RESEARCH PAPER

# Massive Postpartum Hemorrhage Due To Inferior Epigastric Artery Injury After Cesarean Section Managed By Transcatheter Arterial Embolization- A Case Report

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## ABSTRACT

**Background:** Postpartum hemorrhage (PPH) is one of the leading causes of maternal morbidity and mortality worldwide. ¨Although uterine atony and genital tract trauma are the common causes, vascular injuries following cesarean section are rare and potentially life-threatening. Injury to the inferior epigastric artery after lower segment cesarean section (LSCS) is an uncommon complication that may result in concealed hemorrhage, rectus sheath hematoma, hemoperitoneum, and hemodynamic instability.

**Case Presentation:** We report a rare case of massive postpartum hemorrhage in a 33-year-old P1L1 who presented on postoperative day zero following emergency LSCS performed for severe preeclampsia with fetal distress. The patient developed progressive abdominal distension, severe anemia, hypotension, breathlessness, oliguria, and shock and DIC. Ultrasonography revealed hemoperitoneum and anterior abdominal wall hematoma. Contrast-enhanced CT angiography demonstrated a large rectus sheath hematoma with active contrast extravasation from the right inferior epigastric artery along with moderate hemoperitoneum and bilateral pleural effusion. The patient required intensive care management including blood product transfusions, vasopressor support, ventilator support, broad-spectrum antibiotics, and multidisciplinary critical care monitoring. Selective angiography confirmed active bleeding from the right inferior epigastric artery, and successful transcatheter arterial embolization was performed, resulting in rapid hemodynamic stabilization and cessation of bleeding. However patient developed significant loss of ascitic fluid through drain and also developed intense jaundice. The patient gradually improved clinically and was discharged in stable condition after 13 days of hospitalization.

**Conclusion:** Inferior epigastric artery injury following cesarean section is a rare but serious cause of postpartum hemorrhage. Early recognition, timely CT angiographic evaluation, and prompt transcatheter arterial embolization are crucial for successful management and prevention of maternal mortality¨. Multidisciplinary management plays a vital role in improving outcomes in such complex obstetric emergencies.

**Keywords:** Postpartum hemorrhage; Secondary postpartum hemorrhage; Cesarean section; Inferior epigastric artery injury; Rectus sheath hematoma; Hemoperitoneum; Transcatheter arterial embolization; CT angiography; Obstetric hemorrhage; Interventional radiology

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## INTRODUCTION

Postpartum hemorrhage (PPH) remains one of the leading causes of maternal morbidity and mortality worldwide, accounting for a significant proportion of preventable maternal deaths, particularly in developing countries. ¨It is commonly defined as blood loss exceeding 500 mL following vaginal delivery or more than 1000 mL following cesarean section (1,2). Despite advances in obstetric care, PPH continues to pose a major clinical challenge because of its sudden onset, rapid progression, and potentially fatal complications. The most common causes include uterine atony, retained placental tissue, genital tract trauma, coagulation abnormalities, and uterine rupture (3,4). However,

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vascular injuries following obstetric surgeries are rare but important causes of severe postpartum bleeding that require prompt recognition and intervention (3).

Lower segment cesarean section (LSCS), one of the most frequently performed obstetric surgeries worldwide, is generally considered safe. Nevertheless, it may occasionally be associated with unusual vascular complications including uterine artery pseudoaneurysm, broad ligament hematoma, rectus sheath hematoma, and injury to the inferior epigastric vessels (5,6). The inferior epigastric artery arises from the external iliac artery and ascends within the rectus sheath. Due to its anatomical proximity to the surgical field during abdominal incisions, it may rarely be injured during cesarean delivery. Such injuries may lead to concealed hemorrhage, rectus sheath hematoma, hemoperitoneum, hypovolemic shock, abdominal compartment syndrome, or respiratory compromise (7).

The clinical presentation of inferior epigastric artery injury is often nonspecific and may mimic other postoperative complications such as sepsis, paralytic ileus, intra-abdominal abscess, or postoperative collections, leading to delayed diagnosis. Patients may present with abdominal pain, distension, tachycardia, hypotension, severe anemia, oliguria, and respiratory distress (7,8). Early diagnosis is therefore crucial to prevent catastrophic maternal outcomes. Imaging modalities such as ultrasonography and computed tomography (CT) angiography play a vital role in identifying the source of bleeding and associated intra-abdominal complications (9).

Traditionally, exploratory laparotomy was considered the standard treatment for postoperative intra-abdominal hemorrhage". However, advances in interventional radiology have revolutionized the management of obstetric hemorrhage (10,11). Transcatheter arterial embolization has emerged as a safe, effective, and minimally invasive technique for controlling pelvic and abdominal vascular bleeding while avoiding repeat surgery and reducing morbidity (12).

Here, we report a rare and life-threatening case of secondary postpartum hemorrhage due to right inferior epigastric artery injury following emergency cesarean section, successfully managed with transcatheter arterial embolization and multidisciplinary critical care support.

## CASE PRESENTATION

**Patient Information:** A 33-year-old female, P1L1 was referred to the emergency department of KLE Dr. Prabhakar Kore Hospital and Medical Research Centre, Belagavi, in a critical condition on postoperative day zero following emergency lower segment cesarean section (LSCS) performed at a private hospital. "The cesarean section had been carried out at 36 weeks of gestation for severe preeclampsia with fetal distress, and a live male baby weighing 2.3 kg was delivered. The patient had no significant past medical or surgical history. Her obstetric history revealed Preterm LSCS. Menstrual history was unremarkable except for moderate menstrual flow with dysmenorrhea.

**Presenting Complaints:** Following surgery, the patient progressively developed abdominal distension, diffuse abdominal pain, breathlessness, generalized weakness, and reduced urine output over a period of 3-4 hrs. She also developed pallor, jaundice and dizziness. Due to worsening respiratory distress and hemodynamic instability, she was referred to our tertiary care center for further management.

**Clinical Examination on Admission:** At the time of presentation, the patient appeared severely drowsy, pale, icteric, tachypneic and hypotensive. She was conscious and well oriented but in significant distress. General physical examination revealed severe pallor and jaundice and bilateral pitting grade 2 pedal edema. Her pulse rate was 130/min, Respiratory rate- 30 cycles/min and Blood pressure was 80/50mmhg, requiring vasopressor support with noradrenaline infusion. Saturation was 93% on room air, necessitating oxygen supplementation.

Respiratory examination demonstrated reduced bilateral air entry, predominantly over the right lower lung fields. Per abdominal examination revealed marked abdominal distension with diffuse tenderness. Guarding and rigidity was present over the lower abdomen, and bowel sounds were sluggish. The postoperative wound appeared healthy externally without active bleeding/ discharge. Per vaginal examination showed no active bleeding. Urine output was significantly reduced, and the urine appeared cola colored initially.

**Initial Laboratory Investigations:** Initial hematological investigations revealed severe anemia with hemoglobin value 6.7 g/dL and with total leukocyte counts rising up to 15.2 $\times 10^3/\mu L$, suggestive of systemic inflammatory response. Platelet counts were initially low- 95 $\times 10^3/\mu L$

Biochemical investigations showed deranged renal parameters with elevated serum urea- 40.4mg/dl and serum creatinine levels- 1.5mg/dl, indicating acute kidney injury. Liver function tests revealed elevated Total bilirubin 2.5 mg/dl with Direct bilirubin of 2.2 mg/dl and increased transaminase levels- SGOT/ SGPT- 91/ 93. Serum albumin was reduced- 1.2gm/dl. Arterial blood gas analysis demonstrated metabolic acidosis with electrolyte imbalance. INR- 10.0 and D-dimer levels- 1419ng/ml and fibrinogen- 79 mg/dl were markedly elevated suggestive of DIC. Procalcitonin- 0.5ng/dl and C-reactive protein- 7.2mg/L were also raised, suggesting associated inflammatory or septic processes.

**Radiological Findings:** Ultrasonography of the abdomen and pelvis demonstrated internal echoes suggestive of hemoperitoneum and also revealed fluid collection in the anterior abdominal wall at the operative site measuring approximately 3.1 × 13 × 9 cm, suggestive of hematoma formation. Moderate ascites and bilateral pleural effusions persisted on serial imaging studies.

Computed tomography (CT) angiography of the abdomen and pelvis showed a large rectus sheath hematoma measuring approximately 35 × 40 × 62 mm within the anterior abdominal wall with active contrast extravasation from the right inferior epigastric artery. Moderate hemoperitoneum with blood clots within the pelvic cavity and bilateral pleural effusion with subsegmental atelectatic changes were also noted. These

findings confirmed ongoing vascular bleeding as the cause of the patient's hemodynamic deterioration.

**Intensive Care Management:** The patient was immediately shifted to the intensive care unit for aggressive resuscitation and close monitoring. She received oxygen supplementation initially through face mask and subsequently with noninvasive ventilatory support due to persistent tachypnea and hypoxia. Intravenous crystalloids, broad-spectrum antibiotics, , albumin infusions, multiple electrolyte corrections and diuretics were administered. Vasopressor support with noradrenaline infusion was initiated to maintain adequate blood pressure.

Multiple blood and blood product transfusions including 4 pint packed red blood cells, 10 pint fresh frozen plasma, and 4 pint platelet concentrates- RDP and 10 pint cryo were administered in view of ongoing blood loss and coagulopathy. Foley catheterization and drain was maintained for strict urine output and drain output monitoring. Serial laboratory investigations and arterial blood gas analyses were performed to monitor treatment response.

**Interventional Radiology Procedure:** In view of active arterial bleeding demonstrated on CT angiography, urgent interventional radiology consultation was obtained. Selective angiography confirmed active bleeding from the right inferior epigastric artery. The patient subsequently underwent successful transcatheter arterial embolization of the bleeding vessel.

Following embolization, the patient showed gradual hemodynamic stabilization with improvement in blood pressure, reduction in abdominal pain and distension, improvement in urine output, and decreasing oxygen requirement. No further active bleeding episodes were noted after the procedure.

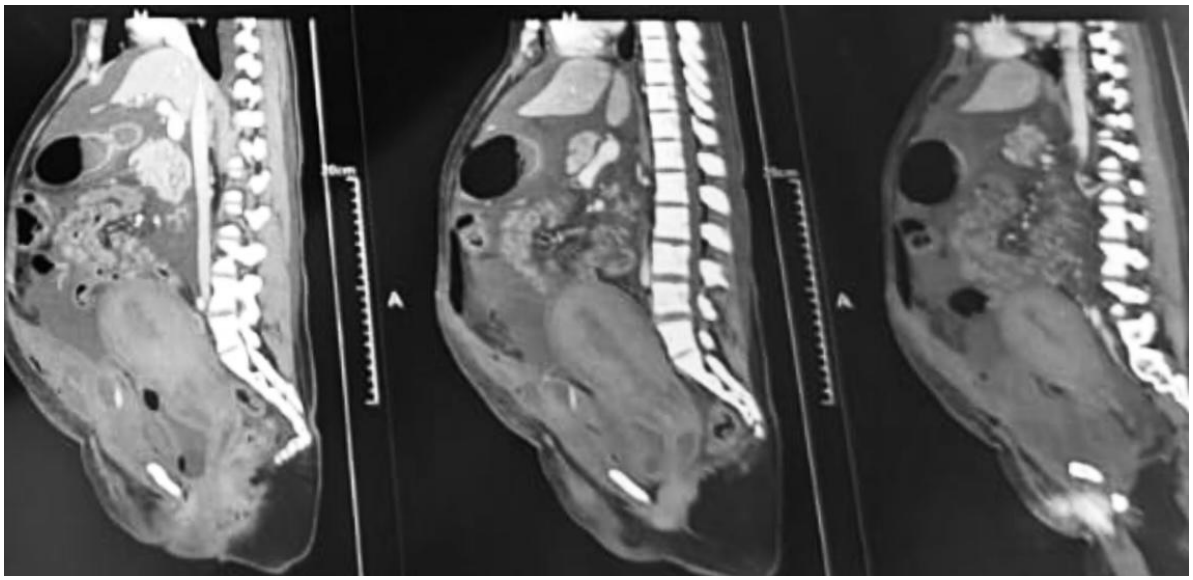

**Figure 1. Contrast-enhanced CT angiography sagittal images showing a large rectus sheath hematoma with active contrast extravasation from the right inferior epigastric artery associated with hemoperitoneum following cesarean section.**

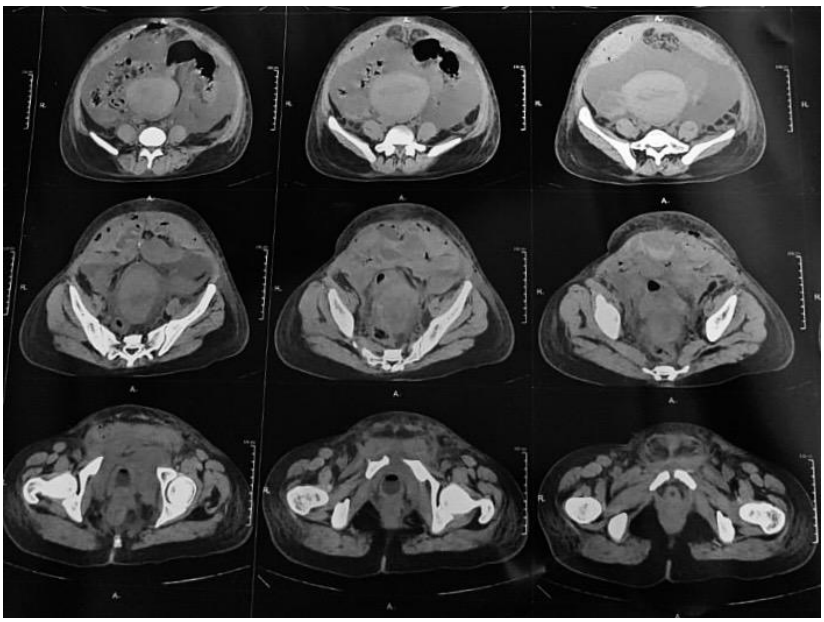

**Figure 2. Axial contrast-enhanced CT images of the abdomen and pelvis demonstrating large rectus sheath hematoma, moderate hemoperitoneum with pelvic blood collections, and postoperative intra-abdominal fluid accumulation secondary to inferior epigastric artery injury following cesarean section.**

**Multidisciplinary Management:** The patient was managed with a multidisciplinary approach involving obstetrics and gynecology, general surgery, interventional radiology, nephrology, respiratory medicine, gastroenterology, cardiology, and critical care teams. Nephrology consultation was obtained for contrast-induced nephropathy risk and acute kidney injury management. Respiratory medicine specialists managed pleural effusion and respiratory distress conservatively with oxygen therapy and diuretics. Gastroenterology consultation was sought for ascites- approximately 500-1000 ml drain output for initial days and increased jaundice with Total bilirubin of 9.8 mg/dl with Direct bilirubin of 8.9 mg/dl management and hypoalbuminemia.

Conservative management was continued for Ascites and pleural effusion with regular imaging follow-up.

**Clinical Outcome and Follow-Up:** Over the subsequent days, the patient demonstrated clinically significant Jaundice improved. Hemoglobin levels stabilized after transfusions, inflammatory markers gradually reduced, renal function improved, and respiratory distress subsided. Repeat imaging showed reduction in abdominal collections and pleural effusion. The abdominal drain output decreased progressively and was subsequently removed.

After 13 days of hospitalization, the patient was discharged in hemodynamically stable condition with advice regarding high-protein diet, adequate oral hydration, wound care, drain site care, regular follow-up, and continuation of prescribed medications including antibiotics, ursodeoxycholic acid, Hepatoprotective drugs, diuretics, and nutritional supplements". She was advised immediate review in case of fever, abdominal pain, foul-smelling vaginal discharge, vaginal bleed, dizziness, or respiratory symptoms.

## DISCUSSION

Postpartum hemorrhage (PPH) remains a major obstetric emergency and is still one of the leading causes of maternal morbidity and mortality worldwide. Fenn et al. (2024) reported that postpartum hemorrhage continues to contribute significantly to maternal complications following both vaginal and cesarean deliveries, especially in tertiary care settings (1). "Similarly, Demissie et al. (2025), in their umbrella review, highlighted the persistent global burden and disparities associated with PPH, particularly in low- and middle-income countries where delayed diagnosis and inadequate emergency management contribute to adverse maternal outcomes (2). The present case demonstrates a rare but potentially fatal cause of secondary postpartum hemorrhage resulting from inferior epigastric artery injury following emergency cesarean section.

The majority of postpartum hemorrhage cases are attributed to uterine atony, retained placental tissue, genital tract trauma, or coagulation abnormalities. Wormer et al. (2024) and Cox et al. (2025) emphasized that vascular injuries following cesarean section are uncommon and may easily be overlooked during the postoperative period (3,4). In the present case, the patient developed progressive abdominal distension, respiratory distress, hypotension, oliguria, and severe anemia on postoperative day three, ultimately found to be secondary to active bleeding from the right inferior epigastric artery. This unusual presentation highlights the importance of considering concealed vascular injury in patients with unexplained postoperative deterioration following lower segment cesarean section.

Postoperative complications after cesarean delivery are increasingly recognized with the rising global cesarean rates. Patel et al. (2025) observed that postoperative hematoma formation and intra-abdominal bleeding are important complications requiring early recognition and intervention (5). Similarly, Cancelo Hidalgo et al. (2025) discussed that surgical trauma during cesarean section may occasionally lead to vascular injuries involving abdominal wall vessels (6). The inferior epigastric artery is anatomically vulnerable during abdominal wall incision and closure because of its close relation to the rectus sheath. Joy et al. (2017) described the clinical anatomy of the inferior epigastric artery and emphasized its susceptibility to injury during invasive abdominal procedures, potentially resulting in rectus sheath hematoma and hemoperitoneum as observed in the present patient (7).

The clinical presentation in this case was initially nonspecific and mimicked other postoperative complications such as sepsis or intra-abdominal collection. Shemes et al. (2025) noted that persistent postoperative abdominal collections may lead to delayed diagnosis when vascular causes are not suspected early (8). Imaging therefore plays a crucial role in diagnosis. In the present case, ultrasonography initially revealed hemoperitoneum and abdominal wall hematoma, while CT angiography accurately identified active contrast extravasation from the right inferior epigastric artery. Mitsuyama et al. (2022) demonstrated the high diagnostic accuracy of contrast-enhanced CT in identifying postpartum hemorrhage and active vascular bleeding, supporting its use in hemodynamically unstable patients (9).

Traditionally, exploratory laparotomy was considered the standard treatment for severe postoperative hemorrhage. Chen et al. (2019) reported that emergency laparotomy is often required in intractable postpartum hemorrhage but may be associated with significant morbidity, repeat surgery, and prolonged recovery (11). However, advances in interventional radiology have transformed the management of obstetric hemorrhage. Gonsalves and Belli (2010) highlighted the growing role

of transcatheter arterial embolization as a minimally invasive and highly effective treatment modality for obstetric vascular bleeding (10). Similarly, Boonsinsukh and Maroongroge (2020) demonstrated the effectiveness of arterial embolization in achieving rapid hemostasis in patients with severe abdominopelvic hemorrhage (12).

In the present case, prompt transcatheter arterial embolization successfully controlled the bleeding and avoided repeat laparotomy". Multidisciplinary intensive care management further contributed to favorable maternal recovery. This case underscores the importance of early suspicion, timely imaging, multidisciplinary collaboration, and interventional radiology in managing rare vascular causes of secondary postpartum hemorrhage following cesarean section.

## CONCLUSION

Secondary postpartum hemorrhage due to inferior epigastric artery injury following cesarean section is an extremely rare but life-threatening complication that may present with nonspecific clinical features and rapid hemodynamic deterioration. "Delayed diagnosis can lead to severe maternal morbidity including massive hemoperitoneum, respiratory distress, acute kidney injury, and shock. This case highlights the importance of maintaining a high index of suspicion for concealed vascular injury in postoperative cesarean patients presenting with abdominal distension, anemia, and hemodynamic instability. Prompt imaging with CT angiography played a crucial role in accurately identifying the bleeding source and guiding definitive management. Transcatheter arterial embolization proved to be a safe, minimally invasive, and highly effective therapeutic modality that successfully controlled hemorrhage while avoiding repeat laparotomy". Early multidisciplinary intervention involving obstetrics, interventional radiology, critical care, nephrology, and respiratory medicine was essential for successful maternal recovery and favorable clinical outcome in this rare presentation.

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