

CASE REPORT

External Fixator as a Viable Treatment Option for Combined Pelvic Ring and Sacrum Fracture in a Pregnant Patient: A Case Report

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Abstract

We report a case of a 32-year-old pregnant woman who suffered a combined type pelvic fracture and medial malleolus fracture due to a car accident at 24 weeks and 2 days of gestation. She underwent external fixation of the pelvic ring and percutaneous screw fixation of the ankle fracture. She recovered well and delivered a healthy baby by cesarean section at 37 weeks and 1-day gestation. External fixation can be a definitive treatment option for some pelvic fractures with anterior instability in pregnant patients, as it reduces the risk of fetal harm.

Level of evidence: IV

Keywords: Pelvic ring injury, Pelvic fracture, Pelvic fractures in pregnancy, Sacral fracture, Straddle fracture

Introduction

Fractures during pregnancy are relatively infrequent, occurring in approximately one out of every 1,498 pregnancies, with motor vehicle accidents (MVA) being the most common cause. Among the various anatomical regions, pelvic fractures are one of the rarest types of fractures, accounting for only 5-7% of all fractures. However, pelvic fractures carry the highest risk of adverse outcomes, such as placental abruption, blood transfusions, and maternal death. They are also the most common causes of fetal death among traumatic injuries.¹⁻⁴ The risk of fetal death is 48 times higher in patients with pelvic and acetabular fractures resulting from MVAs.⁵

Even if the fetus survives the initial traumatic event, there is a higher risk of low birth weight, premature delivery, and permanent neurocognitive dysfunction.¹ Therefore, the management of pelvic fractures in pregnant patients is of utmost importance. Hip fractures are of particular concern in pregnant patients as they can result in significant morbidity and mortality for both the mother and the fetus.

Prior studies have reported only one case of a pregnant patient with an open book injury (APC type 2) who was successfully treated with an external fixator.⁶ However, to our knowledge, a case of a pregnant patient with a

simultaneous traumatic fracture of the combined pelvic ring and sacrum managed with an external fixator as the definitive treatment has not been reported.

In this case report, we describe the management of a pregnant patient with a simultaneous traumatic fracture of the combined pelvic ring and sacrum. The patient was treated with an external fixator, which allowed for definitive management of the injury while minimizing the risk of harm to the fetus. This report aimed to demonstrate that external fixation can be a viable treatment option in certain cases.

Case Presentation

A 32-year-old pregnant woman with a gestational age (GA) of 24 weeks and 2 days was brought to our Trauma Center after a car accident. Before arriving at the hospital, the pelvic binder and the lower limb splint were applied. First, the trauma team for pregnant women, including emergency medicine, obstetrics and gynecology, a general surgeon, and an orthopedic surgeon, visited the patient. The patient had a Glasgow Coma Scale score of 15, was hemodynamically stable, and physical examination revealed a torn vaginal wall with vaginal bleeding and urine leakage. An urologist

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applied a cystostomy tube with the diagnosis of urethral rupture.

The fetal heart rate (FHR) and the transvaginal examination were normal, and an ultrasound examination revealed a live fetus in the cephalic position inside the uterine cavity with a gestational age of approximately 21 weeks and 4 days.

Radiographic examination showed a combined type of pelvic ring fracture (straddle fracture and sacrum fracture) and medial malleolus fracture. A spiral CT scan of the pelvis was performed to get more information about fracture components, which showed a straddle fracture and a sacrum intraforaminal fracture (Type two Denis classification). In addition, a fracture of the transverse process of the L5 vertebra was seen on the right side, which can be a sign of vertical shear type on the right side based on the Young and Burgess Classification [Figure 1].

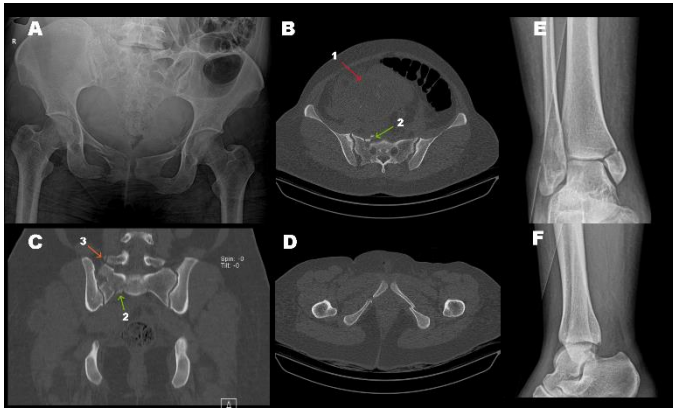


Figure 1. A) AP radiography showing pelvic straddle fracture, B, C, D) Pelvic CT scan showing: 1) Fetus, 2) Sacral Denis type 2, and 3) L5 transverse process fracture, E, F) Showing medial malleolus fracture

The patient was initially admitted to the intensive care unit and closely monitored. After three days, with stable vital signs for both the mother and fetus and under the supervision of the obstetrician and gynecologist, the patient was transferred to the operating room for further management.

Prior to the operation, the risks associated with general anesthesia, surgery, and the use of a C-arm for both the mother and fetus were thoroughly explained to the parents. However, the parents declined the use of a C-arm in the abdomen and pelvis. In agreement with the parents, consent was obtained to perform a portable radiograph of the ankle area while ensuring the protection of the abdomen and pelvis with a radiological shield above and below these areas. In the operating room, the patient, who had been given general anesthesia, was placed in the supine position on a radiolucent table. Following sterile preparation and draping, two small (1.5 cm) incisions were made on the wing of the ileum in the iliac crest area, inner and outer table pins were placed, and 5 mm Schanz pins were inserted parallel to them at the same distance between the two pins. After attaching the clamps to the rods, reduction was achieved, and the

clamps were tightened. Finally, two 3.5 mm cancellous screws were inserted percutaneously, and a portable ankle radiograph was taken [Figure 2].

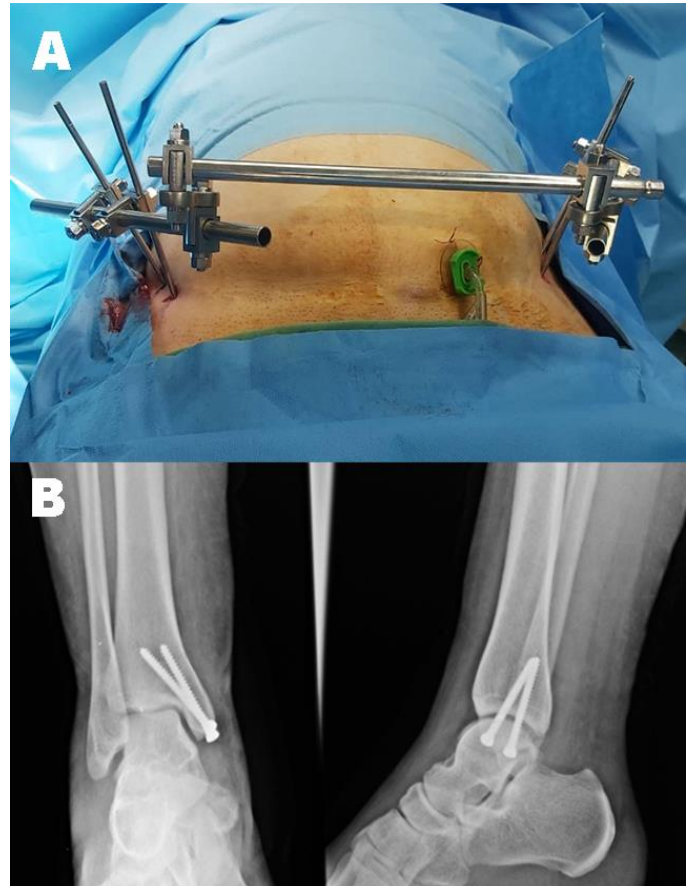


Figure 2. A) Anterior external fixator applied, B) Medial malleolus fracture that open reduction internal fixation with two screws

After the surgery, the patient was able to sit in a wheelchair on the third day and was allowed to walk with the help of a walker with partial weight bearing on the right lower limb after 12 days. Six weeks after the surgery, the patient achieved full weight-bearing status with the assistance of a walker.

At three and a half months following pelvic surgery, the patient underwent a cesarean section at 37 weeks and 1-day gestational age and 35 weeks and four days by ultrasound age (Apgar score 9/10), considering the history of three previous cesarean sections and the pelvic fracture. Both the mother and the baby were discharged from the hospital in stable condition.

After a 29-month follow-up, the patient reported no complaints, and there was a complete range of motion in the hip and ankle. The patient could walk without any limping or pain (HARRIS Hip Score = 100), and the child had normal development [Figure 3].



Figure 3. The Photograph showing the patient's range of motion at a 29-month follow-up and indicates that the patient has achieved full range of motion

Discussion

We present a case report of a combined type pelvic fracture in a pregnant patient that was managed with an external fixator as definitive treatment.

Pelvic fractures due to trauma during pregnancy are uncommon but can result in morbidity and mortality for both the mother and the fetus due to high-energy trauma.^{1,7-9} Retro- and intraperitoneal hemorrhage can compromise the fetus and even cause maternal death, while hemodynamic instability and hypovolemic shock can decrease placental blood flow by up to 20%, contributing to higher rates of fetal demise.^{3,8,10-12} In some studies, the mortality rate for the mother is 9%, and for the fetus, it is 35%.¹³

Therefore, in every pregnant patient with high-energy blunt trauma, traumatic pathologies related to the pelvis should be considered, and at least an anteroposterior pelvic x-ray should be taken.⁵

As a result, it is critical to emphasize that when dealing with a pregnant patient with pelvic trauma, the first action should be to follow the Advanced Trauma Life Support (ATLS) guidelines, which include the ABCDEF approach (F stands for fetus). This requires a multidisciplinary team of obstetricians, general trauma surgeons, orthopedic traumatologists, anesthesiologists, and maternal-fetal care professionals.^{3,10,14,15}

After primary resuscitation, if the patient is unstable, it is necessary to apply the pelvic binder. However, using a pelvic binder can increase the compression of the gravid uterus on the inferior vena cava (IVC), leading to further decreased venous return to the heart and cardiac output, particularly in open-book pelvic fractures. Therefore, this should be done with caution, and frequent reassessment of the patient's hemodynamic status is recommended.^{3, 10, 16}

In pregnant women who are hemodynamically unstable, focused assessment sonography for trauma (FAST) should be performed as a part of the initial assessment to identify possible sources of bleeding.¹⁷ Despite the high sensitivity and specificity of CT, focused abdominal sonography for trauma (FAST) is considered the preferred diagnostic tool due to its safety and non-invasive nature.¹⁸ If the source of bleeding is not found in FAST, it is necessary for the patient to undergo CT. This imaging technique should not be avoided if needed for managing the mother's injuries.¹⁷

When major bleeding in FAST or a patient unresponsive to resuscitation is present or major bleeding is not seen on CT, the patient should be taken to the operating room for laparotomy/pelvic packing/external fixator. In stable patients surgical indications for pelvic fractures are the same in pregnant women as in the general population.^{16, 19}

The existence of vaginal blood must be evaluated for the presence of an open fracture, placenta previa, placental abruption, or labor.³ According to several researchers, disruption of the anterior ring and an unstable pelvic ring increased the risk of vaginal damage, as happened in our patient.²⁰ While vaginal laceration following pelvic trauma is relatively rare (with an incidence of 2-4%), it is still crucial to consider vaginal bleeding and its underlying cause.^{4,19,21,22}

We believe that an external fixator can be considered the final treatment for pelvic fractures with anterior instability, considering the amount of instability and displacement in pregnant women.

Conclusion

We reported a rare case of a pregnant patient with a simultaneous traumatic fracture of the combined pelvic ring and sacrum, which was successfully treated with an external fixator as the definitive treatment. This case highlights the importance of a multidisciplinary approach and the application of ATLS guidelines in managing pelvic

fractures in pregnant patients. External fixation can be a safe and effective option for certain cases of pelvic fractures with anterior instability, as it allows for early mobilization and minimal risk of harm to the fetus.

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Ethical Statement

Informed consent was obtained.

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References

1. El Kady D, Gilbert WM, Xing G, Smith LH. Association of maternal fractures with adverse perinatal outcomes. *Am J Obstet Gynecol.* 2006;195(3):711-6. DOI: 10.1016/j.ajog.2006.06.067
2. Vivian-Taylor J, Roberts CL, Chen JS, Ford JB. Motor vehicle accidents during pregnancy: a population-based study. *Bjog.* 2012;119(4):499-503. doi:10.1111/j.1471-0528.2011.03226.x
3. Marmor M, El Naga AN, Barker J, et al. Management of Pelvic Ring Injury Patients With Hemodynamic Instability. Review. *Frontiers in Surgery.* 2020;12(7):588845. doi:10.3389/fsurg.2020.588845
4. Yoo BJ. Pelvic Trauma and the Pregnant Patient: a Review of Physiology, Treatment Risks, and Options. *Current Trauma Reports.* 2018;4(3):225-232. doi:10.1007/s40719-018-0136-0
5. Aboutanos MB, Aboutanos SZ, Dompkowski D, et al. Significance of motor vehicle crashes and pelvic injury on fetal mortality: a five-year institutional review. *J Trauma.* 2008;65(3):616-20. doi:10.1097/TA.0b013e3181825603
6. Zhang P, Zhou DS, Hu JM, et al. Management of hemodynamically unstable pelvic fracture in pregnancy: a case report and review of literature. *Chin J Traumatol.* 2012;15(4):234-7.
7. Sakamoto J, Michels C, Eisfelder B, Joshi N. Trauma in Pregnancy. *Emerg Med Clin North Am.* 2019;37(2):317-338. doi:10.1016/j.emc.2019.01.009
8. Mirza FG, Devine PC, Gaddipati S. Trauma in pregnancy: a systematic approach. *Am J Perinatol.* 2010;27(7):579-86. doi:10.1055/s-0030-1249358
9. ACOG educational bulletin. Obstetric aspects of trauma management. Number 251, September 1998 (replaces Number 151, January 1991, and Number 161, November 1991). American College of Obstetricians and Gynecologists. *Int J Gynaecol Obstet.* 1999;64(1):87-94.
10. Louise D A, Sandra V, Marc S. Management of the pregnant trauma patient: A literature study. *Open Journal of Trauma.* 2020;4(1):038-046. doi:10.17352/ojt.000031
11. Petrone P, Marini CP. Trauma in pregnant patients. *Curr Probl Surg.* 2015;52(8):330-51. doi:10.1067/j.cpsurg.2015.07.001
12. Jain V, Chari R, Maslovitz S, et al. Guidelines for the Management of a Pregnant Trauma Patient. *J Obstet Gynaecol Can.* 2015;37(6):553-74. doi:10.1016/s1701-2163(15)30232-2
13. Leggon RE, Wood GC, Indeck MC. Pelvic fractures in pregnancy: factors influencing maternal and fetal outcomes. *J Trauma.* 2002;53(4):796-804. doi:10.1097/00005373-200210000-00033
14. Brown S, Mozurkewich E. Trauma during pregnancy. *Obstet Gynecol Clin North Am.* 2013;40(1):47-57. doi:10.1016/j.ogc.2012.11.004
15. Pearce C, Martin SR. Trauma and Considerations Unique to Pregnancy. *Obstet Gynecol Clin North Am.* 2016;43(4):791-808. doi:10.1016/j.ogc.2016.07.008
16. Amorosa LF, Amorosa JH, Wellman DS, Lorich DG, Helfet DL. Management of pelvic injuries in pregnancy. *Orthop Clin North Am.* 2013;44(3):301-15, viii. doi:10.1016/j.ocl.2013.03.005
17. M LAR, Loaiza S, Zambrano MA, Escobar MF. Trauma in Pregnancy. *Clin Obstet Gynecol.* 2020;63(2):447-454. doi:10.1097/grf.0000000000000531
18. Petrone P, Jiménez-Morillas P, Axelrad A, Marini CP.

- Traumatic injuries to the pregnant patient: a critical literature review. *Eur J Trauma Emerg Surg.* 2019;45(3):383-392. doi:10.1007/s00068-017-0839-x
19. Maghfuri HB, Alraeh HM. Pelvic fracture in pregnancy: factors influencing maternal and fetal outcomes. *IJMDC.* 2020;4(9):1502-1506. doi:10.24911/IJMDC.51-1595769403
20. Li P, Zhou D, Fu B, Song W, Dong J. Management and outcome of pelvic fracture associated with vaginal injuries: a retrospective study of 25 cases. *BMC Musculoskelet Disord.* 2019;20(1):466. doi:10.1186/s12891-019-2839-y
21. Niemi TA, Norton LW. Vaginal injuries in patients with pelvic fractures. *J Trauma.* 1985;25(6):547-51. doi:10.1097/00005373-198506000-00015
22. Dlaney KM, Reddy SH, Dayama A, Stone ME, Jr., Meltzer JA. Risk factors associated with bladder and urethral injuries in female children with pelvic fractures: An analysis of the National Trauma Data Bank. *J Trauma Acute Care Surg.* 2016;80(3):472-6. doi:10.1097/ta.0000000000000947