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Bilateral Ligation of Internal Iliac Arteries in Postpartum Haemorrhage (PPH): Emergency Situation Study of 20 Cases: A Retrospective Study

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ABSTRACT
This study aimed to assess the efficacy of emergency bilateral internal iliac ligation in managing postpartum hemorrhage which were not managed by medical treatment (Refractory PPH). We conducted a retrospective analysis of 20 cases involving women who underwent emergency bilateral internal iliac ligation for PPH. All 20 women in this study received emergency bilateral internal iliac ligation. Among these cases, 14 were attributed to atonic postpartum hemorrhage, 1 was uterine rupture, 2 were Adherent placenta, 1 was Uterine rupture, 1 was coagulopathy ligament hematoma and 1 was lower genital tract injuries. A single hysterectomy was required in these cases. During the procedure, no case experienced an injury to the internal iliac artery. No mortality occurred during or after the bilateral internal iliac ligation procedure. Bilateral internal iliac ligation emerges as an effective, time-efficient and life-preserving intervention for refractory post-partum hemorrhage, provided that prompt decision-making and skilled surgical execution are employed.

INTRODUCTION

Severe postpartum hemorrhage (PPH) following childbirth stands as a primary contributor to maternal mortality on a global scale. Annually, approximately 14 million women confront PPH, resulting in roughly 70,000 maternal fatalities worldwide. Survivors of such critical events often necessitate urgent surgical interventions to manage bleeding and may encounter enduring reproductive impairments[1]. WHO[2] reports that postpartum hemorrhage accounts for 25% of all maternal deaths internationally. PPH may stem from various obstetric conditions, including uterine atony, placental anomalies such as placenta accreta, obstetric trauma, hemorrhagic diathesis and trauma to the abdominopelvic region[3].

The management of PPH encompasses both medical and surgical approaches. WHO recommends intravenous administration of Oxytocin as the primary therapeutic choice, with ergometrine (alone or in conjunction with Oxytocin) or a prostaglandin agent (e.g., misoprostol at a dose of 800 micrograms sublingually) as secondary options[4]. When massage and uterotonic therapy prove ineffective, various surgical techniques have been proposed, including uterine compression sutures, bilateral uterine artery ligation, or internal iliac artery (hypogastric artery) ligation. As a last resort, a subtotal or total hysterectomy may be undertaken[5].

Bilateral internal iliac artery ligation (BIAL) significantly reduces pelvic blood flow by 49% and venous pressure by 84%, fostering hemostasis within arterial circuits[6]. The success rate of BIAL varies, ranging from 40-100%[7]. BIAL represents a secure, swift and highly efficient approach for managing obstetric hemorrhage in the most severe scenarios. It offers a rapid alternative to hysterectomy for women desiring to preserve their reproductive potential and proves valuable in mitigating the elevated surgical and anesthetic risks faced by already compromised patients. Furthermore, BIAL serves as the sole therapeutic recourse in cases involving massive broad ligament hematomas, retracted vessel tears within the broad ligament and even in postoperative hemorrhage following obstetric hysterectomy when no definite source of bleeding is discernible[8]. While BIAL is sometimes perceived as technically challenging, it is associated with minimal operative complications and possesses a short learning curve[9].

The primary aim of this study was to assess the efficacy, complications and outcomes of interventions employed in the context of PPH management.

MATERIALS AND METHODS

This retrospective study was conducted between January 2002 and December 2010 at a tertiary care teaching hospital located in Gujarat, India. The study cohort comprised 20 patients who suffered from significant Postpartum Hemorrhage (PPH), defined by a blood loss exceeding 2500 milliliters, necessitating either admission to the Intensive Care Unit (ICU) or surgical intervention.

These patients underwent bilateral internal iliac artery Ligation (BIIAL) as an intervention to achieve hemostasis. Notably, patients with non-obstetric uterine hemorrhage were excluded from the study.

The initial management of these patients involved uterine massage and the administration of uterotonic agents, such as oxytocin via infusion and carboprost injections. Additionally, fluid resuscitation and transfusions of blood products were administered as required. BIIAL was performed in cases where patients did not respond favourably to these medical interventions. Subsequently, patients were assessed for the cessation of PPH and in cases where the condition persisted, hysterectomy was considered as a final therapeutic option.

Operative technique: Adequate surgical exposure was achieved by incising the peritoneum covering the common iliac artery and carefully dissecting it down to the bifurcation point into the external and internal iliac arteries. Branches located distally to the external iliac arteries were meticulously examined to confirm the presence of pulsations. The Bilateral Internal Iliac Arteries were ligated at a point situated 5 centimeters distal to the bifurcation of the common iliac artery, with attention paid to avoid ligating posterior division branches. Vicryl number 1 sutures were employed for ligating the artery, securing it at two locations spaced 0.5 centimeters apart and pulsations distal to the ligature were subsequently reconfirmed. All surgical procedures were conducted by the most experienced surgeon at the hospital.

Statistical analysis: Data collected during the course of the study were entered into Microsoft Excel and subjected to statistical analysis using GraphPad version 7. The results were presented in terms of mean values, accompanied by their respective standard deviations (SD), for quantitative data. Qualitative data were summarized using frequencies (n).

RESULTS

A total of 20 instances of Bilateral Internal Iliac Artery Ligation (BIIAL) were conducted to address cases of Postpartum Hemorrhage (PPH) throughout the study duration. Uterine atony emerged as the most frequent indication for therapeutic BIIAL, accounting for 70% of the cases. Other indications encompassed uterine rupture, adherent placenta, coagulopathy, ligament hematoma and lower genital tract injuries. The average age of the patients was 30.3 years with a

Table 1: Demographic data

Characteristics	Data
Age (years)	30.3±4.85
Parity	
Primigravida	5
Multigravida	15
Gestational age (37-42 weeks)	20 (100%)
Mode of delivery	
Vaginal	06
Caesarean section	14

Table 2: Indication of the bilateral internal iliac artery ligation (BIIAL)

Indication	No.	Percentage
Atonic PPH	14	70
Uterine rupture	01	5
LSCS with Broad ligament hematoma	01	5
Adherent placenta	02	10
Coagulopathy	01	5
Lower genital tract injury	01	5

standard deviation of 4.85. The parity of the patients spanned from nulliparity to para 3. In three cases, Cesarean hysterectomy was performed as a result of uncontrolled bleeding following BIIAL. Conversely, in the remaining cases, BIIAL was executed for therapeutic purposes and yielded successful outcomes. Importantly, none of the 20 patients enrolled in the study experienced any complications directly related to BIIAL, including complications such as gluteal paraesthesia but tock necrosis, or bladder atony. All 20 patients were discharged without any subsequent issues or complications arising during their postpartum follow-up. Remarkably, six out of the twenty patients subsequently achieved successful pregnancies, with no indications of reduced fetal growth or recurrent PPH (Table 1 and 2).

DISCUSSIONS

Postpartum hemorrhage (PPH), characterized by severe bleeding following childbirth, stands as the predominant contributor to maternal mortality on a global scale. Annually, approximately 14 million women encounter PPH, resulting in approximately 70,000 maternal fatalities worldwide[1]. The current retrospective investigation was undertaken to assess the effectiveness of emergency Bilateral Internal Iliac Artery Ligation (BIIAL) as a strategy to prevent hysterectomies in patients grappling with massive and life-threatening PPH. This study enrolled a cohort of twenty patients afflicted with massive PPH, where the estimated blood loss exceeded 2500 milliliters, necessitating the implementation of surgical interventions.

In the context of this investigation, the predominant cause of PPH was uterine atony, accounting for 70% of cases, followed by cases involving an adherent placenta. Interestingly, in a nationwide survey conducted by Bateman, a similar trend was observed, with uterine atony being identified as the primary etiological factor in 79% of PPH cases[10]. Notably, our study findings align with the outcomes of studies carried out by Kabediy and Harsha[11] and Nayak *et al*.[12] both of which highlighted uterine atony as the most prevalent indication for BIIAL, ranging from 46.6-60%. This was followed by placenta previa and abruptio placentae, accounting for 31 and 20% of cases, respectively, with traumatic PPH constituting 22.2 and 13.3% of cases in their respective studies.

In the present study, it was necessary to perform hysterectomy in 5% of patients who had undergone emergency Bilateral Internal Iliac Artery Ligation (BIIAL) as an intervention for the management of massive Postpartum Hemorrhage (PPH). Importantly, no instances of maternal mortality were observed in this group. Prior researchers have also reported favorable outcomes regarding uterine preservation, with findings such as an 83.3% uterine salvage rate by Vedantham *et al*.[7] 60.7% by Nayak (2017) and 75% by Darawade *et al*.[13]. Saleem *et al*.[14] conducted a study focusing on the efficacy of BIIAL in the context of massive uterine hemorrhage and reported that 64% of patients did not require subsequent hysterectomy. It is worth noting that BIIAL is a recommended option for women who have not completed their family planning or those desiring to preserve their uterus. Earlier publications have also demonstrated that the BIIAL technique does not adversely affect ovarian functions[15]. In fact, two studies have found no significant reduction in women's ovarian reserve or fertility potential following BIIAL or uterine devascularization surgery[3,16].

CONCLUSION

Bilateral internal iliac artery ligation (BIIL) emerges as a straightforward, time-efficient and life-preserving surgical procedure that, while demanding skilled execution, proves invaluable in mitigating Postpartum Hemorrhage (PPH) of diverse etiologists. Notably, the necessity for a hysterectomy can often be obviated when managing PPH through BIIL. Furthermore, BIIL can facilitate uterine repair and uphold the prospect of future pregnancies, enabling the completion of family planning. Given its potential to avert maternal mortality, it is imperative that obstetricians receive training in this life-saving procedure, thereby expanding its utilization to safeguard maternal health more widely.

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