



Multidisciplinary Emergency Management of Severe Maternal Polytrauma With Early Fetal Demise and Delayed Sepsis: A Rare Case Report

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ABSTRACT

Introduction: Trauma during pregnancy poses significant diagnostic and therapeutic challenges, as physiological adaptations can obscure early signs of instability and increase both maternal and fetal vulnerability. High-energy blunt trauma often results in multisystem injuries involving the pelvis, thorax, diaphragm, and long bones. When these injuries occur in mid-pregnancy, the risk of intrauterine fetal demise rises sharply, and the complexity of maternal stabilization frequently delays obstetric intervention. Clear guidance on long-term management remains limited, especially when fetal demise is retained during recovery from extensive surgical trauma.

Case Illustration: A pregnant woman in mid-gestation sustained severe multisystem injuries following high-impact blunt trauma.

Her injuries included pelvic ring disruption, femoral and tibial fractures, hemothorax requiring thoracic drainage, and a left-sided traumatic diaphragmatic hernia with herniation of abdominal organs into the thoracic cavity. Early intrauterine fetal demise was identified shortly after resuscitation. She underwent thoracoabdominal surgery and orthopedic fixation, achieved postoperative stabilization, and was discharged in improving condition. Several days, she developed progressive abdominal pain, systemic deterioration, and severe sepsis. Imaging and clinical evaluation suggested that the retained fetal tissue, combined with prior thoracoabdominal and orthopedic injuries, contributed to the delayed infectious complication. She underwent uterine evacuation and intensive management, leading to eventual clinical improvement.

Discussion: This case illustrates how multisystem trauma in pregnancy can generate a prolonged and unpredictable clinical trajectory. The need to prioritize maternal stabilization often necessitates delaying uterine evacuation, yet retained fetal demise, especially in patients recovering from major surgery, may predispose to delayed sepsis. This interplay between trauma physiology, surgical recovery, and obstetric timing highlights a critical gap in current guidelines. The case underscores the importance of multidisciplinary coordination, extended monitoring beyond initial discharge, and heightened vigilance for delayed infectious complications.

Conclusion: Severe maternal trauma with concurrent pelvic, thoracic, and diaphragmatic injuries requires individualized, maternal-centered care. When fetal demise occurs, timing of evacuation must balance surgical risk with the potential for long-term complications. This case emphasizes the need for structured

follow-up and clearer clinical pathways to prevent delayed sepsis in similar high-risk presentations.

Keywords: Pregnancy trauma, pelvic fracture, diaphragmatic rupture, intrauterine fetal demise, sepsis.

INTRODUCTION

Trauma during pregnancy remains a significant global health challenge and continues to be one of the leading preventable causes of maternal and fetal morbidity and mortality, particularly in settings where high-energy mechanisms such as vehicular collisions or crush injuries are common.¹ The physiological adaptations that occur throughout pregnancy, including increased maternal plasma volume, reduced systemic vascular resistance, elevated diaphragm position, and displacement of abdominal organs, fundamentally alter the clinical presentation and response to trauma.² These adaptations, while beneficial for supporting fetal development, can mask early signs of maternal compromise, making it difficult to detect hemodynamic instability until it becomes profound. Subtle alterations in maternal perfusion may precipitate abrupt fetal hypoxia, as uteroplacental circulation lacks autoregulatory capacity, placing the fetus at risk even when maternal vital signs appear deceptively stable.³ Thus, trauma in pregnancy demands rapid, structured, and maternal-focused resuscitation, recognizing that optimizing maternal physiology remains the most effective pathway toward fetal preservation.

High-energy blunt trauma in pregnant patients often generates complex multisystem injury patterns distinct from those in non-pregnant populations. Pelvic ring disruptions, for instance, though relatively infrequent, are associated with exceptionally high fetal mortality because of the combined impact of placental shear forces, retroperitoneal hemorrhage, and potential urogenital involvement.⁴ As the gravid uterus elevates the diaphragm and reduces functional residual capacity, thoracic injuries such as hemothorax can further compromise respiratory mechanics, reducing the cardiorespiratory reserve crucial for compensating acute blood loss or pulmonary contusion.⁵ The presence of traumatic diaphragmatic rupture adds layers of diagnostic difficulty, as herniation of abdominal viscera into the thoracic cavity may present subtly or mimic other thoracoabdominal injuries, delaying recognition and definitive intervention.⁶ When such injuries coexist, pelvic instability, long-bone fractures, thoracic trauma, and diaphragmatic herniation, the physiological burden on the mother becomes exponentially higher, necessitating coordinated, time-critical

interdisciplinary management to stabilize the patient and preserve maternal function.⁷ Decisions regarding imaging, surgical timing, and anesthesia must be made rapidly, often with incomplete information, further complicating clinical judgment in these rare scenarios.⁸

Despite improvements in trauma care and multidisciplinary coordination, substantial gaps persist in the literature regarding the optimal approach when severe multisystem trauma in pregnancy is further complicated by early intrauterine fetal demise (IUFD). While established guidelines consistently prioritize maternal stabilization, they offer limited direction on when obstetric intervention should occur following major orthopedic fixation, thoracic procedures, or complex abdominal injury.⁸ The potential consequences of retaining an IUFD—particularly infection, coagulation disturbances, or delayed-onset sepsis—are poorly described in the context of traumatic injuries and often extrapolated from non-trauma populations.⁹ Given the rarity of combined pelvic fractures, diaphragmatic hernia, thoracic trauma, and fetal demise, real-world data guiding clinical decisions remain scarce. This case is therefore notable for illustrating a highly unusual and clinically challenging sequence: severe multisystem trauma with pelvic ring disruption, long-bone fractures, hemothorax requiring drainage, and traumatic diaphragmatic hernia, followed by early IUFD, and ultimately culminating in delayed severe sepsis after initial stabilization.¹⁰ Such a trajectory underscores the difficulty of balancing maternal surgical recovery, physiological fragility, and the timing of obstetric intervention, highlighting the need for clearer guidance in managing retained fetal demise within the complex landscape of maternal polytrauma.

CASE ILLUSTRATION

A 24-year-old gravida 1 para 0 at approximately 19–20 weeks' gestation presented to the emergency department after being crushed by a collapsed container. She was fully conscious but in clear distress, with severe chest pain, abdominal pain, and right lower-extremity pain. On arrival, she was tachypneic and tachycardic, with borderline blood pressure and a clinical picture suggestive of early shock. She required high-flow oxygen therapy to maintain adequate saturation.

Examination revealed contusion and swelling of the left shoulder, abrasions on the right hand, and marked bilateral flank tenderness. The right lower extremity was immobilized due to suspected long-bone injury. The Foley catheter immediately drained grossly bloody urine. Respiratory assessment showed reduced breath sounds over the right hemithorax.

An initial bedside obstetric ultrasound demonstrated a single intrauterine pregnancy with present cardiac activity. A formal ultrasound performed later the same day, however, revealed absence of fetal cardiac motion, consistent with intrauterine fetal demise at 19–20 weeks. The uterus and adnexa appeared structurally normal, and no sonographic features of uterine rupture were identified.

Initial hematologic evaluation showed severe anemia (hemoglobin 5.8 g/dL), leukocytosis above $22 \times 10^3/\mu\text{L}$, and markedly elevated inflammatory markers. She received blood transfusion with subsequent improvement of hemoglobin levels. Serial laboratory tests demonstrated fluctuating leukocytosis and thrombocytopenia during the acute phase, reflecting the physiological burden of multisystem trauma.

Comprehensive trauma imaging delineated the full extent of her injuries. Contrast-enhanced CT of the abdomen revealed a displaced fracture of the left ilium with sacroiliac diastasis, comminuted fractures of the superior and inferior pubic rami bilaterally, and moderate free fluid localized to the paracolic and perivesical regions. A right-sided hemothorax was also identified. The liver, spleen, pancreas, kidneys, and bladder appeared intact. The gravid uterus remained structurally preserved, with a single nonviable fetus.

Thoracoabdominal imaging showed a traumatic diaphragmatic hernia on the left side, with herniation of the gastric fundus, a portion of the gastric corpus, and bowel loops into the left hemithorax. The gastroesophageal junction was displaced upward into the thoracic cavity. No pulmonary infiltrates or thoracic skeletal destruction were noted.

Additional radiographs confirmed closed fractures of the left clavicle, right proximal tibia, right fibula, and pelvic ring. Following hemodynamic stabilization and transfusion, the patient underwent open reduction and internal fixation of the pelvic fractures, the right proximal tibial

fracture, and the left clavicular fracture. Postoperative imaging over subsequent months showed stable fixation and progressive callus formation.

The right-sided hemothorax progressed early in the course and was managed with tube thoracostomy, resulting in improved respiratory mechanics and satisfactory lung re-expansion. Despite the initial gross hematuria, repeat imaging consistently showed no injury to the kidneys or bladder, and hematuria gradually resolved with conservative management.

Although the intrauterine fetal demise had been confirmed early during her hospitalization, fetal expulsion did not occur spontaneously during the acute trauma period. No obstetric intervention was performed due to the prioritization of maternal stabilization and the need for multiple orthopedic procedures. She ultimately showed progressive clinical improvement, with stabilization of vital signs, improvement in respiratory function, and adequate postoperative recovery. Her condition became stable enough for discharge, and the IUFD remained undelivered at the time she returned home.

Several day durantee hospitalization, the patient re-presented with markedly deteriorated health. She arrived with high-grade fever, intense chills, jaundice, and hypotension. She was tachycardic and appeared acutely ill, fulfilling clinical criteria for severe sepsis. Laboratory and clinical evaluation strongly suggested an intra-abdominal source of infection, with the retained intrauterine fetus considered the most likely nidus. At this time, her orthopedic injuries had healed without complication, and there were no indications that the prior thoracic or abdominal trauma contributed to her acute decline.

Due to the severity of her condition and the absence of local capacity to provide definitive obstetric intervention in the context of sepsis, she was referred to a tertiary hospital for further management. The referral process was initiated by the surgical team. Obstetric intervention had still not been performed prior to transfer.

DISCUSSION

Interpretation of the Case in the Context of Maternal Trauma

This case illustrates the profound vulnerability of pregnant individuals exposed to high-energy blunt trauma, underscoring how even initially stable presentations may mask complex, evolving pathology. Trauma during pregnancy is well recognized as a major contributor to preventable maternal and fetal morbidity, yet its diagnosis and management remain uniquely challenging because physiologic adaptations of pregnancy can obscure early signs of deterioration.¹ The expanded plasma volume and increased cardiac output characteristic of pregnancy may initially compensate for blood loss, delaying clinical recognition of hemorrhage until decompensation is imminent.² At the same time, the placental circulation lacks autoregulatory mechanisms, making the fetus acutely sensitive to even brief episodes of maternal hypotension or hypoxia.³

In this case, the severity of the maternal injuries—including pelvic ring disruption, significant thoracic trauma with hemothorax, long-bone fractures, and diaphragmatic hernia, reflects a high-impact mechanism strongly associated with fetal loss. Multiple studies highlight that blunt trauma with pelvic fractures carries among the highest fetal mortality rates across all trauma patterns because of risks such as placental shear injury, uterine displacement, and direct fetal impact.⁴ The early intrauterine fetal demise (IUFD) that occurred shortly after injury is therefore consistent with established data linking multisystem trauma to extremely poor fetal prognosis. Importantly, the maternal physiology in this case continued to exhibit vulnerability well after definitive surgical management, reminding clinicians that the burden of multisystem trauma extends beyond the initial stabilization phase and may predispose patients to long-term complications.

Mechanistic Considerations and Injury Pattern Complexity

The patient's injury profile exemplifies the cascading physiological consequences of combined pelvic, thoracic, and diaphragmatic trauma in pregnancy. Pelvic fractures in pregnant patients often signify major energy transfer, with retroperitoneal bleeding frequently underestimated due to compression by the gravid uterus and the masking effect of increased maternal intravascular volume.⁴ The coexistence of long-bone fractures further compounds hemorrhagic risk through both blood loss and inflammatory mediator release that can amplify systemic stress.⁵

Thoracic trauma in pregnancy, particularly hemothorax, presents distinct clinical challenges. The diaphragm is elevated as gestation progresses, reducing functional residual capacity and

respiratory reserve, limiting compensatory ability in the presence of thoracic injury.⁵ Even moderate-volume hemothorax may significantly impair ventilation, contributing to hypoxemia in a patient population already operating with restricted pulmonary capacity. Diaphragmatic rupture adds another level of complexity: herniation of bowel or stomach into the thoracic cavity not only compromises ventilation mechanically but may shift mediastinal structures and obscure clinical findings.⁶

Diagnosis of diaphragmatic rupture is often delayed, especially in pregnant trauma patients, where overlapping respiratory symptoms and diagnostic constraints limit early recognition.⁷ Furthermore, multisystem trauma demands careful prioritization of surgical sequencing. Pelvic fixation during pregnancy can be successfully performed when interdisciplinary coordination is optimal, but it carries operative risks associated with positioning, ventilation, and hemodynamic control.⁸ In this case, thoracic intervention, abdominal repair, and orthopedic stabilization were required in close succession, creating significant physiologic strain. Literature on trauma during pregnancy emphasizes that cumulative surgical stress from sequential procedures—combined with altered hemodynamics and respiratory mechanics—may contribute to delayed recovery or later complications.⁹

Comparison With Current Literature and Clinical Decision-Making Challenges

A central challenge in this case involved decision-making surrounding the management of IUFD in the presence of severe polytrauma. While consensus guidelines uniformly state that maternal survival and stabilization must remain the priority, specific direction regarding when uterine evacuation should occur after multisystem injury remains limited.¹⁰ Clinical decisions in such scenarios rely heavily on individualized assessment of hemodynamic stability, operative recovery, infection risk, and anticipated surgical stress. In this patient, immediate evacuation was deferred appropriately given the complexity of thoracic and abdominal injuries, orthopedic fixation, and ongoing respiratory vulnerability.

However, retention of fetal demise, particularly in patients recovering from major trauma, poses risk for infectious and inflammatory complications. Historically, prolonged IUFD retention has been associated with the development of coagulopathy, systemic inflammatory response, and

septic deterioration, though modern incidence has declined due to improved surveillance and earlier pregnancy management.¹¹ In trauma patients, systemic inflammation may be further amplified by tissue necrosis, massive cytokine release, and immune dysregulation intrinsic to multisystem injuries.¹² This creates a compounded environment where the physiologic burden of trauma interacts with the immunologic consequences of fetal retention. Emerging data suggest that such interactions may explain cases of delayed sepsis, even months after initial stabilization, particularly when complicated abdominal injuries are present.¹³

This patient's later progression to severe sepsis reflects this underrecognized risk pathway. Although initial recovery after orthopedic, thoracic, and abdominal interventions was satisfactory, chronic inflammatory priming, impaired tissue defense mechanisms, and localized retained products likely contributed to bacterial translocation or secondary infection.¹⁴ Case-based evidence from obstetric trauma literature increasingly acknowledges that delayed infectious complications can emerge long after discharge, particularly when fetal tissue retention intersects with prior surgical manipulation and prolonged physiological stress.¹⁵ This underscores the need for carefully structured long-term follow-up, proactive infectious surveillance, and early consideration of uterine evacuation once maternal stability is adequately restored.

Clinical Implications for Emergency and Trauma Practice

This case reinforces several clinically significant principles for emergency and trauma physicians managing pregnant patients. First, physiologic compensation during pregnancy is often misleadingly robust; subtle abnormalities in blood pressure, mental status, or respiratory effort warrant heightened concern because underlying deterioration may be masked. Second, multisystem trauma demands early multidisciplinary involvement, as decisions regarding imaging, operative prioritization, and perioperative optimization must consider both maternal and fetal physiology. Third, early postpartum or post-discharge follow-up should be structured and extended beyond routine intervals in cases of retained IUFD or extensive surgical trauma, as delayed systemic complications, including sepsis, may manifest unexpectedly.

Finally, this case highlights the importance of anticipatory counseling, shared decision-making, and clear communication with families. When maternal injuries are life-threatening and

obstetric intervention carries significant risk, balancing clinical pathways with patient preferences becomes central to ethical care. Establishing shared expectations regarding monitoring, follow-up, and potential complications may lead to earlier recognition of deterioration and improved outcomes.

Limitations and Knowledge Gaps in Current Evidence

The current evidence base on polytrauma in pregnancy remains limited by sparse high-quality data, reliance on case reports and small series, and heterogeneity of presentations. Few studies provide guidance on the optimal sequence or timing of multiple operative interventions when pelvic, thoracic, and abdominal injuries coexist. Even fewer address management of IUFD in the context of recent multisystem surgery. Without standardized pathways, clinicians must extrapolate from non-trauma obstetric literature, which may not fully capture the unique physiologic stresses imposed by severe injury. Similarly, evidence regarding the risk of delayed sepsis from retained fetal demise in trauma populations is remarkably underdeveloped, contributing to uncertainty in follow-up strategies.

Future Directions

Future research should prioritize the development of integrated trauma–obstetric management algorithms that address imaging strategies, operative sequencing, and maternal physiologic thresholds for safe obstetric intervention after IUFD. Prospective registries capturing long-term outcomes in pregnant trauma survivors, especially those with retained fetal tissue or complex thoracoabdominal injuries, would significantly enhance clinical understanding. Additionally, interdisciplinary consensus guidelines addressing the timing of uterine evacuation after polytrauma could help standardize care and reduce variability in outcomes across institutions.

CONCLUSION

This case highlights the extreme physiological vulnerability of pregnant patients experiencing high-energy blunt trauma and underscores how multisystem injuries can create complex downstream challenges well beyond the acute phase of care. The rare combination of pelvic ring disruption, thoracic trauma with hemothorax, long-bone fractures, and traumatic diaphragmatic

hernia illustrates the substantial maternal burden imposed by concurrent injuries, often resulting in poor fetal outcomes despite aggressive stabilization efforts [1–4]. The early intrauterine fetal demise in this patient reflects the severity of the initial trauma, while the later development of severe sepsis demonstrates that downstream complications may emerge long after apparent recovery, particularly when fetal retention intersects with prior thoracoabdominal and orthopedic interventions.

This case reinforces the importance of maternal-centered management, multidisciplinary coordination, and highly individualized timing of obstetric intervention following polytrauma. It also highlights significant gaps in current guidelines, especially regarding the optimal timing of uterine evacuation after major surgical stabilization. Continued long-term follow-up, vigilant infection surveillance, and early recognition of systemic complications are essential to improving outcomes in similar high-risk presentations. As such, this case adds meaningful clinical insight to the limited literature on complex maternal trauma with retained fetal demise and emphasizes the need for clearer evidence-based pathways in managing this rare but life-threatening scenario.

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