

FERTILITY FOLLOWUP AFTER BILATERAL INTERNAL ILIAC ATRERIES LIGATION FOR LIFE THREATENING OBSTETRICS HEMORRHAGE

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Abstract

Background: An obstetric hemorrhage may occur before or after delivery. Many deaths occur because of a poor clinical response to massive bleeding. Various surgical techniques have been described. Among them, BIIAL procedure is a surgical approach which decreases pelvic and uterine perfusion and preserves fertility. The objective is to determine the effectiveness and future fertility in women for whom bilateral internal iliac arteries ligation were done to control life threatening obstetrics hemorrhage during childbirth. **Materials and Methods:** This was an ambidirectional study done among 85 pregnant women who had major obstetric haemorrhage during childbirth that had been controlled using Bilateral Internal Iliac arteries ligation in IOG/ ISO-KGH, Chennai during the period of January 2016 to December 2020. The permission to conduct the study was obtained from Institutional Human Ethics Committee. The data was collected and entered in MS Excel and analysed using SPSS software. Descriptive statistics was used. **Result:** Out of 85 cases the mean age was 26.7 years. Most of the cases were 48 (56.5%) primigravida. Most the women had GDM (28%) and GHTN (26%). About, 79 (92.9%) cases were delivered by LSCS followed by 4 (4.7%) were vaginal and only 2 (2.4%) were instrumental mode of delivery. Placenta previa (50.6%) as observed more among cause of PPH followed by uterine atonicity. Along with BIIAL procedure UAL were also performed in all the cases. Compression suture was performed in 20% cases, Foley tamponade 16.5% cases and OAL was in 4.7% of cases was done. A total of 85 cases who undergone BIIAL procedure, 66 (77.6%) of them subsequently showed fertility positive. Most of the patients (48.5%) become fertile within 1-2 years after BIIAL surgery followed by 3-4 years (34.8%). About 56.1 % had a full term delivery, 18.2 % had a medical termination of pregnancy, 9.1 % had a preterm delivery, 6.1 fraction had a first trimester miscarriage, and 4.5 % had an ectopic pregnancy. In subsequent pregnancy most had LSCS in 42 (49.4 %). Gestational hypertension, Gestational Diabetes mellitus and Anaemia were most common comorbidities in subsequent pregnancy. About 5 (5.9%) showed recurrence and in 1(1.2%) cases hysterectomy was performed and another 1.2% of the cases uterine rupture were observed. **Conclusion:** To summarise, all obstetricians and gynaecologists must be trained and familiarised with BIIAL in order to include it in their arsenal of tools against pelvic haemorrhage, and surgeons must lower their threshold for its use in emergent situations.

INTRODUCTION

Approximately 830 women die every day around the world as a result of pregnancy or childbirth-related complications with obstetric haemorrhage remaining

a major cause of maternal morbidity and mortality.^[1] A World Health Organization (WHO) systematic analysis into the global causes of maternal deaths from 2003 to 2009 found haemorrhage to be the leading direct cause of maternal mortality followed by hypertensive disorders and sepsis. Overall,

haemorrhage accounted for 27.1% of all maternal deaths worldwide.^[2]

Even in the developed world, obstetric haemorrhage remains one of the major causes of maternal death. The Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK (MBRRACE-UK) Confidential Enquiries into Maternal Deaths found the mortality rate as a direct result of haemorrhage to be 0.55 per 100,000 maternities in the United Kingdom from 2011 to 2013.^[3]

WHO estimates that of the 5,29,000 maternal death occurring every year, 1,36,000 or 25.7% of death takes place in India and two-third of these maternal death occurs after delivery, PPH being the most commonly reported complication.^[4] The unacceptably high maternal death of 540 per 100,000 live births in India in last few decades remains a major challenge.⁴ Hysterectomy is the traditional treatment for cases of refractory PPH, when all other methods to arrest bleeding fails. Advances in interventional radiology and surgical techniques have provided safe and effective alternatives to hysterectomy in many cases.

An obstetric hemorrhage may occur before or after delivery, but more than 80% of cases occur postpartum.^[5] A postpartum hemorrhage (PPH) can be fast, furious and frightening. Perhaps not the 500 mL after a vaginal delivery or the 1000 mL after a cesarean delivery, losses that meet the standard definitions of a PPH,^[6] but massive obstetric hemorrhage, resulting in the rapid loss of 1500, 2000 mL or more when a woman becomes pale, sweaty and diaphoretic; her pulse rate exceeds her systolic blood pressure and the blood she is losing is watery and does not clot. This type of hemorrhage is responsible for 25% of the deaths of an estimated 358,000 women worldwide each year.^[7,8] The overwhelming majority die in resource-poor countries,⁴ but an unacceptable number of these women die in resource-rich countries.^[8,9]

Many deaths occur because of a poor clinical response to massive bleeding,^[7] and while in many countries this reflects a scarcity of resources, trained personnel and access to basic health care, even when these are present,^[7] there is often a failure to coordinate the management of emergency resuscitation procedures. A concerted effort is required in every country and community to optimize care with available resources and identify where improvements can be made.^[7]

A massive obstetric hemorrhage results from the failure of normal obstetrical, surgical and/or systemic hemostasis. When a woman is not pregnant, <1% of her cardiac output flows through her uterus, but at the end of pregnancy uterine blood flow accounts for 15% of cardiac output. After separation and expulsion of the placenta, failure of the uterus to contract can lead to massive bleeding.

Failure of the uterus to contract (uterine atony) is the most common cause of a massive obstetric hemorrhage, but massive bleeding can also arise from

incisions and lacerations and, although less likely, from disorders of hemostasis. Even if the origin of the hemorrhage is uterine atony or trauma, the situation can quickly evolve and the woman can become coagulopathic.^[10]

Various surgical techniques have been described in PPH patient's refractory to massage and uterotonic therapy, Uterine compression sutures, bilateral uterine artery or internal iliac artery (hypogastric artery) ligation (BIIAL) and as a last resort subtotal or total hysterectomy can be performed.^[11] In order to save the life of the mother, prompt applicability and effectiveness are critically important issues for the method to be used. Among them, BIIAL procedure is a surgical approach which decreases pelvic and uterine perfusion at a rate of 75-80%, and also preserves fertility.^[12]

On the other hand, BIIAL procedure is not used prevalently in the obstetrical practice for the following disadvantages. Indeed, various technical details should be meticulously observed, such as retroperitoneum should be entered during ligation, ureters passing immediately over common iliac artery should be visualized and dissected away before the start of ligation, and ligation should be done after clearly visualization of the external iliac artery. In addition, procedure-related important complications as inadvertent suturing of external iliac artery, potential injury to adjacent vascular structures, and a need for a certain amount of surgical experience.^[13]

The current study aimed to assess the effectiveness and future fertility in women for whom bilateral internal iliac arteries ligation were done to control life threatening obstetrics hemorrhage during childbirth.

Aim & Objectives

To determine the effectiveness and future fertility in women for whom bilateral internal iliac arteries ligation were done to control life threatening obstetrics hemorrhage during childbirth.

MATERIALS AND METHODS

This was an ambidirectional study done among 85 pregnant women who had major obstetric haemorrhage during childbirth that had been controlled using Bilateral Internal Iliac arteries ligation in IOG/ ISO-KGH, Chennai during the period of January 2016 to December 2020. All pregnant women who had internal iliac artery ligation to control severe obstetric hemorrhage during childbirth were included in the study. Women who subsequently needed emergency hysterectomy and Women who did not desire future fertility and using contraceptives or underwent concurrent sterilization / interval sterilization were excluded from the study.

The permission to conduct the study was obtained from Institutional Human Ethics Committee. After approval from the committee, the study was conducted. The participants were recruited and

informed about the study and its purpose. The informed consent was obtained from the participants. Collection of data regarding obstetrics women who had internal iliac artery ligation to control severe obstetric hemorrhage during previous childbirth were done using record office sources and operation theatre registers. Case notes were reviewed for clinical details and outcome of surgical procedure. Subsequent fertility was assessed by means of a follow-up visit or questionnaire sent to the patient using electronic methods and counselling them for a follow up visit to OPD for detailed history and evaluation based on their willingness. Our study was combined retrospective and prospective study performed in accordance with the principles related to experiments in human beings as established in the Institutional Ethics Committee.

Among obstetrics women who delivered in IOG / ISO-KGH between January 1, 2016 and December 31, 2020, records office sources of the obstetrics women who had undergone internal iliac artery ligation procedure with the indication of life threatening obstetric hemorrhage were reviewed along with those who had undergone during my period of postgraduation. Obstetrical and demographic characteristics of the patients including age, parity, menstruation, subsequent conception and their outcomes, underwent any assisted reproductive techniques, contraceptive methods.

Then the data was entered in MS Excel and analysed using SPSS software. Descriptive statistics like mean, standard deviation, frequency and proportion were used.

RESULTS

The following observations were made from the data collected during the study of 85 cases of undergone bilateral internal iliac artery (BIIAL) procedure for major life threatening obstetrics haemorrhage during childbirth for the period of 5 years studied with

respect to age, comorbidities, mode of delivery and parity number between January 2016 to December 2020 at IOG / ISO-KGH, Madras Medical College.

Out of 85 cases the mean age of the study group was 26.7 years which was fall between 19 to 40 years of age. Most of the cases were 48 (56.5%) primigravida than 37 (43.5%) multigravida. Among the multigravida, some cases showed three abortion as well as the live birth 1 was seen in this study. [Table 1]

Most the women had GDM (28%) and GHTN (26%). Out of 85, 79 (92.9%) cases were delivered by LSCS followed by 4 (4.7%) were vaginal and only 2 (2.4%) were instrumental mode of delivery. In our study Placenta previa (50.6%) as observed more among cause of PPH followed by uterine atonicity. In this study along with BIIAL procedure UAL were also performed in all the cases. Compression suture was performed in 20% cases, Foley tamponade 16.5% cases and OAL was in 4.7% of cases was done. [Table 2]

In this study a total of 85 cases who undergone BIIAL procedure, 66 (77.6%) of them subsequently showed fertility positive. Most of the patients (48.5%) become fertile within 1 -2 years after BIIAL surgery followed by 3-4 years (34.8%). About 56.1 % of the study population had a full term delivery, 18.2 % had a medical termination of pregnancy, 9.1 % had a preterm delivery, 6.1 fraction had a first trimester miscarriage, and 4.5 % had an ectopic pregnancy. The remaining 1.5 percent of cases had not yet been delivered, and 1.5 percent had molar pregnancy. The mode of delivery observed after bilateral internal iliac artery (BIIAL) procedure was LSCS in 42 (49.4 %) cases and vaginal delivery in only 2.4%. After bilateral internal iliac artery (BIIAL) procedure comorbidities occurred, among them Gestational hypertension, Gestational Diabetes mellitus and Anaemia were most common. Out of 85 cases, 5 (5.9%) showed recurrence and in 1(1.2%) cases hysterectomy was performed and another 1.2% of the cases uterine rupture were observed. [Table 3]

Table 1: Socio demographic details

Details		N	%
Age group	<20 years	5	5.9%
	21-30 years	66	77.6%
	31-40 years	14	16.5%
Age	Mean (SD)	26.7	4.4
Parity	Primi	48	57%
	Multi	37	43%

Table 2: Obstetric related details

Details		N	%
Comorbidities	GDM	24	28%
	Gestational hypertension	22	26%
	Thyroid Disorder	7	8%
	Pre LSCS	7	8%
	Seizure disorder	3	4%
	AML Prolapse/ mild MR/mild TR	1	1%
	Anaemia	1	1%
	APLA +VE	2	2%
	Covid +ve	1	1%
	MCDA & DCDA twins	2	2%

	Dengue +ve	1	1%
	Gestational thrombocytopenia	1	1%
	RHD- mild MS	1	1%
Mode of Delivery	LSCS	79	93%
	Vaginal	4	5%
	Instrumental	2	2%
Causes of Haemorrhage	Placenta previa	43	50.6%
	Uterine atonicity	38	44.7%
	Placenta accreta	3	3.5%
	Others	1	1.2%
Other procedures along with BILAL	UAL	85	100%
	OAL	4	4.7%
	Compression sutures	17	20%
	Foley tamponade	14	16.5%

Table 3: Fertility & Outcome in subsequent pregnancies

Details		N	%
Fertility	Yes	66	77.6%
	No	19	22.4%
Fertility in duration after surgery (n=66)	0-1	4	6.1%
	1-2	32	48.5%
	2-3	23	34.8%
	3-4	7	10.6%
Outcome in subsequent pregnancy (n=66)	Full term delivery	37	56.1%
	Medical termination of pregnancy	12	18.2%
	Preterm delivery	6	9.1%
	First trimester miscarriage	4	6.1%
	Ectopic pregnancy	3	4.5%
	Not yet delivered	3	4.5%
Mode of delivery in subsequent pregnancy (n=66)	Molar pregnancy	1	1.5%
	LSCS	42	49.4%
Comorbidities in subsequent pregnancy (n=66)	Vaginal	2	2.4%
	GHTN	10	11.8
	GDM	6	7.1
	Anaemia	5	5.9
	Hypothyroid	4	4.7
	Seizure disorder	3	3.5
	IUGR	2	2.4
	Pre2 LSCS	2	2.4
	APLA +VE	2	2.4
	Placenta increta	1	1.2
	Pre LSCS	1	1.2
	Hyperthyroid	1	1.2
	AML Prolapse/ mild MR/mild TR	1	1.2
	Severe pre-eclampsia	1	1.2
	RHD- moderate MS / mild PHTN	1	1.2
Complications	Hysterectomy	1	1.2
	Recurrence	5	5.9
	Uterine rupture	1	1.2

DISCUSSION

In our study, the efficacy of bilateral internal iliac artery ligation performed with the indication of serious obstetrical bleeding were taken. We didn't encounter any procedure-related major complications which were reported in the literature such as major vessel and ureter injury or inadvertent ligation of the external iliac artery.^[14]

In the recently conducted study including 58 patients, Unal et al. reported effectiveness of the method as 87.9 percent.^[15] Similarly, in their review of the results of retrospective studies encompassing 52 patients who had undergone internal artery ligation, Chelli et al indicated an 82.45 % success rate.^[16] Within the frame of literature findings, and results of our study, we think that BIIL is a life-saving method with smaller number of side effects in obstetrical bleedings refractory to medical treatment.

Indeed, most of the postpartum bleedings can be brought under control with bimanual massage, or uterotonic treatment with oxytocin, methyl ergonovine and prostaglandins. Ledee et al. reported an incidence of 0.18% for postpartum bleeding refractory to aggressive treatment.^[17]

In our study, the rate of PPH requiring surgical treatment was found to be 8.2 percent. Since our hospital is a university hospital of the region with the highest patient circulation, we conceive that the reason for this higher rate can be associated with our multiparous patient population mostly with impaired hemodynamics, and higher risk of postpartum atony who had delivered in an external health care center.^[18,19]

Following BIIL uterine arterial pressure drops and uterine blood supply decreases at a rate of 85 percent.^[18,19] BIIL aids in the achievement of hemostasis. On the other hand, owing to the presence

of collaterals between,^[20] peripheral and central segments of internal iliac artery,^[21] peripheral and aortic branches,^[22] uterine artery and subcutaneous abdominal, ovarian, and renal arteries, development of uterine and pelvic necrosis after the procedure is prevented.^[23] Spontaneous birth rate after BIIAL was reported as 51.7 %, and a decrease in utero placental blood was not asserted during pregnancies of these cases.^[24,25]

Maximum number of IIAL were performed for placenta previa followed by atonic PPH, abruptio placentae and rupture uterus in that order. In complete placenta previa, the placental site receives a significant proportion of its arterial blood supply from the descending cervical and vaginal arteries. These arteries continue to perfuse the lower segment even after uterine artery ligation, which may fail to control haemorrhage.^[11] In these circumstances, IIAL is effective by diminishing the blood flow in the uterine, cervical and vaginal vessels. In most of the other studies, the major indication for IIAL was atonic PPH. IIAL was especially useful to save uterus in cases of cervical pregnancy, placenta increta and HELLP syndrome in our study. Data from Papp et al. suggest that ligation might be effective in preventing hysterectomy for cervical pregnancy in 40 % of cases.^[26]

Retroperitoneal coursing of internal iliac arteries, and their close vicinity to the ureter necessitate ligation of these vessels before partial ureteral dissection, and perfect knowledge of retroperitoneal anatomy. Since BIIAL requires more expertise than a routine obstetric surgery, internal iliac artery ligation is not preferred by many obstetricians and gynecologists for the management of postpartum bleeding. On the other hand, in the literature serious intraoperative side effects have been reported such as injury to the internal iliac vein or ureter during ligation of internal iliac artery and related mortality, inadvertent ligation of external iliac artery, post procedural vesical necrosis, development of perineal and gluteal necrosis.^[14,17] To avoid these side effects before ligation of the artery, observation of external, and common iliac arteries, retraction of the ureter away from the operation field, and ligation of the artery distal to its posterior branches are recommended. To this end, artery should be ligated at least 3 cm distal to the bifurcation site.

In our study, 5 (5.9%) showed recurrence and 1(1.2%) were hysterectomy and uterine rupture were encountered less complications. This phenomenon might be related to higher frequency of surgical interventions for the management of postpartum bleeding in our clinics, and resultant moderate surgical experience on this issue. Since ovaries are mainly perfused by ovarian artery directly originating from aorta and partially by ovarian branch of the uterine artery, in the literature potential risk of adverse impact of BIIAL on ovarian reserves of the patients have been suggested.^[26] Still some investigators have claimed that this procedure has non favorable effect on ovarian functions, and

complete consensus has not been reached on this issue.^[27,28]

In our study, postpartum serum FSH, oestradiol values and ultra-sonographic measurements of ovarian volumes were seen. Based on these results it can be said that during early postoperative period, BIIAL procedure do not affect ovarian functions adversely. In the literature healthy pregnancies have been reported following BIIAL procedure, however its efficacy on the ovarian reserve in the long run is not known. Similarly, in the study by Nizard et al. who evaluated the relation between BIIAL, and fertility in the largest series in the literature so far, the authors had not observed infertility in any of 68 patients who had been treated with BIIAL. They also reported that all patients who wished to become pregnant achieved their goals within postoperative 12 months.^[25]

In India, obstetric haemorrhage constitutes 38 % of maternal deaths.^[29] PPH can cause exsanguination rapid enough to be fatal in spite of the immediate availability of blood products. One of the reasons for this could be the delay in resorting to surgical techniques once conservative measures have failed. In our study, we found a direct correlation between the time taken for IIAL and the graver outcome of the patients. The need for blood products and ventilator support was directly proportional to the time interval between onset of hemorrhage and IIAL. Kalburgi et al,^[4] also found similar results, while Joshi et al,^[11] found that time interval between the onset of hemorrhage due to uterine atony and IIAL influenced the uterine salvage rate. Thus, an early IIAL has been emphasized, as a delay leads to an irreversible hemorrhagic shock and multiorgan failure, as it was observed in one of our cases. Good collateral circulation allows interruption of one or both hypogastric arteries to be performed relatively safely without severe complications, even in an atherosclerotic patient.^[30] In our study, we found that the uterine arterial perfusion was well maintained after ligation as denoted by a decrease in RI and PI. In fact, there was a decrease in impedance of the uterine arteries.

On the other hand, in our study, the outcomes of the patients who had undergone BIIAL were not compared with the results of the patients who had been treated with other surgical treatment alternatives of PPH.

CONCLUSION

BIIAL is a successful fertility preservation procedure during massive obstetric haemorrhage particularly in younger women of low parity. In experienced hands, the BIIAL procedure can be very safe and simple, with no major intraoperative complications. A thorough understanding of retroperitoneal anatomy is required to avoid inadvertently injuring adjacent structures. Making decisions in a timely manner is critical for improving patient outcomes. BIIAL treats

pelvic haemorrhage while keeping the uterus perfused which is an important pre-requisite for future fertility and uterine transplantation. Although no effect on ovarian functions was observed, ovarian perfusion may decrease following BIIAL. To summarise, all obstetricians and gynaecologists must be trained and familiarised with BIIAL in order to include it in their arsenal of tools against pelvic haemorrhage, and surgeons must lower their threshold for its use in emergent situations.

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