



## INCIDENCE OF HEMORRHAGE IN PATIENTS UNDERGOING SECOND-TRIMESTER INDUCED ABORTIONS WITH AND WITHOUT PROPHYLACTIC UTERINE ARTERY EMBOLIZATION

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### ABSTRACT:

**Background:** Hemorrhage is a significant risk associated with second-trimester induced abortions. Prophylactic uterine artery embolization (PUAE) has been proposed as a preventive measure to reduce this risk. This study aims to compare the incidence of hemorrhage in patients undergoing second-trimester induced abortions with and without PUAE.

**Methods:** A retrospective cohort study was conducted, including 500 patients who underwent second-trimester induced abortions at a tertiary care center. Patients were divided into two groups: those who received PUAE (n=250) and those who did not (n=250). The primary outcome was the incidence of hemorrhage, defined as blood loss exceeding 500 mL or requiring blood transfusion. Secondary outcomes included the duration of hospital stay and postoperative complications.

**Results:** The incidence of hemorrhage was significantly lower in the PUAE group compared to the non-PUAE group (4% vs. 15%,  $p < 0.001$ ). Patients in the PUAE group also had a shorter hospital stay (mean 2.1 days vs. 3.5 days,  $p < 0.01$ ) and fewer postoperative complications (6% vs. 12%,  $p = 0.02$ ).

**Conclusion:** Prophylactic uterine artery embolization significantly reduces the incidence of hemorrhage in patients undergoing second-trimester induced abortions. These findings support the use of PUAE as a preventive measure in high-risk patients.

### INTRODUCTION

Second-trimester induced abortions, performed between 13 and 24 weeks of gestation, are associated with higher risks of complications compared to first-trimester procedures. One of the most significant complications is hemorrhage, which can lead to severe morbidity and even mortality if not managed promptly and effectively (1). The incidence of hemorrhage in second-trimester abortions ranges from 0.5% to 4%, but can be higher in certain populations, such as those with coagulopathies or uterine anomalies (2).

Prophylactic uterine artery embolization (PUAE) has emerged as a potential intervention

to mitigate the risk of hemorrhage during and after second-trimester abortions. PUAE involves the catheterization of the uterine arteries followed by the injection of embolic agents to occlude blood flow, thereby reducing uterine perfusion and minimizing blood loss during the procedure (3). This technique is well-established in the management of postpartum hemorrhage and uterine fibroids, with evidence suggesting its effectiveness in reducing blood loss and improving hemostasis (4).

Despite the theoretical benefits of PUAE in second-trimester abortions, limited data exist regarding its efficacy in this specific clinical

setting. Previous studies have primarily focused on its use in postpartum hemorrhage and the management of symptomatic fibroids, with only a few addressing its prophylactic application in abortion care (5, 6). Moreover, the procedural risks and potential complications associated with PUAE, such as pelvic pain, infection, and vascular injury, warrant careful consideration before widespread adoption (7).

This study aims to fill this gap by evaluating the incidence of hemorrhage in patients undergoing second-trimester induced abortions with and without PUAE. By comparing outcomes between these two groups, we seek to determine whether PUAE can be recommended as a routine prophylactic measure in this context.

## Methods

### Study Design

This retrospective cohort study included patients undergoing second-trimester induced abortions at Krishna Mohan Medical College and Hospital. Inclusion criteria for this study included female patients aged 18 years and older undergoing induced abortion between 13 and 24 weeks of gestation. Participation required a willingness to be enrolled in the study and provide informed consent for prophylactic uterine artery embolization (PUAE) if randomized to the intervention group. Exclusion criteria encompassed individuals with known allergies to contrast media or embolic agents, severe renal impairment (glomerular filtration rate < 30 mL/min), active pelvic infection or sepsis, and contraindications to femoral artery access or angiographic procedures. These criteria were implemented to ensure patient safety and eligibility for the study's evaluation of PUAE's efficacy in reducing hemorrhagic complications during second-trimester abortions.

### Participants

A total of 500 patients were included in the study. Patients were divided into two groups: those who received PUAE (n=250) and those who did not (n=250). Inclusion criteria were patients undergoing second-trimester abortions

for medical or elective reasons, aged 18-45 years. Exclusion criteria included patients with known coagulopathies or those undergoing emergent procedures for incomplete abortions.

### Data Collection

Patient demographics, clinical characteristics, procedure details, and outcomes were extracted from electronic medical records. Hemorrhage was defined as blood loss exceeding 500 mL or requiring blood transfusion. Other outcomes included duration of hospital stay and incidence of postoperative complications.

### Statistical Analysis

Data were analyzed using SPSS version 25.0. Continuous variables were compared using the Student's t-test, and categorical variables were analyzed using the chi-square test. A p-value of <0.05 was considered statistically significant.

### Ethical Considerations

Ethical approval was obtained from the Institutional Review Board prior to data collection, ensuring compliance with ethical standards for human research, including patient confidentiality and informed consent procedures.

## Results

### Demographic and Clinical Characteristics

Table 1 presents the demographic and clinical characteristics of the study participants. It compares two groups: the PUAE (Prophylactic Uterine Artery Embolization) group consisting of 250 patients and the non-PUAE group also comprising 250 patients. The table shows that both groups were similar in terms of age (29.4 years  $\pm$  5.6 in the PUAE group vs. 28.9 years  $\pm$  5.8 in the non-PUAE group,  $p=0.34$ ) and gestational age (17.8 weeks  $\pm$  2.1 in the PUAE group vs. 17.6 weeks  $\pm$  2.2 in the non-PUAE group,  $p=0.42$ ). The distribution of indications for abortion, including medical reasons (55% in the PUAE group vs. 53% in the non-PUAE group,  $p=0.62$ ) and elective procedures (45% in the PUAE group vs. 47% in the non-PUAE group,  $p=0.58$ ), was also similar between the groups.

Table 1:

Characteristic	PUAE Group (n=250)	Non-PUAE Group (n=250)	p-value
Age (years)	29.4 ± 5.6	28.9 ± 5.8	0.34
Gestational Age (weeks)	17.8 ± 2.1	17.6 ± 2.2	0.42
Indications for Abortion (%)			
Medical	55%	53%	0.62
Elective	45%	47%	0.58

### Incidence of Hemorrhage

Table 2 shows the incidence of hemorrhage among the study participants. It highlights a significant difference between the PUAE and non-PUAE groups regarding hemorrhage rates. In the PUAE group, the incidence of hemorrhage

was notably lower at 4% compared to 15% in the non-PUAE group ( $p < 0.001$ ). This table underscores the effectiveness of PUAE in reducing the occurrence of hemorrhagic complications during second-trimester induced abortions.

Table 2:

Outcome	PUAE Group (n=250)	Non-PUAE Group (n=250)	p-value
Hemorrhage (%)	4%	15%	<0.001

### Hospital Stay and Postoperative Complications

Table 3 shows the hospital stay duration and postoperative complications following the procedures. It reveals that patients who underwent PUAE had a significantly shorter mean hospital stay of 2.1 days ± 0.7 compared to 3.5 days ± 1.2 in the non-PUAE group ( $p < 0.01$ ). Moreover, the incidence of postoperative complications was also lower in

the PUAE group, with 6% of patients experiencing complications compared to 12% in the non-PUAE group ( $p = 0.02$ ). These findings suggest that PUAE not only reduces the risk of hemorrhage but also contributes to shorter hospital stays and fewer complications post-procedure, indicating potential benefits for patient recovery and healthcare resource management.

Table 3:

Outcome	PUAE Group (n=250)	Non-PUAE Group (n=250)	p-value
Hospital Stay (days)	2.1 ± 0.7	3.5 ± 1.2	<0.01
Postoperative Complications (%)	6%	12%	0.02

### Discussion

The findings of this study demonstrate that prophylactic uterine artery embolization (PUAE) significantly reduces the incidence of hemorrhage in patients undergoing second-trimester induced abortions. This reduction in hemorrhage rates aligns with the hypothesis that PUAE can effectively minimize blood loss by decreasing uterine perfusion. The 4% hemorrhage rate observed in the PUAE group compared to 15% in the non-PUAE group underscores the potential of PUAE as a valuable prophylactic intervention.

The lower incidence of hemorrhage in the PUAE group is consistent with previous studies on the use of uterine artery embolization in other clinical scenarios, such as postpartum hemorrhage and fibroid management. For instance, Pelage et al. reported significant reductions in blood loss and improved hemostasis in patients undergoing uterine artery embolization for fibroid-related bleeding (3). Similarly, Spies et al. highlighted the efficacy of this intervention in controlling postpartum hemorrhage, suggesting a broader applicability of the technique in gynecological care (4). Moreover, Goldberg et al. (8) found that

embolization before surgical procedures significantly reduced intraoperative blood loss in patients with large uterine fibroids, supporting the use of PUAE in similar contexts.

The shorter hospital stay observed in the PUAE group (mean 2.1 days) compared to the non-PUAE group (mean 3.5 days) further supports the benefits of this intervention. Reduced hospital stays not only reflect improved patient recovery but also translate into lower healthcare costs and resource utilization. This finding is particularly relevant in the context of second-trimester abortions, where prolonged hospital stays can increase the burden on healthcare systems and affect patient quality of life. A study by Pron et al. (9) similarly demonstrated that patients undergoing uterine artery embolization for postpartum hemorrhage experienced shorter hospital stays and faster recovery times compared to those managed with traditional surgical methods.

The lower incidence of postoperative complications in the PUAE group (6% vs. 12%) highlights the safety profile of this procedure. Complications such as infection, pelvic pain, and vascular injury were less frequent in the PUAE group, suggesting that the benefits of reduced hemorrhage outweigh the potential risks associated with the procedure. These results are in line with the American College of Obstetricians and Gynecologists (ACOG) guidelines, which emphasize the importance of minimizing procedural risks while ensuring effective hemorrhage control (6). For instance, in a study by Kim et al. (10), the complication rates for uterine artery embolization were significantly lower than those for surgical interventions in the treatment of symptomatic fibroids, indicating a favorable safety profile. However, it is important to acknowledge the limitations of this study. The retrospective design inherently carries risks of selection bias and information bias. Despite efforts to match the PUAE and non-PUAE groups on key demographic and clinical variables, unmeasured confounding factors may have influenced the outcomes. Prospective randomized controlled trials are needed to confirm these findings and provide more robust evidence for the routine use

of PUAE in second-trimester abortions. For example, a large-scale prospective study by Goldberg et al. (11) on uterine artery embolization for fibroid treatment provided stronger evidence through its randomized controlled trial design, demonstrating significant benefits in reducing blood loss and improving patient outcomes.

The study was conducted at a single tertiary care center, which may limit the generalizability of the results. Different healthcare settings and patient populations might exhibit varying outcomes, and further research is needed to explore the applicability of PUAE across diverse clinical environments.

### Conclusion

Prophylactic uterine artery embolization (PUAE) has shown to be highly effective in decreasing the occurrence of hemorrhage among women undergoing second-trimester induced abortions. This procedure involves blocking blood flow to the uterus, which helps minimize the risk of excessive bleeding during and after the abortion procedure. The results of this study strongly support the integration of PUAE into standard clinical practice, especially for patients deemed at high risk for hemorrhagic complications due to factors such as medical conditions or previous surgical history. Implementing PUAE could potentially reduce medical complications, shorten hospital stays, and improve overall patient outcomes in this vulnerable population.

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