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Can internal iliac artery ligation be an alternative to pelvic devascularization/hysterectomy for obstetric and pelvic haemorrhage?

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Abstract
Aim: To evaluate the role of Internal Iliac Artery Ligation (IIAL) as an alternative to pelvic devascularization and hysterectomy for obstetric haemorrhage and pelvic haemorrhage following gynaecological surgery.
Study design: Retrospective study performed over 25 women who underwent therapeutic IIAL/Pelvic devascularization to combat haemorrhage.
Study area: Santokba Durlabhji Memorial Hospital (SDMH), Jaipur from January 2016 to July 2020.
Study Sample: Women admitted to SDM Hospital, for obstetric or gynaecological intervention who underwent IIAL/Pelvic devascularization/Hysterectomy to combat haemorrhage.
Method: Bilateral or unilateral IIAL/ Pelvic devascularization performed.
Outcome: Need for hysterectomy following IIAL to combat haemorrahge or morbidity, mortality and complications following procedure.
Results: Total of 23 patients underwent IIAL, 16 bilateral and 7 unilateral. All ligations were done through a transperitoneal approach. 2 out of 23 ligations were performed for gynaecological indication. Out of 21 patients with obstetric complications, 9 underwent IIAL due to atonic postpartum haemorrhage, 2 for complete and 1 for incomplete placenta previa, 3 for placenta previa with adherent placenta, 2 for haemorrhagic shock in previous scar, 2 for uterine rupture.
Other 2 were done as there was an extension of uterine incision. There were 2 patients who underwent systemic devascularisation. Bleeding was controlled only in one case while other one required subtotal hysterectomy.
Conclusions: IIAL is an effective procedure to combat both obstetric and pelvic haemorrahge in a short span of time. Further it prevents women from undergoing hysterectomy and its following complications.

Keywords: Internal iliac artery ligation, haemorrhage, pelvic devascularization, hysterectomy

Introduction
The World Health Organization (WHO) defines PPH as "blood loss greater than or equal to 500 ml within 24 hours after birth", and severe primary PPH as "blood loss greater than or equal to 1000 ml within 24 hours" [1]. Postpartum haemorrhage (PPH) is a major cause of worldwide maternal mortality ranging from 13% in developed countries to 34% in developing countries [2]. Uterine atony is the commonest cause of PPH that accounts for 80% of cases [3]. Other causes include retained placental bits, uterine rupture and lower genital tract injuries.
Risk factors for PPH include: past history of PPH, multiple pregnancy, fetal macrosomia, primi-gravida, grand multi-parity, older age, preterm births, non-use of oxytocics for PPH prophylaxis, labour induction, cesarean birth and intra-uterine fetal deaths [4, 8]. Occurrence of PPH is unpredictable before-hand and no case is exempt from its risk.
If PPH continues despite aggressive medical treatment, early surgical intervention should be considered. Various surgical methods are available such as uterine cavity tamponade, selective uterine artery embolization, uterine brace sutures, uterine artery ligation, systemic devascularization and lastly hysterectomy as a lifesaving procedure. Amongst all, IIAL has been advocated as an effective means of controlling intractable PPH and preventing maternal death. Following ligation of anterior branch of internal iliac artery, there is a reduction of 85% in pulse pressure and 48% in the blood flow in the arteries distal to the ligation [9, 10].
Here we present a retrospective study performed over 25 women who underwent surgical IIAL/ Pelvic devascularization to combat haemorrhage.

Methods

This is a retrospective study of the internal iliac artery ligation, done at our institute from January 2016 to July 2020. Unilateral/bilateral IIAL and pelvic devascularization were performed as therapeutic measures to combat haemorrhage.

Results

Total of 23 patients underwent IIAL, 16 bilateral and 7 unilateral. The indications have been listed in Table 1. All ligations were done through a transperitoneal approach. 2 out of 23 ligations were performed for gynecological indication. One case underwent IIAL following myomectomy being done for intramural and subserosal fibroids resulting in a broad ligament haematoma formation and another case underwent IIAL because of abnormal uterine bleeding with intramural fibroids.

Out of 21 patients with obstetric complications, 9 underwent IIAL due to atonic PPH, 6 were done in relation to different types of placenta previa, 2 in case of haemorrhagic shock with previous LSCS, 2 for uterine rupture & 2 were done as there was an extension of uterine incision. Elaborative description of all obstetric indications illustrated in Figure 1.

Other 2 patients underwent Pelvic devascularization. All Obstetric cases underwent cesarean section, the indications with gravidity of patients listed in Table 2.

IIAL resulted in control of bleeding in all 25 cases. No case required re-laparotomy in the postoperative period. Intrauterine packing was done in 12 cases and was removed after 36 hours. Intraabdominal drain was put in 17 cases and was removed after 72 hours in 10 cases, 48hrs in 5 cases and 7 days in 2 cases respectively. All cases required blood transfusion. Requirements for all has been listed in Table 3.

In two patients who underwent systemic devascularisation, bleeding was controlled only in one case [Table 4; Graph 1]. Amongst these two, one case had atonic PPH and the other case was morbidly adherent placenta which led to atonic PPH for which subtotal hysterectomy was performed.

All the cases were initially managed medically but failed to control the intractable haemorrahge. 100% success was achieved by IIAL while it was only 50% with systemic devascularisation.

Table 1: Indications for IIAL

	Number of patients	Percentages (%)
Obstetric Causes		
Atonic PPH	9	39.2%
Complete PP	2	8.7%
Incomplete PP	1	4.3%
PP + adherent placenta	3	13.1%
Haemorrhagic shock with previous LSCS	2	8.7%
Uterine rupture	2	8.7%
Extension of uterine incision	2	8.7%
Gynaecological Causes		
Broad ligament haematoma following myomectomy	1	4.3%
AUB-L	1	4.3%
Total	23	100%

Table 2: Indication of LSCS with Gravidity of patient

Gravidity	Indication	No. of Cases
G1P0	Deep Transverse Arrest	1
G1P0	Non-Progress of Labour	4
G1P0	Short stature	1
G2A1	Meconium stained liquor	2
G2P1L1	Complete Placenta Previa	1
G2P1L1	Hemorrhagic shock	1
G2P1L1	Placenta percreta	1
G2P1L1	Placenta percreta with previous LSCS	1
G2P1L1	Incomplete Placenta previa	1
G2P1L1	Previous LSCS	4
G2P1L1	Previous LSCS with hemorrhagic shock	1
G3P2L2	Placenta previa with adherent placenta	1
G4P2L2A1	Shoulder dystocia	1
G5P1L1A3	Complete Placenta Previa with previous LSCS	1

Table 3: Blood transfusion requirements.

Number of units	Number of cases requiring blood transfusion		
	Pre-op	Inter-op	Post-op
1	6	0	19
2	6	2	6

Table 4: Management to control PPH

Procedure	Number of patients	Percentages (%)
Bilateral internal iliac artery ligation	16	64.0%
Unilateral internal iliac artery ligation	7	28.0%
Pelvic devascularization	1	4.0%
Pelvic devascularization and Subtotal hysterectomy	1	4.0%

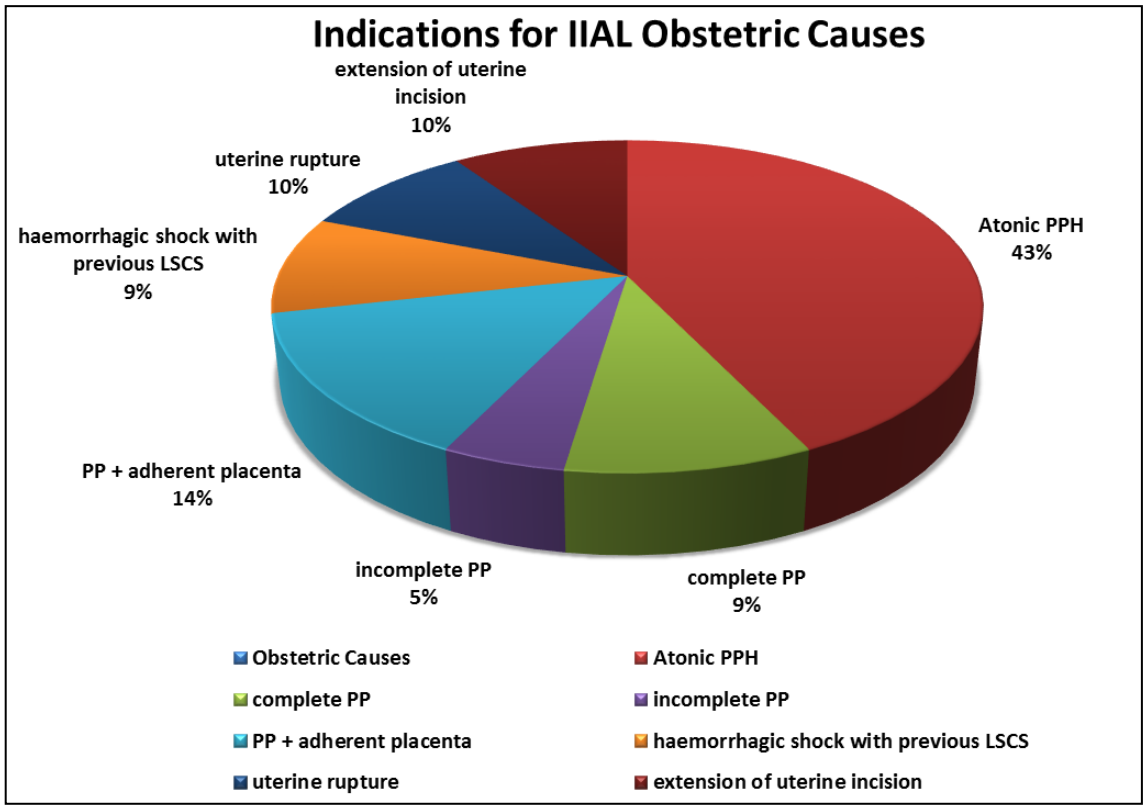
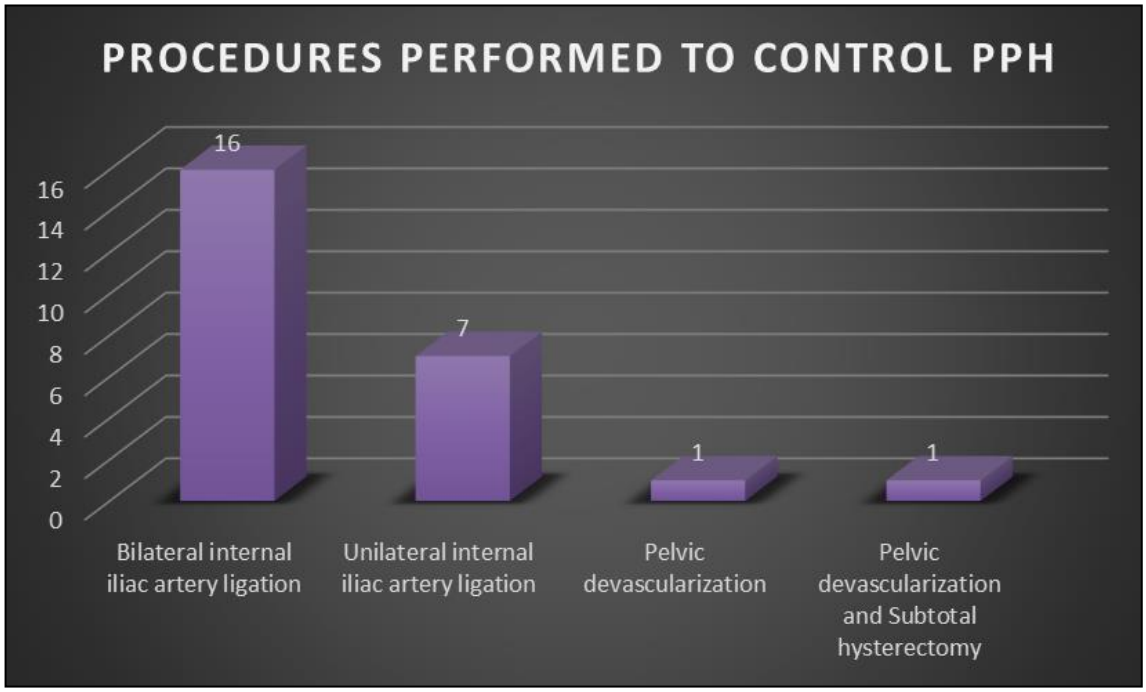


Fig 1: Indications for IIAL



Graph 1: Procedures performed to control PPH

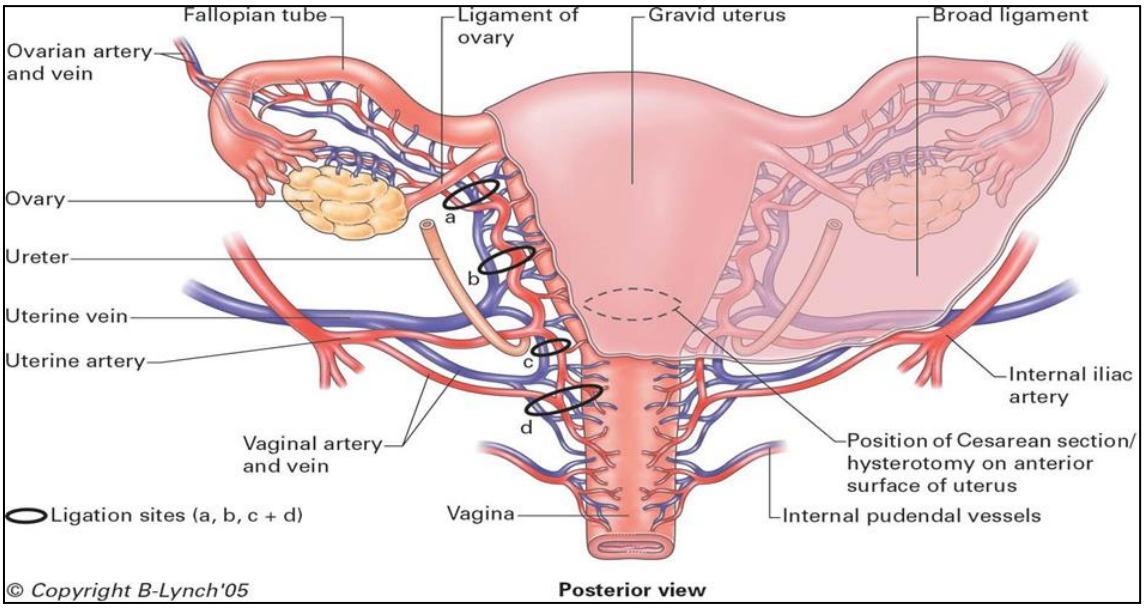


Fig 2: Placement of ligatures in stepwise devascularization, including ligature of the descending uterine and vaginal arteries.

Discussion

Bruchell [10] has described the mechanism responsible for controlling pelvic haemorrhage following IIAL without compromising blood supply. The ligation of internal iliac arteries greatly decreased the pulse pressure and converted the pelvic arterial system into a venous like system with slow and sluggish blood flow. With bilateral ligation, the drop in pulse pressure was 85% whereas with unilateral ligation it was 77% on the same side and 14% on the opposite side [10]. This pulse pressure reduction causes thrombosis of bleeding vessel.

Waiting too long to perform it is its biggest pitfall [11]. In order to decrease operative time, main trunk ligation is recommended.

Jain A conducted a study titled Internal iliac artery ligation to combat postpartum haemorrhage [12]. In this study, out of 12 cases, 2 cases required both IIAL and subtotal hysterectomy to control PPH. Hence, IIAL is a good alternative to hysterectomy in cases where fertility preservation is desired. In this study, complications of IIAL like injury to iliac vein, DIC, ischaemic necrosis, bladder atony or parasthesias of gluteal region were not seen.

Due to good collateral circulation, reproductive function following IIAL is not affected. In our study, out of 25 cases, in 21 cases uterus was preserved and 5 out of these cases conceived again. O'leary [13] performed bilateral internal iliac artery ligation in 110 cases for post cesarean haemorrhage and has reported 12 pregnancies in his study. Wagaarachchil and Fernando [14] reported 3 pregnancies out of 12 cases of IIAL.

For stepwise devascularization, essential requirements are neither simple nor freely available. One must be competent in performing this procedure with thorough knowledge of pelvic anatomy, including the vascular and neurological supply of pelvic organs. It requires application of independent ligation sutures at various levels [15] [Figure 2].

Conclusion

IIAL is an effective procedure to combat both obstetric and pelvic haemorrahge in a short span of time. It should be considered as the first line of management where conservation of uterus is required. Further when compared with systemic devascularization, it is less complicated and doesn't require placement of multiple independent ligation sutures at various levels. It also prevents women from undergoing hysterectomy and its following complications. This procedure saves time, life and organ. As PPH is one of the most dreadful complications of labour, one should master the skill of performing IIAL to overcome adverse outcomes and to lessen the perioperative burden of PPH. We have successfully overcome this fear in current times by mastering the art of IIAL.

Contributions

Dr. Nishi Gupta: Study conception and design, data analysis and interpretation and critical revisions.

Dr. Aditi Sehgal: acquisition of data, data analysis and interpretation and manuscript writing.

Dr. Aarti Soni: acquisition of data, data analysis and interpretation and manuscript writing.

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