

## COMPLICATIONS ASSOCIATED WITH INTERNAL ILIAC LIGATION IN THE CONTEXT OF SEVERE POST-PERIPARTUM HYSTERECTOMY BLEEDING

ULLAH S<sup>1</sup>, QAZI Q<sup>2\*</sup>, KHAN N<sup>3</sup>, KHAN H<sup>3</sup>, SHAHBAZ N<sup>4</sup>

<sup>1</sup>Division of Vascular Surgery, Lady Reading Hospital Peshawar, Pakistan

<sup>2</sup>Department of Gynecology and Obstetrics, Lady Reading Hospital, Peshawar, Pakistan

<sup>3</sup>Khyber Medical College, Peshawar, Pakistan

<sup>4</sup>Department of Obstetrics and Gynecology, Woman and Children type C Hospital Karak, Pakistan

\*Corresponding author's email address: [qudsiakamran@gmail.com](mailto:qudsiakamran@gmail.com)

(Received, 27th October 2023, Revised 19<sup>th</sup> December 2023, Published 26<sup>th</sup> March 2024)

**Abstract:** Severe post-peripartum hysterectomy bleeding poses a critical threat to maternal health, necessitating swift and effective interventions to ensure favorable outcomes. The main objective of the study is to find the potential complications associated with internal iliac ligation in the context of severe post-peripartum hysterectomy bleeding. This prospective observational study was conducted in the gynecology and obstetrics department of Lady Reading Hospital Peshawar from June 2022 till the required sample size is obtained. The study included women who had significant and profuse post-peripartum hysterectomy bleeding. All women with post-peripartum hysterectomy hemorrhage were identified, focusing specifically on cases where internal iliac ligation was employed as an intervention. The demographic information, including patient age, parity, medical history, and obstetric details, was collected on predesigned proforma. Data was collected from 196 patients. The mean age of the patients was 31.5±4.2 years. About 97% of patients were multiparas, and all patients presented with postpartum hemorrhage (100%). The mode of delivery was vaginal in 89% of cases. It is concluded that internal iliac ligation, while effective in controlling severe post-peripartum hysterectomy hemorrhage, presents a nuanced landscape marked by a low incidence of vascular (1.5%) and ureteric (0.5%) injuries. Consequently, we believe that procedure is worth trying in the face of catastrophic uncontrolled haemorrhage, especially in low-income countries.

**Keywords:** Post-Peripartum Hysterectomy bleeding, Internal Iliac Ligation, complications

### Introduction

Severe post-peripartum hysterectomy bleeding poses a critical threat to maternal health, necessitating swift and effective interventions to ensure favorable outcomes. Among the strategies employed, internal iliac ligation (IIA ligation) is a crucial technique for controlling pelvic bleeding, particularly in cases where conventional measures prove insufficient.

Obstetric indications for therapeutic or prophylactic IIA ligation are postpartum hemorrhage due to atonic uterus, uterine laceration or rupture, placental abruption or placenta previa, morbidly adherent placenta, significant and profuse post peripartum hysterectomy bleeding from broad ligament, pelvic sidewalls or unidentifiable vascular bed.

Postpartum hemorrhage (PPH) is a critical complication affecting healthy mothers, often without warning, and contributes to 30% of maternal mortality globally (Selcuk et al., 2018). Uterine atony accounts for 80% of PPH cases. Therefore, IIA ligation plays a crucial role in managing life-threatening hemorrhage during childbirth (Kostov et al., 2023).

The procedure is often successful and life-saving, particularly in situations of peripartum bleeding. This is especially true in obstetrics and gynecology where hemorrhage remains a major cause of mortality and significant morbidity. Both short-term and long-term effects of IIA ligation are generally salutary.

The historical background of (IIA) ligation to control intractable pelvic hemorrhage in gynecological surgery finds its roots in 1893 when initially described by Kelly focusing on a case of cervical carcinoma.

This intervention involves occluding the internal iliac arteries, disrupting blood flow to the pelvic organs, and reducing bleeding. It significantly reduces the pulse pressure and rate of blood flow allowing effective thrombosis within the small bleeding vessels

In cases of intra-peritoneal bleeding, typically due to injury to the uterine arteries or branches of the internal iliac arteries, where the precise location cannot be identified, IIA ligation is a viable option due to the IIA, 's role as the primary blood supply to pelvic viscera. Bilateral IIA ligation during massive pelvic or peripartum bleeding results in a significant reduction in pelvic arterial blood flow by 49% and pulse pressure by 85%.(Desai et al., 2017).

However, internal iliac ligation is not without its intricacies and potential complications (Lu et al., 2010).

It requires a delicate balance to prevent unintended consequences. Vascular injury, ischemic complications, and the impact on fertility are among the potential complications associated with internal iliac ligation (Madhubala et al, 2019). The inadvertent damage to adjacent structures or prolonged ischemia may lead to significant morbidity, necessitating an increased understanding of retroperitoneal anatomy and regional

variations of the IIA to reduce the risk of intraoperative and postoperative complications. (Huang et al., 2018). Thus, main aim of the study was to find the potential complications associated with internal iliac ligation and to highlight the increased need for an understanding of retroperitoneal anatomy and regional variations of the IIA to reduce the risk of intraoperative and postoperative complications.

**Methodology**

This prospective observational study was conducted in the *Gynecology and Obstetrics department of Lady Reading Hospital Peshawar after approval by the ethical Committee of the hospital Ref No 64/LRH/MTI, till the required sample size was obtained.* A sample size of 196 was calculated using a WHO sample size calculator with a 95% confidence level, the margin of error of 7%, and an expected frequency of internal iliac vein injury of (3, 15%) in patients with internal iliac artery ligation. The study included all women who underwent IIA ligation for significant and profuse post-peri-partum hysterectomy bleeding from broad ligament typically due to injury to the uterine arteries or branches of the internal iliac arteries. Exclusion criteria involve cases with incomplete medical records or alternative interventions for hemorrhage control if used. Written informed consent was obtained from all participants. The demographic information, including patient age, parity, medical history, and obstetric details, was recorded on a predesigned proforma pre-hand from a patient in case of planned high-risk surgeries while next of kin/guardian consented in emergencies in best interest of patients. Clinical information such as indications for hysterectomy, gestational age, mode of delivery, and specifics of the hysterectomy procedure were carefully documented. Internal iliac ligation specifics, encompassing the timing of ligation were systematically recorded. IIA ligation was done by cardiovascular consultants who had completed specialized training in vascular surgery and had experience in performing complex vascular procedures. Outcome measures, comprising postoperative complications like vascular and ureteric injuries were meticulously documented. The length of hospital stay and the need for additional interventions (abdominal packing), blood transfusions, and exploratory laparotomy were also assessed as secondary outcome measures. Data was collected and descriptive statistics such as mean, and standard deviation will be calculated for quantitative variables. Frequency and percentages will be calculated for categorical variables. The statistical analysis of results will be done by using SPSS 26. A p value of <0.05 was taken as significant.

**Results**

The mean age of 196 patients was 31.5±4.2 years. About 6 (3%) of patients were primiparous while 97% were multiparas. About 89% of patients delivered vaginally while C-section was performed in 11% of cases. Bilateral ligation was performed in all cases.

**Table 01: Demographic data of patients**

Characteristic	Frequency	%age
Age (years)	31.5±4.2 (Mean ± SD)	
Primiparous	6	3%
Multiparous	190	97%
Previous c sections	42	21.4%
<b>Indications for hysterectomy</b>		
Ruptured uterus	161	82%
Atonic uterus	17	8.6%
Placenta previa	17	8.6%
Placenta accreta spectrum	12	6.1%
<b>Mode of Delivery</b>		
Vaginal delivery	174	89%
Cesarean section	22	11%

Vascular injuries occurred in 3(5.8%) of cases with one case (0.5%) of common iliac artery injury, and 2 cases of internal iliac vein injury (1.0%) (all with p-value <0.05). No case of ureteric injury was noticed.

**Table 03: Outcomes and primary measures**

Complications	Previous c section		To tal	P value
	yes	no		
Vascular Injuries	2(1%)	1(0.5%)	3	0.001
Common iliac artery injury	1(0.51%)	0	1	0.021
Internal iliac vein injury	1(0.5%)	1(0.5%)	2	0.008
Ureteric injury	0	0	0	

Vascular complications showed a statistically significant association with previous c-sections (p-value = 0.001). The mean length of hospital stay was 5.5±2.5 days. Additional interventions observed were intra-abdominal packing in 9(4.5%) cases, exploratory laparotomy in 12 (6%), and blood transfusion in all (100%) cases.

**Table 04: Adverse maternal outcomes**

Outcome	Frequency/	%age
Mean Hospital Stay	5.5±2.5 days (Mean ± SD)	
Additional Interventions (like intra-abdominal packing)	9	4.5%
Blood Transfusions	196	100%
Exploratory Laparotomy	5	2.5%

**Discussion**

This prospective observational study demonstrated peri-procedural complications of bilateral internal iliac artery ligation for 196 post-peri-partum hysterectomy patients with severe bleeding.

The study observations of vascular injuries like an internal iliac vein in 1.0% of cases are in contrast with existing literature showing internal iliac vein injury in 15% of cases (Choi K et al 2023) and highlighting the technical complexity and inherent risks of internal iliac ligation. Our results emphasize the importance of careful consideration

[Citation: Ullah, S., Qazi, Q., Khan, N., Khan, H., Shahbaz, N. (2024). Potential complications associated with internal iliac ligation in the context of severe post-peripartum hysterectomy bleeding. *Biol. Clin. Sci. Res. J.*, 2024: 698. doi:<https://doi.org/10.54112/bcsrj.v2024i1.698>]

of expertise for the performance of this intervention by consultants as followed in our study.

The common position of the internal iliac vein beneath the artery prone it to inadvertent and iatrogenic injury during dissection. It is difficult to control this injury, even for experienced vascular surgeons as it lies deep. Serious accidents occurred in two cases where controlling hemorrhage was challenging. After roughly stitching several sutures, surgeons were able to manage the critical patient.

The common iliac got injured in one case of placenta percreta with previous 3 c-sections and was repaired along with 32 blood transfusions, owing to multiple adhesions and the complexity of the surgery.

The incidence of obstetric hemorrhage related to abnormal placenta conditions, including placenta previa with variations such as accreta, increta, and percreta, has led to an elevated demand for blood transfusions and an increased likelihood of postpartum hysterectomy (Nieto et al., 2023). This poses a higher risk and complication rate, especially in cases of repeat lower-segment cesarean section (LSCS).

The placenta previa population, particularly those with accreta, experiences extensive maternal morbidity due to postpartum hemorrhage (Yousef et al., 2021). To mitigate blood loss, various surgical approaches such as arterial embolization, prophylactic balloon occlusion of the abdominal aorta, and intervention in common iliac, internal iliac, or uterine arteries are employed (Bonde et al., 2020). Hysterectomy becomes a necessary intervention in hemodynamically unstable patients to gain control over bleeding risks and associated complications. Emergency cesarean hysterectomy is performed in over 8.6% of cases involving abnormal placenta, and selected patients may undergo elective hysterectomies as a preventive measure against morbidities.

Burchell introduced a pelvic hemorrhage control method known as internal iliac artery ligation. This procedure has significantly reduced pulse pressure, effectively converting the pelvic artery into a system resembling veins with minimal blood flow (Kalaivani et al., 2022). The slowed blood flow at a reduced rate is a preventive measure against excessive blood loss. The findings of this study emphasize the nuanced nature of internal iliac ligation, balancing its efficacy in achieving hemostasis with potential complications.

Damage to the ureter was avoided by careful dissection and visualization of pelvic structures before ligating vessels.

When opting for IIA ligation, clinicians must weigh the risks and benefits, considering patient-specific factors (Kwinta et al., 2020). The results underscore the importance of specialized training and ongoing quality improvement efforts in enhancing procedural outcomes.

## Conclusion

It is concluded that internal iliac ligation, while effective in managing severe post-peripartum hysterectomy bleeding, presents a nuanced landscape marked by a low incidence of vascular injuries and ureteric injuries.

## Recommendations:

IIAL is a complex surgical procedure that requires specialized skills and experience. It should be performed by experienced surgeons who are trained in vascular surgery and familiar with pelvic anatomy.

## Declarations

### Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

### Ethics approval and consent to participate

Approved by the department concerned.

### Consent for publication

Approved

### Funding

Not applicable

## Conflict of interest

The authors declared the absence of a conflict of interest.

## Author Contribution

### SAJJAD ULLAH (Medical Officer)

*Drafting, final approval of version, coordination of collaborative efforts*

### QUDSIA QAZI (Associate Professor)

*Conception of idea and design of study, manuscript writing, and final approval of version*

### NOMAN KHAN (4th Year MBBS Student)

*Manuscript writing and revising criticality, data acquisition, coordination of collaborative efforts*

### HASSAN KHAN (2nd Year MBBS Student)

*Revising manuscript criticality, Data acquisition*

### NAZIA SHAHBAZ (Medical officer)

*Data acquisition, Data analysis*

## References

- Selcuk I, Yassa M, Tatar I, Huri E. Anatomic structure of the internal iliac artery and its educative dissection for peripartum and pelvic hemorrhage. *Turk J Obstet Gynecol* 2018; 15: 126-9.
- Kostov, S., Kornovski, Y., Watrowski, R., Slavchev, S., Ivanova, Y., & Yordanov, A. (2023). Internal Iliac Artery Ligation in Obstetrics and Gynecology: Surgical Anatomy and Surgical Considerations. *Clinics and Practice*, 14(1), 32-51.
- Kelly H. Ligation of both internal iliac arteries for hemorrhage in hysterectomy for carcinoma uterus. *John Hopkins Med Journal*. 1894;5:53-4
- Desai R, Jodha B, Garg R. Morbidly adherent placenta and its maternal and fetal outcome. *Int J Reprod Contracept Obstet Gynecol*. 2017;6(5):1890-1893. doi: 10.18203/2320-1770.ijrcog20171943
- Lu Gao, Jennifer, et al. "Laparoscopic Internal Iliac Artery Ligation for Postpartum Spontaneous

[Citation: Ullah, S., Qazi, Q., Khan, N., Khan, H., Shahbaz, N. (2024). Potential complications associated with internal iliac ligation in the context of severe post-peripartum hysterectomy bleeding. *Biol. Clin. Sci. Res. J.*, 2024: 698. doi:<https://doi.org/10.54112/bcsrj.v2024i1.698>]

- Hemoperitoneum." *Journal of Obstetrics and Gynaecology Canada*, vol. 32, no. 12, 2010, pp. 1172-1175, [https://doi.org/10.1016/S1701-2163\(16\)34742-9](https://doi.org/10.1016/S1701-2163(16)34742-9).
- Madhubala, M. "Bilateral Internal Iliac Artery Ligation, a Rational Choice of Surgery in Placenta Previa, a Hospital-Based Retrospective Study on the Prevention of Hysterectomy and Control of Postpartum Hemorrhage." *Journal of Obstetrics and Gynaecology of India*, vol. 69, no. 6, 2019, pp. 535-540, <https://doi.org/10.1007/s13224-019-01258-8>.
- Huang K-L, Tsai C-C, Fu H-C, et al. Prophylactic transcatheter arterial embolization helps intraoperative hemorrhagic control for removing invasive placenta. *J Clin Med*. 2018;7(11):460. doi: 10.3390/jcm7110460.
- B-Lynch C, Keith LG, Campbell WB. A textbook of postpartum hemorrhage - a comprehensive guide to evaluation, management, and surgical intervention. 1st ed. Sapiens Publishing; 2006. p. 299-307
- Choi K, Keum MA, Choi B, Noh M, Choi S, Kyoung KH, Kim S, Hong ES, Kim JT. Effectiveness and safety of bilateral internal iliac artery ligation with pre-peritoneal pelvic packing for life-threatening pelvic trauma. *Injury*. 2023 Feb 1;54(2):598-603.
- Bagaria, D. K., Anwer, M., Choudhary, N., Kumar, A., Priyadarshini, P., Banerjee, N., ... & Kumar, S. (2022). Revisiting role of bilateral ligation of internal iliac arteries and preperitoneal pelvic packing for hemorrhage control in patients with pelvic injuries in resource constraint settings. *Indian Journal of Surgery*, 1-6.
- Nieto-Calvache, A. J., Palacios-Jaraquemada, J. M., Aryananda, R. A., Basanta, N., Burgos-Luna, J. M., Rodriguez, F., ... & Messa-Bryon, A. (2023). Ligation or Occlusion of the Internal Iliac Arteries for the Treatment of Placenta Accreta Spectrum: Why Is This Technique Still Performed? *Maternal-Fetal Medicine*, 5(03), 131-136.
- Yousef, M. M. K., Rateb, A. M., & Mohamed, A. M. H. (2021). The Role of Bilateral Internal Iliac Artery Ligation in Minimizing Blood Loss Before Cesarean Hysterectomy Patients with Abnormally Invasive Placenta. *World*, 2(4), 62-68.
- Bonde, A., Velmahos, A., Kalva, S. P., Mendoza, A. E., Kaafarani, H. M., & Naderpelt, C. J. (2020). Bilateral internal iliac artery embolization for pelvic trauma: effectiveness and safety. *The American Journal of Surgery*, 220(2), 454-458.
- Kalaivani, G. (2022). Fertility Followup after Bilateral Internal Iliac Arteries Ligation for Life-Threatening Obstetrics Hemorrhage (Doctoral dissertation, Madras Medical College, Chennai).
- Kwinta, B. M., Myszka, A. M., Bigaj, M. M., Dragan, M. R., Kenig, J., & Krzyżewski, R. M. (2020). Iatrogenic common iliac vessel injury during routine degenerative lumbar spine surgery: Report of 2 cases and literature review. *World Neurosurgery*, 137, 111-118.



**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution, and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The images or other third-party material in this article are included in the article's Creative Commons license unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>. © The Author(s) 2023