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Internal Iliac Artery Ligation: A Lifesaving Procedure

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Abstract
Background: *Internal iliac artery supplies the pelvic viscera. Internal iliac artery ligation (IIAL) is a valuable surgical procedure to control intractable pelvic haemorrhage with the mainstay aim of uterus preservation. There is a reduction of 85% in pulse pressure and 48% in the blood flow in the arteries distal after internal iliac artery ligation. Thus, the expertise to perform IIAL should be present in every obstetric unit.*
Objective(s) : *To find out the utility of emergency internal iliac artery ligation (IIAL) in a busy gynecological and obstetric setup.*
Material and method(s) : *Between July 2016 to June 2017 a total of 15 IIAL were performed as life saving procedures along with uterine or ovarian artery ligation or hysterectomy as and when required.*
Results: *Except one patient, who died of disseminated intravascular coagulation, all could be successfully treated.*
Conclusion(s): *IIAL still remains an important life saving procedure and hence there is an urgent need to train and familiarize the younger generation of obstetricians to perform IIAL.*

I. Introduction

Classically, after the termination of third stage of labour, bleeding more than 500ml is defined as postpartum hemorrhage (PPH).[1] Generally, abnormal postpartum bleeding not intervened in due time are responsible for 25% of maternal morbidities, which rise to 60% in developing countries. Various surgical techniques have been described in PPH patients refractory to massage and uterotonic therapy. Uterine compression sutures, bilateral uterine or internal iliac artery ligation and as a last resort subtotal or total hysterectomy can be performed. Among them, Internal iliac artery ligation (IIAL) is a surgical approach which causes a drop in arterial pressure and virtual elimination of the Trip-hammer effect and also preserves fertility.[3] It is not used routinely due to the disadvantages like careful dissection of the retro peritoneum, closeness of the ureter to the iliac vessels and inadvertent ligation of the external iliac artery.In women not responding to medical treatment, the traditional surgical treatment is to perform an emergency hysterectomy, eliminating any possibility of future fertility. IIAL is an alternative life-saving operation, which preserves reproductive capacity. In this article, we have presented the efficacy of IIAL in arresting and preventing PPH as well as in preserving uterus.

II. Material And Methods

This is a retrospective study of the internal iliac ligations done at RCSM, Government Medical College and CPR Hospital, Kolhapur over a 1 year (July 2016-June 2017) period. The patients were identified using operation theatre registers and record office sources. Case notes were reviewed for clinical details and outcome of surgery. A total of 15 emergency internal iliac ligations (IIAL) were performed during this period. This was done as a life saving measure to control hemorrhage. All cases were done via intra-peritoneal route. Associated operations like hysterectomy, uterine artery ligation and ligation of the bilateral ovarian vessels medial to the ovary were done when indicated. The intra-operative and post-operative complications, morbidity and mortality were recorded.

Surgical technique
Internal iliac artery was approached in our procedures in two ways:

By opening the peritoneum between the Round ligament and the ovarian ligament and approaching the bifurcation Common iliac artery. By direct incision of the peritoneum over the bifurcation of the common iliac arteries. In both the ways, Ureter was retracted medially and injury to the internal iliac veins was avoided. The artery was ligated using 1-0 vicryl or linen approx 3-4 cm below the bifurcation. Femoral and Dorsalis pedis arteries were palpated for pulsations to rule out inadvertent ligation of External iliac artery.

III. Results

In the study period, Internal Iliac artery ligations were done in 15 cases to control serious obstetrical hemorrhage. All the registered cases were initially managed medically but it failed to control the intractable haemorrhage and 100% success was achieved by IIAL or peripartum hysterectomy.

Table 1: Parity

Parity	Hysterectomy, n(%)	IIAL, n(%)
Primigravida	0	3(20%)
Multigravida	9 (60 %)	12(80%)

Table 2:Obstetrical risk factors in patients

Risk factors	(N)	(%)
PIH	6	40.00
Anemia	4	26.66
Previous LSCS	5	33.33
Placenta previa	3	20.00
Abruption	3	20.00
IUD	1	6.66

Table 3: Indications of IIAL

Indications	(n)	(%)
Uterine atony	6	40.00
Placenta praevia	2	13.33
Abruptio placentae	3	20.00
Broad ligament hematoma	2	13.33
Uterine rupture	2	13.33

Associated Procedures	(n)	(%)
Total Hysterectomy	8	53.33
Subtotal Hysterectomy	1	6.66
Uterine artery ligation	10	66.66
Ovarian artery ligation	3	20.00
B-Lynch sutures	5	33.33
None	0	0

Table 4 : Associated procedures

Among 15 patients, 3 were primigravidas who needed IIAL and in all these patients we were able to save the uterus (Table 1). The risk factors associated with patients who underwent IIAL are listed in table 2. Out of the 15 women who underwent IIAL, 14(93.3%) had therapeutic IIAL and 1(6.67%) had prophylactic IIAL. In most patients, the principal contributor to haemorrhage was an atonic, empty uterus not responding to oxytocics. Other indications are listed in Table 3. Associated procedures like hysterectomy, B-lynch suture, uterine and ovarian artery ligation were done and the statistics are tabulated in Table 4. Almost all the patients required blood transfusions of >4 units. In 9 women, hysterectomy was performed following IIAL due to continuing haemorrhage. Complications associated are listed in table 5.

Table 5: Complications following surgery

Complications	(n)	(%)
DIC	5	33.33
ARF	2	13.33
Respiratory tract problems	2	13.33
Maternal mortality	1	6.66

In our series, only 1 (6.6%) women out of 15 died, with no women having any delayed complications, demonstrating the effectiveness of the procedure. The women eventually died as a result of intractable haemorrhage due to disseminatedintravascularcoagulation precipitated by severe pre-eclampsia and massive blood transfusion. Neither our patients had any injuries like ureteric and vascular injuries, nor any delayed complications like ischaemic necrosis, parathesias of gluteal region or bladder atony

IV. Discussion

After ligature, circulation in the parts supplied by the internal iliac artery would be carried on by the anastomosis of i) the uterine and ovarian arteries; ii) the middle and the superior vesical arteries; iii) the iliolumbar with the last lumbar and iv) the lateral sacral with the middle sacral arteries.[4] Burchell[5] has put forward the mechanism responsible for controlling pelvic haemorrhage following ligation of internal iliac artery without compromising blood supply. He observed that blood flowed freely from a severed uterine artery even after bilateral IIAL. The ligation of internal iliacs greatly dampened the pulse pressure and transformed the pelvic arterial system into a venous like system with slow and sluggish blood flow. The 'trip hammer effect' of the arterial pulsation was lost. The blood clots, which were formed distal to the ligation, therefore remained in place it also allowed for identification of remaining individual bleeders for ligation, which would otherwise be difficult.[6]

Burchell[5] also proved that 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. The mean arterial pressure decreased to 24% with bilateral ligation and with unilateral ligation the decrease was 22% on the same side and 10% on the opposite side. The rate of blood flow dropped to about 48% on the same side after ligation. In a literature review detailing follow-up of 634 patients undergoing hypogastric artery ligation, 28% developed buttock claudication and 18% sexual dysfunction.[7] Similarly, in a series of 39 patients undergoing bilateral internal iliac artery embolization before endovascular aneurysm repair (EVAR), postprocedural buttock claudication occurred in 31% of patients but remained in only 9% after 1 year; sexual dysfunction was seen in only 5% and spinal ischaemia in 3%.[8]

Internal iliac ligation is a valuable surgical procedure and should be the first line of treatment where conservation of the uterus is desired. The complications encountered are few if the procedure is performed carefully and with knowledge of pelvic anatomy.

V. Conclusion

In conclusion, IIAL is a safe, effective procedure for treating life-threatening obstetric haemorrhage. Before hysterectomy, in order to control life threatening intractable postpartum bleeding especially in young women with lower parities, it should be tried. It is not costly, does not require complex equipment and has superior advantages such as scarcity of complications, and maintenance of fertility. There is an urgent need to train and familiarize the younger generation of obstetricians to perform IIAL.

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