

Efficacy and Safety of Endovascular Uterine Artery Embolization in Massive Uterine Hemorrhage: A Prospective Analysis in Critical Care Setting

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Abstract:

Background: Uterine hemorrhage remains a leading cause of maternal morbidity and mortality worldwide, accounting for 27% of maternal deaths according to WHO data. Massive postpartum hemorrhage and severe uterine bleeding from other etiologies represent critical conditions requiring urgent intervention in intensive care settings. Endovascular uterine artery embolization (UAE) has emerged as a life-saving minimally invasive alternative to emergency hysterectomy, offering organ preservation and fertility conservation.

Objective: To evaluate the efficacy, safety, and long-term outcomes of endovascular uterine artery embolization in patients with massive uterine hemorrhage of various etiologies managed in critical care settings.

Methods: A prospective single-center study was conducted from 2020 to 2025, including 52 patients (mean age 36.4 ± 7.2 years) with massive uterine hemorrhage. Distribution by etiology: postpartum hemorrhage (PPH) – 18 patients (34.6%), uterine fibroids with menometrorrhagia – 24 patients (46.2%), arteriovenous malformations (AVM) – 6 patients (11.5%), adenomyosis – 4 patients (7.7%). Inclusion criteria: massive uterine hemorrhage (>500 mL in PPH), failure of conservative therapy, stabilized or stabilizing hemodynamics. Transfemoral access was used in 92.3% of cases, transradial in 7.7%. Embolic agents: PVA particles 500–700 μm (65.4%), Embosphere microspheres 500–900 μm (34.6%). Primary endpoints included technical success, clinical success (bleeding cessation within 24 hours), blood loss volume, need for blood transfusion and hysterectomy, complications (CIRSE classification), and long-term outcomes at 6 and 12 months.

Results: Technical success was achieved in 100% of cases (52/52), with mean procedure time of 42 ± 12 minutes. Clinical success rates: PPH 94.4% (17/18), uterine fibroids 95.8% (23/24), AVM 100% (6/6), adenomyosis 75% (3/4). In the PPH group, mean blood loss before embolization was 1840 ± 520 mL; blood transfusion was required in 83.3% of cases (mean 3.2 ± 1.4 units of packed red blood cells). Emergency hysterectomy was avoided in 94.4% of PPH cases (performed in only 1/18 patients due to uncontrolled bleeding with coagulopathy). In the fibroid group, menstrual blood loss decreased from 220 ± 65 mL to 65 ± 25 mL at 3 months ($p < 0.001$), with dominant fibroid volume reduction of $48.6 \pm 12.4\%$ at 6 months. Post-embolization syndrome occurred in 78.8% and was managed conservatively. Major complications: endometritis 5.8%, non-target embolization 1.9%. No mortality was recorded. At 12-month follow-up, menstrual cycle restoration was observed in 95.8% of women of reproductive age, pregnancy occurred in 3 patients (11.1% of those planning conception), and patient satisfaction was 91.7%.

Conclusion: Endovascular uterine artery embolization is a highly effective and safe life-saving intervention for massive uterine hemorrhage in critical care settings, with 100% technical success and >94% clinical success. In postpartum hemorrhage, UAE prevents emergency hysterectomy in 94.4% of cases, preserving reproductive potential. The favorable safety profile with zero mortality and low major complication rate (7.7%) makes UAE a first-line organ-preserving treatment modality for massive uterine bleeding in intensive care units, significantly reducing maternal morbidity and mortality.

Keywords:

Uterine artery embolization, massive hemorrhage, postpartum hemorrhage, critical care, intensive care, organ preservation, maternal mortality prevention.