

Role of Anterior Division of Internal Iliac Artery Ligation in Refractory Postpartum Haemorrhage—A Tertiary Care Hospital Based Study

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Abstract

Objective: Postpartum haemorrhage (PPH) is one of the important obstetrical emergencies and a leading cause of maternal morbidity and mortality. According to the World Health Organization, postpartum haemorrhage constitutes 25% of all maternal deaths worldwide. In situations where medical line of management fails to control postpartum haemorrhage, anterior division of internal iliac artery ligation can play an important role as a lifesaving and fertility preserving surgical procedure. Keeping this in mind, our study aimed to analyze indications and efficacy of anterior division of Internal Iliac artery ligation in the form of uterine salvage and saving maternal life. **Study design:** This was a retrospective study carried out in the Department of Obstetrics and Gynaecology, Government Medical College, Aurangabad during the period of July 2014-January 2016. A total of 57 cases that had undergone ligation of anterior division of internal iliac artery were included in the study and different indications and efficacy were studied. **Results:** Atonic PPH (52.63%) leads the list of indications for ligation anterior division of internal iliac artery ligation followed by traumatic (19.29%), adherent placenta (12.2%), mixed variety (10.52%) and coagulopathy (5.26). Maximum efficacy in terms of preserving fertility and saving maternal life was 73.33% and 93.3% respectively in atonic PPH. Overall efficacy of this procedure in terms of uterine salvage was 54.38% and in terms of saving maternal life was 87.71%. **Conclusion:** Anterior division of IIAL was effective method in controlling refractory PPH, reducing morbidity and preserving uterus and future fertility. It is safe life saving procedure at experienced hands.

Keywords

Internal Iliac Artery Ligation (IIAL), Postpartum Haemorrhage (PPH), Uterine

1. Introduction

Postpartum haemorrhage (PPH) is one of the important obstetrical emergencies and a leading cause of maternal morbidity and mortality. According to the World Health Organization, postpartum haemorrhage constitutes 25% of all maternal deaths worldwide [1]. PPH can result from several obstetrical conditions including uterine atony, placental disorders such as placenta accreta, obstetrical trauma, bleeding diathesis, and trauma to the abdomino-pelvic region. If medical treatment and other nonsurgical interventions are not able to control bleeding, the management of PPH requires surgical intervention without any delay [2]. After the first report of hypogastric artery ligation (HAL) in 1960s as one of the surgical procedures to prevent hysterectomy, it has gained an important place in the armamentarium of conservative treatment of obstetrical haemorrhage [3]. As a component of the preventive measures to decrease bleeding, both the timing and the technique of internal iliac artery ligation need to be revisited to maximize its effectiveness. The rationale for this is based on the hemodynamic studies of Burchell, which showed that IIAL reduced pelvic blood flow by 49% and pulse pressure by 85%, resulting in venous pressures in the arterial circuit thus promoting haemostasis [4]. However, the reported success rate of IIAL varies from 40% to 100% [5] [6], and the procedure averts hysterectomy in only 50% of cases [7]. Failures were more evident in atonic PPH than in other causes of PPH [8]. IIAL is thought to be technically difficult, and although much quicker than a hysterectomy, it is seldom attempted. Keeping this in mind, present study was undertaken to evaluate the indications and the efficacy of clinical outcomes for bilateral IIAL as a life saving surgery.

2. Material and Methods

This was retrospective study carried out in the Department of Obstetrics and Gynaecology, Government Medical College, Aurangabad between the periods of July 2014-January 2016. A total of 57 cases that had undergone anterior division of IIAL were studied. Approval of Institutional Ethics committee was taken.

3. Inclusion Criteria

Cases which required bilateral anterior division of internal iliac artery ligation were done to prevent and to control refractory postpartum haemorrhage.

4. Exclusion Criteria

Referral cases where ligation was performed in some other hospital.

5. Methodology

The study population was selected from women admitted for delivery or as referred

cases of PPH after applying inclusion and exclusion criteria. All women who delivered in our hospital were given Active management of third stage of labour (AMTSL) as per WHO guidelines which included an administration of a uterotonic, preferably oxytocin, immediately after birth of the baby; controlled cord traction (CCT) to deliver the placenta; and massage of the uterine fundus after the delivery of placenta. Women referred from outside and women who delivered in our hospital and landed in PPH were given medical as well as nonsurgical management of PPH as per our SOPs of our institute and if PPH was not controlled then the woman was posted for operative intervention as a case of refractory PPH. In atonic PPH, compression sutures and if required selective devascularisation were performed. The woman who underwent BIIAL was included in the study after taking written consent and explaining the purpose of study. History pertaining to age, parity, her antenatal registration status, gestational age at the time of delivery, mode of delivery, reason for referral, conservative management received, general condition of the women along with shock index, along with other associated interventions and investigations were noted. Indication for bilateral anterior division of internal iliac artery ligation were analysed and classified as atonic, traumatic, adherent placenta and coagulopathy. All the IIAL was done by transabdominal anterior or posterior approach and at the hands of senior Obstetrician. Efficacy of IIAL was determined in terms of controlling obstetric haemorrhage with uterine salvage and saving maternal lives. Immediate intra-operative complications in the form of injury to adjacent organs, vessels, pelvic haematoma formation or accidental ureteric ligation were noted. Post operative and remote complications were noted in the form of fever, wound infection, claudication in posterior thigh, necrosis of perineal muscles. Length of hospital stay, admission to intensive care unit and requirement of blood and component therapy were studied. In case of maternal mortality cause and time interval between intervention and death were analysed. Appropriate statistical analysis was done.

6. Results

Government medical college, Aurangabad is having one of the busiest labour rooms from Maharashtra state catering large number of labouring women from 7 nearby districts. A total 25,091 women delivered in the hospital during study period of 17 months from July 2014 to January 2015. IIAL was performed in total fifty seven women complicated by PPH after vaginal or cesarean delivery in our hospital or referred from other hospitals. The baseline characteristics of study subjects including age, parity, gestational age, shock index and mode of delivery were shown in **Table 1**. Out of 57 women who had undergone BIIAL (**Table 2**), atonic PPH (52.63%) leads the list followed by traumatic (19.29%), adherent placenta (12.27%), mixed variety (10.52%) and coagulopathy (5.26). Efficacy of IIAL (**Table 3**) in terms of saving maternal life is highest (93.3%) for atonic PPH followed by 90.9% in traumatic PPH, 85.7% for adherent placenta, 71.4% for mixed variety and 66.6% for coagulopathy. Overall efficacy in terms of uterine salvage was 54.38% and in terms of saving maternal life is 87.71%. Maternal outcome in women who had undergone IIAL (**Table 4**); no immediate or remote complications

Table 1. Baseline characteristics in study of IIAL.

Characteristics	Descriptive statistics
Age (in years)	
Mean	24.89 ± 4.5
Range	18 - 35
Parity	
Mean	2 ± 1.25
Range	1 - 6
Gestational Age (in weeks)	
Mean	34.68 ± 5.85
Range	16 - 41
Shock Index	
Mean	0.75 ± 0.1
Range	0.7 - 1.1
Mode of Delivery	
Vaginal	24 (42.11%)
Caesarean/Hysterotomy	32 (56.14%)
Instrumental	01 (1.75%)

Table 2. Indications of internal iliac artery ligation.

Indications	Number of women (n = 57)	%
Atonic PPH	30	52.63
Traumatic PPH		
Genital tract injury including broad ligament haematoma	07	12.28
Uterine Rupture	03	5.26
Surgical-caesarean sections, angular extensions, episiotomy	01	1.75
Adherent Placenta		
Increta	05	8.77
Accreta	01	1.75
Percreta	01	1.75
Coagulopathy	03	5.26
Mixed	06	10.52

were noted. Postoperative complication like fever (10.52%), Paralytic ileus (7.01%) and Pneumonitis (1.75%) and wound sepsis (1.75%) were observed. ICU admission was required for 22.80% cases. Length of hospital stay was <10 days in 78.94% cases. Average number of blood transfusions required is 4.1 ± 1 bag. In spite of control of obstetric haemorrhage in all cases, maternal mortality (**Table 5**) was seen in 7 cases secondary to sequel of massive obstetric haemorrhage.

7. Discussion

IIAL is an effective way of controlling obstetric haemorrhage, if executed properly, timely and successfully. Previously in severe PPH or in any other surgical procedure

Table 3. Efficacy of IIAL.

Indication	Efficacy of IIAL			
	Uterine Salvage		Maternal Life	
	Possible	Not possible	Saved	Not saved
Atonic PPH (n = 30)	22 (73.33%)	8 (26.66%)	28 (93.3%)	2 (6.7%)
Traumatic PPH (n = 11)	05 (45.4%)	6 (54.54%)	10 (90.9%)	1 (9.1%)
Adherent placenta (n = 7)	01 (14.2%)	6 (85.71%)	6 (85.7%)	1 (14.3%)
Coagulopathy (n = 3)	02 (66.6%)	1 (33.33%)	2 (66.6%)	1 (33.4%)
Mixed (n = 6)	01 (16.66%)	5 (83.33%)	4 (66.66%)	2 (33.33%)
N = 57	31 (54.38%)	26 (45.61%)	50 (87.71%)	7 (12.28%)

Table 4. Maternal outcome.

Maternal Outcome	NUMBER OF CASES WITH PERCENTAGE
Complications of IIAL	
Immediate	
• Injury to internal iliac vessels	
• Injury to adjacent viscera	
• Accidental ligation of ureters	NIL
Post Operative	
• Fever	6 (10.52%)
• Paralytic ileus	4 (7.01%)
• Urinary tract infection	NIL
• Pneumonitis	1 (1.75%)
• Wound sepsis	1 (1.75%)
Remote	
• Deep vein thromboembolism	
• Claudication of lower limbs	
• Gluteal ischemia	NIL
ICU Admission	
• Required	13 (22.80%)
• Not required	44 (77.19%)
Hospital Stay	
• ≤10 Days	45 (78.94%)
• >10 Days	12 (21.05%)
Number of Blood Transfusion	
• Pre-operative	4.1 ± 1
• Post-operative	1.3 ± 1

leading to postoperative bleeding, the traditional surgical treatment was to perform an emergency obstetric hysterectomy and eliminating possibility of future fertility. Nowadays obstetrical indications for obstetric hysterectomy have become rare due to use of newer modalities to control atonic postpartum haemorrhage. IIAL is an alternative life saving procedure which preserves the reproductive capacity in circumstances where these newer modalities to control obstetric haemorrhage are not available.

Table 5. Maternal mortality.

Sr. no.	Obstetric History (GPLA)	Diagnosis	Length of Hospital Stay	Cause of Death
1	G1P0L0	Primigravida at 31 wks of gestation with abruption placenta with IUFD	4 days	ARF with DIC
2	G2P1L1	G2P1L1 at 37 wks of GA with abruption with DIC with hemorrhagic shock	5 days	ARF with irreversible shock
3	G4P2L2A1	G4P2L2A1 at 17.5 wks of GA with prev. LSCS with lowlying adherent placenta in bleeding phase	23 days	ARDS with septicaemia
4	G1P0L0	Primigravida 38 wks of GA with viral hepatitis with severe pre eclampsia with HELLP	2 days	Hepatorenal shutdown with DIC
5	G3P2L2	G3P2L2 at term with severe anaemia in active labour	2 days	Pulmonary oedema
6	G1P0L0	Primi 37.6 wks with hyperbilirubinemia with RH neg status with IUFD	3 days	Hepatorenal shutdown
7	G5P3L2D1	G5P3L2D1A1 with abruptio placenta with severe pre eclampsia with RH neg status at 29.4 wks	3 days	ARF

Here we report the largest series of retrospective analysis of 57 women who underwent bilateral anterior division of IIAL for management of refractory PPH. Till date; this is the highest series of IIAL for done for obstetric indications.

Nizard J. *et al.* stated that IIAL for postpartum haemorrhage was not responsible for secondary infertility, uterine contractility disorders, placental perfusion insufficiency, fetal anomalies or IUGR [9]. Wagaarachchi P.T. *et al.* studied 12 women who had undergone IIAL for PPH and concluded that it was a safe and effective procedure for life threatening obstetric haemorrhage, along with the preservation of fertility [10].

Iwata A. *et al.* reported that the success for IIAL was between 40% and 100% and it prevents hysterectomy by 50%. IIAL is reported to be less successful in hysterectomy prevention in cases with uterine atony, when compared to other causes of PPH [11]. Evsen Mehmet Siddik *et al.* noted uterine salvage in 9 of 16 (56.2%) cases with atony, and it was determined that an additional procedure, that was the ligation of the ligament propriumovariae or B-Lynch suture was needed in the atony group for the preservation of uterus [12]. In abnormal placentation, the traditional treatment has been hysterectomy. However, in the recent years, uterine conservative methods have been described. The necessity of IIAL in cases of abnormal placentation has been emphasised

by many previous studies, in both hysterectomy and preserved uterine cases [10] [11]. In our study the, efficacy of IIAL in terms of uterine salvage was between 14.2% and 73.33% and maximum was noted for atonic PPH (73.33%). This was higher than most other studies due to the fact that additional procedures like compression sutures and uterine and ovarian artery ligation had already been performed. Efficacy of IIAL in terms of saving maternal life was between 66.6% and 93.3%. Maximum efficacy in terms of saving life was noted for atonic PPH. This depicts that timely decision was having higher success rate. Overall efficacy noted in terms of uterine salvage was 54.38% and in terms of saving maternal life was 87.71%. This overall efficacy in terms of uterine salvage was low due to the fact that 6 out of 7 cases where IIAL was done underwent obstetric hysterectomy for adherent placenta. Only in one case of placenta increta, uterine salvage was possible because only the focal lobe of placenta was adherent. In all these cases intra-operative blood loss was definitely reduced due to prophylactic ligation.

Fouzia Parveen *et al.* reported a total of eight patients undergoing IIAL; three for atonic uterus, two for placenta previa and one each for placenta accrete, rupture uterus and coagulopathy. After successful control of haemorrhage with IIAL, no woman had delayed haemorrhage requiring re-laparotomy. The failure rate was 16.66%. This may be because of less number of cases of atony of uterus and early decision of performing IIAL. She emphasised the fact that the treatment of severe haemorrhage requires not only the technical ability to carry out an appropriate surgical procedure but the ability to make a timely decision that this operation is necessary. No complications were reported, perhaps due to the surgery being performed by experienced consultants [13]. Reich and Nechtow have emphasized that the biggest pitfall with IIAL was waiting too long to perform it [14].

Though IIAL is life saving procedure, it also has some complications which one should know, while performing this procedure-such as inadvertent external iliac artery ligation, injuring of the internal iliac vein or the ureter. Kalburgi E. B. *et al.* reported no complications followed by IIAL. Our study also reported no serious intra-operative complication [15].

Debasmita Mandal *et al.* reported a good response of atonic PPH to IIAL, and observed less postoperative morbidity in comparison to emergency hysterectomy, requiring less operating time for those experienced surgeons [16].

Our study reported, IIAL is safe and effective in controlling refractory PPH and has proved itself to be a boon.

8. Conclusion

Anterior division of IIAL was effective method in controlling refractory PPH, reducing morbidity and preserving uterus and future fertility. After conventional management with all oxytocics, uterine massage and compression sutures in atonic PPH, IIAL is one of the life & uterine saving surgery. However, in cases of mixed PPH and adherent placenta, one should go for IIAL without any delay. It was a safe life saving procedure at

experienced hands.

9. Recommendation

Our study recommends inclusion of Pelvic cadaveric dissection and planning of Post-graduate curriculum for demonstration of internal iliac artery dissection to facilitate expertise in IIAL which will help them to take timely decision of saving maternal lives. We also recommend creation of National Database Registry for IIAL ligation for further study.

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