. Uterine conservation was possible in fifteen (93.7%) patients that was the maximum within all the categories. (Table 2)

For the purpose of transfusion of blood components, the mean requirement of packed red blood cell, fresh frozen plasma and whole blood were 3.46±1.27, 1.61±2.28 and 1.44±1.18 units respectively. In preoperative and post-operative mean haemoglobin of each patient was 7.12±1.33 gm/dl and 8.12±0.84 gm/dl respectively. Average operative time was 91.83±14.22 minutes and blood loss were 1448.78±260.88 ml for IILA. The duration of average hospital stay of patients was 6.63±1.18 days with a range of six to eleven days. (Table 3)

## 4. Discussion

Internal iliac artery ligation (IILA) is an effective procedure to stop bleeding in PPH and protect fertility of women by conserving uterus.<sup>13</sup> Risk of complications is little in experienced hand. In our study, only one needed relaparomy out of forty-one patients. Intraoperative internal iliac vein injury occurred in two patients, repairing of vein were required in one of the case and another one bleeding was stopped after sustained pressure for few minutes. Both of the internal iliac vein injury were treated successfully. Clear understanding of retroperitoneal anatomy and meticulous dissection of internal iliac artery was needed before applying ligature.<sup>14</sup> Surgical site wound infection developed in two patients and was treated successfully by broad-spectrum antibiotics. We had not encountered any procedure related major or long term sequelae e.g. ureteric injury or inadvertent ligation of external iliac artery. Nkwabong et al<sup>15</sup> reported one case of internal iliac vein injury in their case series.

We had measured the effectiveness of IILA to control PPH and rate of conservation of uterus after IILA. In our study, out of forty-one patients, conservation of uterus was possible in thirty-six (87.8%) patients after satisfactory control of PPH. In a similar study, the rate of conservation of uterus was 75% as reported by Nkwabong et al.<sup>15</sup> It was similar to our study result.

In our study of total forty-one patients, uterine atony was the single most common indication and was present in sixteen (39%) cases for IILA. Uterine atony was in combination with placenta praevia in eleven (26.8%) patients and in combination with placental abruption it was present in six (14.6%) patients. A study reported by Yalınkaya et al<sup>16</sup> found that uterine atony was the most common reason of PPH for which paripartum hysterectomy was needed in their study group. Nayak et al<sup>4</sup> reported the indications of IILA for uterine atony 46.6%, placenta praevia 13.3%, abruptio placenta 8.8%, rupture uterus 22.2%, lower genital tract injury 4.4% and broad ligament hematoma 4.4% respectively in their study subject. In another study, uterine atony was the most common

**Table 1:** Data of patients with internal iliac artery ligation and success of uterine conservation.

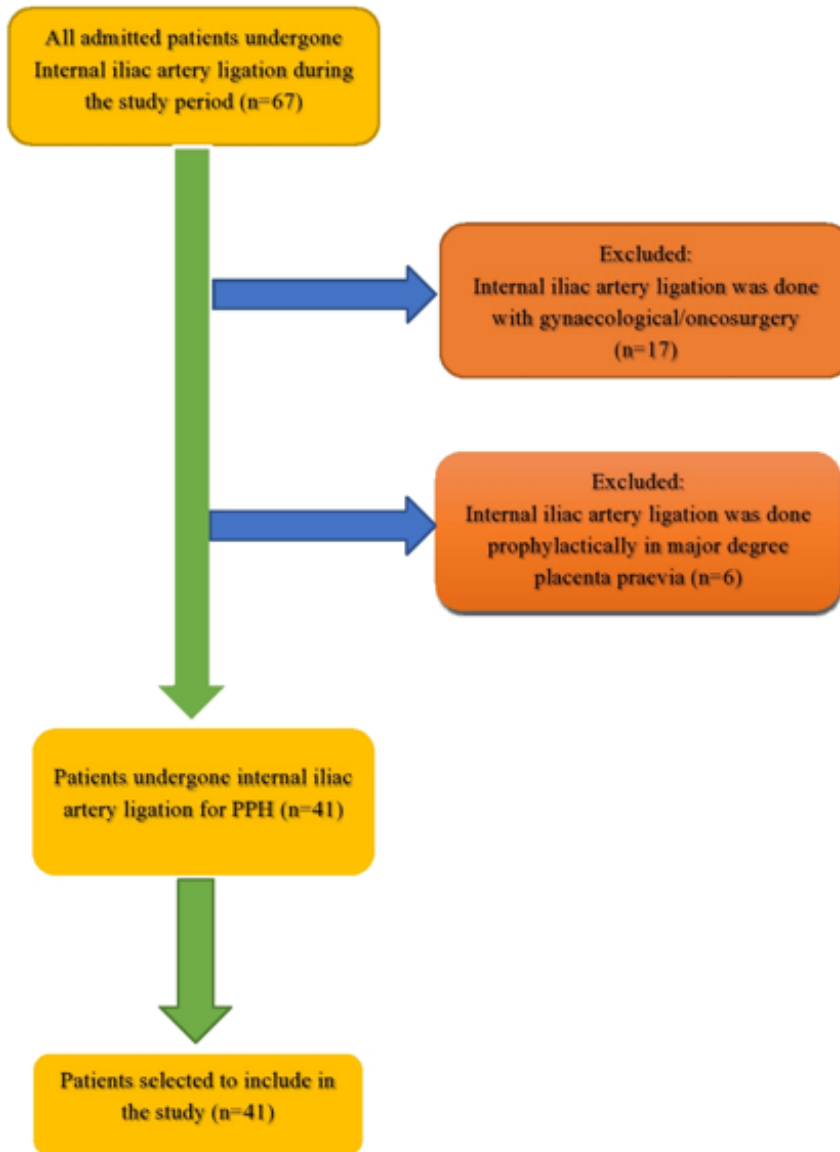
Indications	No. (%) of women. (n=41)	Hysterectomy done No. (%) (n=no. of individual category)	Uterine conservation rate (n=no. of individual category)
Uterine atony alone	16 (39%)	1 (6.3%)	15 (93.7%)
Placenta praevia with uterine atony	11 (26.8%)	3 (27.3)	8 (72.7%)
Placental abruption with Uterine atony	6 (14.6%)	0 (0%)	6 (100%)
Broad ligament haematoma	3 (7.3%)	0 (0%)	3 (100%)
Rupture uterus/ scar dehiscence	3 (7.3%)	1 (33.3%)	2 (66.7%)
Coagulation disorder	2 (4.9%)	1 (50%)	2 (50%)
Total	41 (100%)	6 (14.6%)	36 (87.8%)

**Table 2:** Demographic data

Characteristics of patients	Patients data	Frequencies	Percentage
Parity	Primigravida	11	26.8
	Multigravida	30	73.2
Gestational age (weeks)	28-36 weeks	28	68.3
	37-42 weeks	13	31.7
Mode of delivery	Vaginal delivery	7	17.1
	Caesarean section	34	82.9
Type of anaesthesia	General anaesthesia	37	90.2
	Regional anaesthesia	4	9.8
Operative complication	Relaparotomy required	1	2.4
	Internal iliac vein injury	2	4.9
Birth weight of baby (gm)	Surgical site wound infection	2	4.9
	<2,500	11	26.8
	2500-3500	21	51.2
	3501-4000	6	14.6
	>4000	3	7.3

**Table 3:** Data of study population

Patient details	Mean±SD
Age (years)	24.8±3.21
Gestational age (weeks)	35.5±1.92
<b>Transfusion parameter</b>	
Packed cell	3.46±1.27
Fresh frozen plasma	1.61±2.28
Whole Blood	1.44±1.18
<b>Operative parameter</b>	
Preoperative haemoglobin (gm/dl)	7.12±1.33
Operative time (minutes)	91.83±14.22
Amount of blood loss (ml)	1448.78±260.88
<b>Postoperative parameter</b>	
Postoperative haemoglobin (gm/dl)	8.12±0.84
Duration of stay in hospital (days)	6.63±1.18



**Fig. 1:** Flow chart of cases included in the study

indication for requiring IILA in the case series of PPH reported by Nkwabong et al<sup>15</sup> and Wankhede et al.<sup>17</sup> Our study finding was similar to the study reported in the literatures.

In placenta praevia, propensity of PPH was more than those in the other categories. Only uterine artery ligation could not control bleeding in many cases, as lower segment of uterus is very much vascular and get significant proportion of blood supply from descending branch of uterine artery and vaginal arteries. For this reason, IILA was required to control the bleeding from PPH in good number of cases.<sup>10</sup>

In our study, mean age of patient was  $24.8 \pm 3.21$  years, 73.2% patient was of multigravida, most of the pregnancies (68.3%) were within 28-36 weeks of gestation. General anaesthesia was applied most commonly (90.2%) for operation of IILA and caesarean section was the most common (82.9%) mode of child birth. In a similar study, Puangsricharoen et al<sup>18</sup> found in their study most of the pregnancies were from 37-42 weeks of gestation i.e. contradictory to our study finding, that may be due to their small sample size and different geographical area of their study. In the same study, most of the patients were from multigravida (58.1%) and maximum number of patient (90.3%) were delivered by caesarean section i.e. similar

to our study finding. Mean age was  $26.89 \pm 6.06$  year in a similar study conducted by Singh et al i.e. also similar to our study finding.

In our study preoperative and postoperative mean value of haemoglobin was  $7.12 \pm 1.33$  gm/dl and  $8.12 \pm 0.84$  gm/dl. Simsek et al<sup>14</sup> reported that preoperative and postoperative mean haemoglobin value was 7.1 gm/dl and 9.1 gm/dl respectively in their patients of similar study group. We had also found similar result in our study.

IIA is an effective measure and must be offered to those women who have not completed family or wish to preserve her uterus. In the literature it was also shown that IIA procedure had not any adverse effect on ovarian function.<sup>14</sup> In the study reported by Doumouchtsis et al<sup>19</sup> did not also find any significant association of decrease in ovarian reserve and fertility potential of women after IIA or uterine devascularisation operation.

IIA was first performed by Sir Howard Kelly in 1893 to control pelvic haemorrhage during hysterectomy in a case of cervical malignancy.<sup>20</sup> To control PPH, the procedure was later introduced by Mengert WF et al on 1969.<sup>10,21,22</sup>

The limitation of our study is the retrospective design and small sample size in our study. Despite the limitations, our study duly highlighted the usefulness and effectiveness of internal iliac artery ligation for conservation of uterus in the management of PPH. In future, prospective and multi-centre study with larger sample size is to be performed to verify our current study findings in PPH.

## 5. Conclusions

Internal iliac artery ligation is a safe, effective and lifesaving method to control intractable PPH. Almost it is last resort of the fertility preserving method available for conservation of uterus in PPH management. Understanding of retroperitoneal anatomy is necessary for the procedure to prevent inadvertent injury to ureter or internal iliac vein. It is required to be familiar by each obstetrician and gynaecologist with IIA due to its usefulness in the emergency management of PPH.

## 6. Authors' Contributions

Both author exclusively contributed in this work and read and approved the final manuscript.

## 7. Declaration of Patient Consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

## 8. Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

## 9. Source of Funding

None.

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