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Original Research Article

Study of role of Conservative Surgical Management of Post Partum Haemorrhage in caesarean section patients in Tertiary Care Hospital in Southern Rajasthan: An Interventional Cohort Study

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Conflict of interest: Nil

Abstract:

Background: Conservative surgical approaches for managing postpartum haemorrhage (PPH) involve procedures designed to control bleeding while preserving fertility and avoiding the need for hysterectomy. These methods are valued for their safety and effectiveness, with effectiveness defined as the successful cessation of bleeding following the haemostatic intervention. This study aimed to evaluate how well these conservative surgical techniques reduce blood loss and manage PPH in order to prevent hysterectomy.

Methods: In this interventional cohort study, stepwise uterine devascularization and uterine compression sutures were performed on 50 patients to manage intractable postpartum haemorrhage (PPH) unresponsive to standard treatment. The study involved four surgical techniques: Uterine compression sutures, Bilateral Uterine artery ligation, Bilateral Utero-Ovarian artery ligation, and Bilateral Internal iliac artery ligation. Patients were divided into four groups, with each group initially receiving one specific procedure. If bleeding persisted, subsequent procedures were applied in a stepwise manner—second, then third, and finally fourth—until effective haemostasis was achieved.

Results: We observed that the combined use of three methods of conservative surgical management achieved a success rate of 80%. Overall, the use of all four conservative surgical techniques together resulted in a 66.6% success rate, there was need of hysterectomy in one case. The most common intraoperative and postoperative complication was hypovolemic shock occurring in 14% of cases.

Conclusion: To ensure a higher success rate in the conservative surgical management of early PPH, we recommend that obstetricians opt for timely initiation of these procedures.

Keywords: Bilateral Internal iliac artery ligation, Bilateral Uterine artery ligation, Bilateral Utero-Ovarian artery ligation, Caesarean section, Postpartum haemorrhage, Uterine compression sutures.

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Introduction

Postpartum haemorrhage (PPH) remains a leading cause of maternal morbidity and mortality worldwide [1]. 25% of all maternal mortality are linked to PPH, mostly happen in low- and middle-income nations [2]. To address this, several nations have implemented policies and initiatives aimed at reducing maternal deaths [3]. Its management relies on the promptness of diagnosis and the timely initiation of appropriate medical and surgical interventions to control the haemorrhage [1]. Multidisciplinary teams are required, in a coordinated approach to treat patients of PPH. The treatment gets more complexed as the time passes past the "Golden hour" [2]. Delayed control of bleeding increases the risk of adverse outcomes such as hypovolemic shock, hypothermia, acidosis, and coagulopathy, all of which may prove fatal if not rapidly managed [4].

The incidence of severe PPH after Lower Segment Caesarean Section (LSCS) birth is 3.6% [5]. The cut-off for haemorrhage to be considered in criteria of PPH is >500 mL volume of blood loss in vaginal

delivery and >1000 mL volume of blood loss in caesarean section [6]. According to the World Health Organization (WHO), primary PPH refers to bleeding occurring within 24 hours of delivery, whereas bleeding from 24 hours up to 12 weeks postpartum is classified as secondary PPH [7]. Early identification of women at higher risk of PPH, early proactive measures such as AMTSL (Active Management of Third Stage of Labour), involvement of experienced clinicians, and early availability of resources (medicines like Oxytocin, Prostaglandins and Tranexemic Acid) can help in prevention of PPH [8].The third stage of labour is actively managed through prophylactic administration of a uterotonic before placental expulsion, accompanied by delayed cord clamping and controlled cord traction, provided skilled birth attendants are available [9].

Surgical techniques that preserve fertility and exclude the need of hysterectomy are a part of conservative surgical management of PPH. Haemostatic sutures (ligation of pelvic vessels) and uterine compression sutures are most frequently performed surgical procedures for this purpose. The success rate of these procedures depends on type of operation chosen, surgeon skills, severity of PPH, bleeding site and time taken in performing the procedures [2]. Bilateral ligation of the anterior division of the internal iliac arteries can serve as a lifesaving measure in cases of severe pelvic haemorrhage [7]. Conservative surgical approaches are generally characterized by simplicity, safety, and effectiveness, with their success measured by the ability to achieve haemostasis [10]. Evidence-based guideline implementation has significant potential to reduce morbidity and mortality associated with PPH [11].

This study was carried out in the Department of Obstetrics and Gynaecology in a tertiary care centre, during a 6 months study period time, involving patients with caesarean section who landed up in postpartum haemorrhage not relieved on standard medical management. They were treated with fertility-preserving surgical approaches in diverse clinical situations. This study also aimed to evaluate the effectiveness of individual conservative surgical techniques, as well as their combined use, in reducing blood loss and managing PPH while avoiding hysterectomy.

Aims & Objectives:

a) To study the role of Conservative Surgical Management of Post Partum Hemorrhage in caesarean section patients.
b) To study complications of different conservative surgical procedures done on PPH patients.
c) To compare different surgical techniques for management of PPH.

Methods

50 immediate post-partum patients who landed up in PPH [12], not relieved by conservative medical management and required early surgical management were included by judgement sampling method in the interventional Cohort Study in the Department of Obstetrics and Gynaecology in a tertiary care centre, during a 6 months study period time, from January 2025 to June 2025.

Inclusion Criteria: Women of reproductive age group who were delivered by C-section and landed up in PPH which was not relieved by conservative medical management and required early surgical management.

Exclusion Criteria: Patients with normal deliveries, placenta accreta spectrum, and coagulation disorders were excluded.

Following approval from the Institutional Review Board and Ethical Committee (IEC/AIMS & RC/2025/336 – 23-04-25), due informed consent was taken from all study participants. The research was carried out in compliance with the ICMR's 2017 Ethical Guidelines for Biomedical and Health Research involving human participants. All participants underwent detailed history taking (medical and obstetric), including personal data, gravidity, parity, abortions, mode of previous deliveries, last menstrual period, gestational age, and frequency of labour pains. General, abdominal, and gynaecological examinations were performed. Routine investigations comprised a Haemogram, random blood sugar estimation, and liver and kidney function tests. Transabdominal ultrasound was used to assess gestational age, fetal growth, and biophysical profile during antenatal follow-up.

Initial Management: First-line measures included uterine massage and bimanual compression, intravenous administration of diluted oxytocin (20 International Units in 500 mL fluid), intramuscular carboprost (0.25 mg), intramuscular methylergometrine (0.2 mg, if indicated), blood transfusion and supportive therapy, and exploration for retained placental tissue. Women with persistent haemorrhage despite these measures were scheduled for conservative surgical management, including stepwise uterine devascularization and/or Compression uterine sutures, to prevent hysterectomy.

Surgical Techniques: Stepwise uterine devascularization (uterine and utero-ovarian vessel ligation according to Abdrabo [13] and compression sutures (B-Lynch, Hayman, Cho or transverse lower uterine segment sutures) were performed as single or combined procedures:

- **Single procedures (4 groups):** Uterine compression sutures **(Fig-1 and Fig-2),** Bilateral Uterine artery ligation **(Fig-3),** Bilateral Utero-Ovarian artery ligation, or Bilateral Internal iliac artery ligation **(Fig-4).**

- **Two combined procedures (6 groups):** Combinations of compression sutures with any one ligation technique, or two ligation procedures together.
- **Three combined procedures (4 groups):** Combinations of compression sutures with two ligation techniques, or three ligation procedures together.
- **Four combined procedures (1 group):** Uterine compression sutures + Bilateral Uterine artery ligation + Bilateral Utero-Ovarian artery ligation + Bilateral Internal iliac artery ligation.

Cases unresponsive one single procedure, we added second procedure according to above mentioned groups. If two methods failed to control the bleeding, we added the third procedure. If all four combined procedures failed, patient underwent hysterectomy and was included in failure of conservative surgical methods. Maternal intraoperative complications (urinary bladder injury, vascular injury, intraoperative blood loss, and transfusion needs) and postoperative complications (coagulopathy, disseminated intravascular coagulation, wound infection, postpartum collapse, reoperation, hospital stay, and mortality) were recorded. Outcomes in the form of intra-operative and post-operative complications and the need of hysterectomy were recorded.

Statistical Analysis: Microsoft Excel was used to code, process, and analyse data gathered from a patient's history, examination, tests, and outcome measurements. Then, the information was transferred into SPSS (Statistical Analysis Software for the Social Sciences)-version 25. Qualitative variables were summarised as frequencies and relative percentages. Quantitative variables were expressed as mean and standard deviation**.**

Artificial intelligence tools (Microsoft Copilot - Windows 11) was used solely to assist with grammar refinement, language editing, and improving clarity of the manuscript. No content, data interpretation, or scientific conclusions were generated by Artificial Intelligence. All final text was reviewed and approved by the authors.

Results

The participants had a mean age of 25.86 ± 3.38 years, with an average gestational age of 37.11 ± 1.47 weeks. The most common indication for caesarean section was previous caesarean section with scar tenderness (28%), followed by obstructed labour (22%). Primigravida women constituted the majority of cases (54%), while multiparous women accounted for the remainder. Postpartum haemorrhage was predominantly due to uterine atony (72%), with trauma (16%) and bleeding from the placental bed (12%) contributing to fewer cases. The average number of children born to each woman in the study group was 1. **(Table 1)**

We found that the single conservative surgical methods demonstrated limited success (4–6%), underscoring their inadequacy in managing severe postpartum haemorrhage. Double combinations improved outcomes, particularly when bilateral uterine artery ligation was combined with uterine compression sutures (22.5%) or bilateral internal iliac artery ligation (20%). The highest success rates were observed with triple combinations (up to 26.6%). Both Uterine compression sutures + bilateral utero-ovarian artery ligation + bilateral uterine artery ligation (26.6%) and bilateral internal iliac artery ligation + bilateral utero-ovarian artery ligation + bilateral uterine artery ligation (26.6%) were the most effective. Other triple combinations showed moderate success (13.3%), suggesting that stepwise escalation to three techniques offers optimal control of haemorrhage while avoiding hysterectomy. In cases where all four techniques were applied simultaneously, success was achieved in two patients (66.6%), while one case (33.3%) failed, creating need of hysterectomy. Although the success rate was relatively high, the need for multiple procedures reflects the severity of bleeding and the complexity of management. **(Table 2)**

We found that the highest success was observed with triple combinations (80%), followed by four-method combinations achieved a 66.6% success rate, underscoring the effectiveness of stepwise escalation in PPH management. The use of the combined two methods significantly improved outcomes, achieving a success rate of 62.5%. The single conservative surgical method demonstrated limited efficacy, with only 20% success. **(Table 3)**

Hypovolemic shock was the most frequent complication, occurring in 7 cases (14%), reflecting the severity of blood loss before surgical control. Acute respiratory distress syndrome (ARDS) was observed in 3 cases. Disseminated intravascular coagulation (DIC) also occurred in 3 cases (6%), highlighting the risk of coagulopathy in uncontrolled haemorrhage while bladder injury was observed in 1 case (2%). Remote complications were less frequent, with re-operation required in 4% of cases and secondary PPH occurring in 4%. **(Table 4)**

The estimated volume of blood loss varied from 1100 to 2200 mL, with a median of 1500 mL. Mild haemorrhage (1000–1500 mL) was most frequent (56%), followed by moderate haemorrhage (38%), while severe haemorrhage (>2000 mL) occurred in only 6% of cases. Most patients required blood transfusion, with a median of 2 units of packed red blood cells, ranging from 1 to 4 units. These findings highlight that although most cases were

managed within the mild to moderate range of blood loss, transfusion support remained essential to stabilise patients and prevent complications. **(Table 4)**

APGAR (Appearance Pulse Grimace Activity Respiration) scores ranged from 4 to 9, with a median of 6. More than half of the neonates (54%) had normal APGAR scores (7–10), while 46% had moderately low scores (4–6). No cases of critically low APGAR scores (0–3) were observed. The mean birth weight was 2.78 ± 0.47 kg (range 2.4–4.0 kg). **(Table 4)**

Table 1: Demographics, CS indications, and PPH etiologies in the study population.

Variables	**Mean ± Standard Deviation**	
Age (years)	25.86 ± 3.38	
Gestational age (weeks)	37.11 ± 1.47	
Indication of CS	**N = 50**	**(%)**
CPD	5	10 %
Eclampsia	3	6%
Obstructed Labour	11	22%
Previous two LSCS	5	10%
Previous LSCS with Scar tenderness	14	28%
Primi Breech in labour	4	8%
Severe Preeclampsia with impending signs	3	6%
Thick MSL, fetal distress	5	10%
GPAL	**N = 50**	**(%)**
G2P1L1	14	28%
G3P1L1A1	2	4%
G3 P2L2	7	14%
PRIMI	27	54%
Cause of postpartum haemorrhage	**N = 50**	**(%)**
Uterine atony	36	72%
Bleeding from placental bed	6	12%
Traumatic cause	8	16%

Table 2: Success rates of different combinations of conservative surgical techniques for postpartum haemorrhage management.

Types of Conservative Surgical Techniques		
	N	**%**
Single Method	**N=50**	
Uterine compression sutures	**3**	**6%**
Bilateral Uterine artery ligation	**2**	**4%**
Bilateral Internal iliac artery ligation	**3**	**6%**
Bilateral Utero-Ovarian artery ligation	**2**	**4%**
Combined Double Method	**N=40**	
Uterine compression sutures + Bilateral Uterine artery ligation	**9**	**22.5%**
Uterine compression sutures + Bilateral Internal iliac artery ligation	**2**	**5%**
Uterine compression sutures + Bilateral Utero-Ovarian artery ligation	**1**	**2.5%**
Bilateral Utero-Ovarian artery ligation + Bilateral Internal iliac artery ligation	**2**	**5%**
Bilateral Uterine artery ligation + Bilateral Internal iliac artery ligation	**8**	**20%**
Bilateral Uterine artery ligation + Bilateral Utero-Ovarian artery ligation	**3**	**7.5%**
Combined Triple Method	**N=15**	
Uterine compression sutures + Bilateral Internal iliac artery ligation + Bilateral Utero-Ovarian artery ligation	**2**	**13.3%**
Uterine compression sutures + Bilateral Utero-Ovarian artery ligation + Bilateral Uterine artery ligation	**4**	**26.6%**
Uterine compression sutures + Bilateral Uterine artery ligation + Bilateral Internal iliac artery ligation	**2**	**13.3%**
Bilateral Internal iliac, utero-ovarian and uterine artery ligation	**4**	**26.6%**
Combined Four Method	**N=3**	
Uterine compression sutures, Bilateral Uterine artery, Internal iliac artery and Utero-Ovarian artery ligation	**2**	**66.66%**
Failure		**1(33.34%)**

Table 3: Comparative success rate of conservative surgical interventions for postpartum haemorrhage.

	Single method of conservative surgical management		Combined two methods of conservative surgical management		Combined three methods of conservative surgical management		Combined four methods of conservative surgical management	
	N	%	N	%	N	%	N	%
Success Rate	**10**	**20%**	**25**	**62.5%**	**12**	**80%**	**2**	**66.66**
Failure Rate	**40**	**80%**	**15**	**37.5%**	**3**	**20%**	**1**	**33.34**

Table 4: Complications encountered during the surgical interventions, estimated intraoperative blood loss and blood transfusion and Fetal outcomes among the studied population

Variable	**(N = 50)**	
Immediate	**N**	**%**
ARDS	3	6%
DIC	3	6%
Hypovolemic Shock	7	14%
Bladder injury	1	2%
Variable	**(N = 50)**	
Remote	**N**	**%**
Re-operation	2	4%
Secondary PPH	2	4%
Estimated intraoperative blood loss and blood transfusion		
Estimated Blood loss Range(ml) Median (ml)	 1100 – 2200 1500	
Level of Severity	**N (%)**	
Mild (1000-1500 ml)	28 (56%)	
Moderate (1500- 2000 ml)	19 (38%)	
Severe (> 2000 ml)	3 (6%)	
RBSs Transfusion Range Median	 1-4 Units 2 Units	
Fetal Outcome		
APGAR Score Range Median	 4 – 9 6	
APGAR Score Normal (7-10) Moderately Low (4-6) Critically Low (0-3)	 27 (54%) 23 (46%) 0 (0%)	
Birth weight (Kg) Mean ± SD Range	 2.78 ± 0.47 2.4- 4	

SD = Standard Deviation

Figure 1: B-Lynch Suture

Figure 2: Hayman's Suture

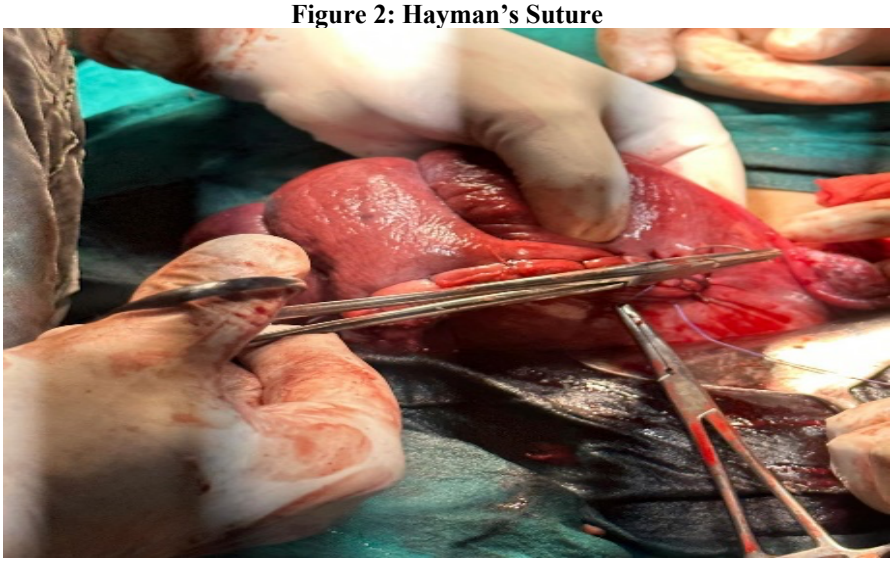

Figure 3: Uterine Artery Ligation

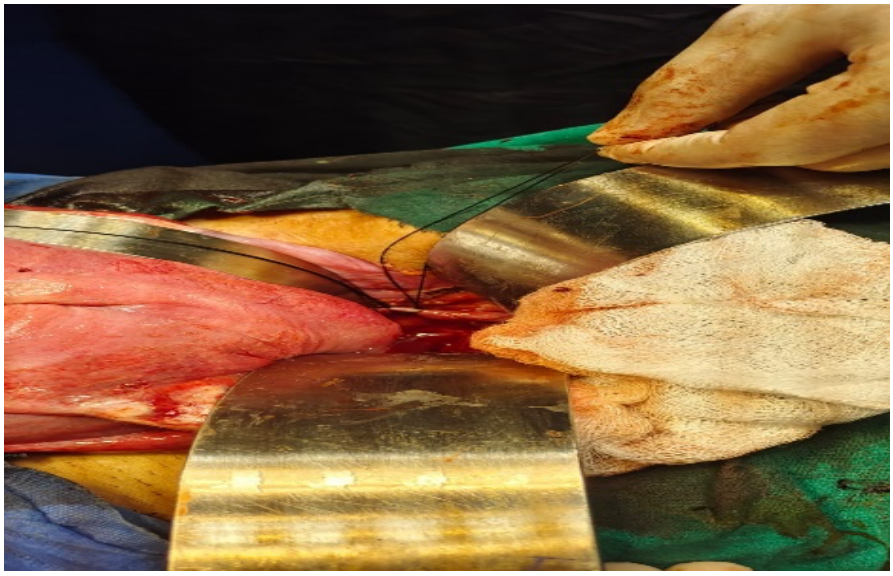

Figure 4: Internal Iliac Artery ligation

Discussion:

The cornerstone of PPH management includes uterine massage, bimanual uterine compression, and medical therapy. In cases where medical or conservative surgical treatment fails, and particularly in women who have completed their families or have unstable haemostasis, hysterectomy remains a definitive life-saving option [14].

For women desiring fertility preservation, surgical measures avoiding need of hysterectomy like balloon tamponade, bilateral uterine and utero-ovarian artery ligation, bilateral Internal iliac artery ligation, Uterine compression sutures, and arterial embolization are considered. Reported success rates for these approaches range between 84.0% and 91.7% [15].

In our study, the mean maternal age was 25.86 years, with an average parity of 1 and a mean gestational age of 37.11 weeks. These findings contrast with those of Mohamed et al. [16], who observed a higher incidence of PPH in women more than 35 years and with high parity. Conversely, our results align with Bais et al. [17], who reported that PPH tends to be more severe in primiparous women.

In the present study, the indications for caesarean section were distributed as follows: previous caesarean delivery (28%), obstructed labour (22%), previous two LSCS (10%), CPD (Cephalo-Pelvic Disproportion) (10%), primi breech in labour (8%), eclampsia (6%), and MSL (Meconium-Stained Liquor) with fetal distress (10%). Our findings are consistent with those of Knight et al. [18] and Ohkuchi et al. [19], who reported an increased likelihood of PPH, abnormal placentation, peripartum hysterectomy, and uterine rupture following a prior caesarean delivery. However, contrary to these studies, some evidence suggests that previous CS may not be an important etiology of PPH (OR 2.05, 95% CI 0.92–4.55) [20,21].

In the present study, uterine atony was the leading cause of PPH, accounting for 72% of cases, followed by bleeding from the placental bed without placenta previa (12%) and traumatic causes (16%). These findings are consistent with those of AbdRabbo [13], who reported uterine atony in 51.3% of cases, placental bed bleeding without placenta previa in 33.3%, and trauma in 14.4%. Our results also align with Stones et al. [22], who identified uterine atony as a major contributor to severe obstetric bleeding, with a relative risk of 13.1 (95% CI 7.47–23). Furthermore, Fyfe et al. [23] noted that antepartum haemorrhage occurred in 5.2% of their nulliparous cohort, highlighting the clinical significance of its association with an increased risk of PPH, even when placenta previa is excluded.

In our study, the use of a single conservative surgical technique achieved an overall success of 20%. Among these, uterine compression sutures and bilateral internal iliac artery ligation each contributed to 6% of successful outcomes, while bilateral ovarian artery ligation and bilateral uterine artery ligation each accounted for 4%. Consistent with our findings, Li et al. [24] reported that uterine compression sutures are an appealing option, with techniques such as the B-Lynch suture gaining widespread use due to their perceived effectiveness and safety. However, unlike our results, another study found the B-Lynch sutures to be the most frequently employed technique, achieving a notably higher success rate of 60% [25].

In the current study, the overall success of using combined two-method conservative surgical management was 62.5%. This aligns with findings

from other studies, which have demonstrated high success rates when combined vascular ligation procedures are performed by experienced gynaecologic oncologists. However, these techniques require specialized training. Previous research has reported success rates ranging from 70% to 96% for combined uterine and ovarian artery ligations [26].

In the current study, we observed an 80% success rate when three conservative surgical methods were combined. This finding is consistent with the results reported by AbdRabbo [13]. Similarly, previous studies have shown that bilateral hypogastric artery ligation is an effective option for managing PPH unresponsive to other treatments [27]. More recently, step-by-step uterine devascularization, entailing bilateral ascending uterine arteries ligation, utero-ovarian arteries ligation, and hypogastric arteries ligation—has been described, achieving an ovarian survival rate of 87% [28].

In current study, the success of using a combination of four conservative surgical methods was 66.6%. This is consistent with findings from a meta-analysis that showed comparable success rates across various interventions—including uterine tamponade (84%), uterine compression sutures (91.7%), iliac artery ligation (84%), and arterial embolization (84.6%)—with no statistically significant differences in their effectiveness [29]. Similar success rates were reported in another study, where Bakri balloon tamponade achieved a 66.7% success rate and uterine compression sutures 75.7%. According to Kaya et al [30], both figures were mildly on a higher side (79.1% and 80%, respectively).

Findings of this study demonstrated a very high overall success rate for conservative surgical therapy (98%). Only one patient (2%) required a hysterectomy, which falls within the range reported in previous studies (75–97.1%) [31,32,33]. Consistent with our results, Shehata et al. [34] noted that several small case series support the feasibility of uterine preservation through conservative management. However, they also emphasized that conservative approaches do not guarantee success in all cases.

Tindell et al. [33], in a systematic review of the literature, reported that uterine balloon tamponade had the highest success rate (97.1%). Several small case series have similarly demonstrated that conservative, uterus-preserving treatments can be effective. However, conservative management does not guarantee successful outcomes [30]. In cases of life-threatening haemorrhage that does not respond to these measures, hysterectomy remains the definitive intervention [35].

In the present study, the mean intraoperative blood loss was approximately 1.5 litres, with patients receiving 2 median units of packed red blood cells (PRBCs). These results are comparable to those reported by Li et al. [10], who documented total blood loss ranging from 2000 to 4600 mL (mean 2586 ± 495 mL) and transfusion volumes between 600 and 2000 mL (mean 1160 ± 429 mL). Our results are also consistent with those of Sergent et al. [36], who documented mean estimated blood loss between 1.39 and 3 litres.

In the current study, bladder injuries accounted for 2% of all intraoperative complications. Additionally, 6% of women developed DIC (Disseminated Intravascular Coagulation), 6% developed ARDS (Acute Respiratory Distress Syndrome), 14% experienced hypovolemic shock, 4% required additional surgical intervention, and 4% developed secondary PPH. These results are comparable to those reported by Robinson et al. [37], who observed a maternal mortality rate of 6.8% and substantial maternal morbidity, including massive haemorrhage, disseminated intravascular coagulation, hysterectomy, and bladder or ureteric injury. In contrast, Pal et al. [38] documented urologic complications, with bladder lacerations occurring in 26% of cases.

In the present study, the median APGAR score was 6, and the mean birth weight was 2.78 kg. Our findings align with those of Kramer et al. [39] and Prata et al. [40], who also reported no association between PPH and fetal macrosomia. Conversely, Jolly et al. [41], in an analysis of 350,311 singleton pregnancies in London, observed a higher incidence of PPH among women delivering macrosomic infants (OR 2.01, 95% CI 1.93–2.10). Similarly, Magann et al. [42] identified macrosomia as a significant risk factor for PPH (OR 1.4, 95% CI 1.4–2.3).

This study is among the few to assess conservative surgical management of early PPH by evaluating each technique both individually and in combination. By emphasizing the effectiveness of these approaches in minimising blood loss and reducing the need for hysterectomy, the study provides important clinical insights. However, its single-centre design and relatively small sample size represent limitations, underscoring the need for future research involving larger cohorts, extended follow-up, and multicentre collaboration.

Conclusion

The conservative surgical management of early PPH in our study demonstrated an exceptionally high overall success of 98%. Among the various techniques, the combination of three conservative surgical methods proved most effective (80%), with the most successful set being bilateral Internal iliac artery ligation, bilateral utero-ovarian artery

ligation, and bilateral uterine artery ligation (26.6%) and Uterine compression sutures, bilateral utero-ovarian artery ligation, bilateral uterine artery ligation (26.6%). These results suggest that obstetricians should consider early implementation of conservative surgical interventions—particularly this combination of arterial ligations and compression sutures—to optimize outcomes in the management of early PPH.

Abbreviations

AMTSL: Active Management of Third Stage of Labour

APGAR: Appearance Pulse Grimace Activity Respiration

ARDS: Acute Respiratory Distress Syndrome

CPD: Cephalo–Pelvic Disproportion

DIC: Disseminated Intravascular Coagulation

GPAL: Gravidity Parity Abortion Live

LSCS: Lower Segment Caesarean Section

MSL: Meconium-Stained Liquor

OBG: Obstetrics and Gynaecology

PPH: Post Partum Haemorrhage

Declaration

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Author Contributions: Dr Megha Tripathi developed the concept for the study, reviewed the literature, conducted the data analysis, and wrote the first draft of the paper; **Dr. Divya Sharma** performed the data analysis, interpretation and edited the paper; **Dr Divya Yadav** performed the data collection and **Dr. Bhupesh Patel** supervised the data analysis interpretation and discussion of the results, and edited the paper.

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Conflicts of Interest: The study's authors affirm that there are no conflicts of interest in the study.

Ethical clearance status: Ananta Institutional Ethics Committee, Ananta Institute of Medical Sciences & Research Centre, Rajsamand-313202, Rajasthan (EC/NEW/INST/2023/3897, ECR/1394/INST/RJ/2020), 23/04/2025, ANANTA IEC/AIMS & RC/2025/336

Informed consent statement: Due Informed consent were taken in all patients.

Data availability statement: All computing datasets are accessible from the corresponding author for a specific purpose.

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