Modified Stoppa approach for acetabular fracture in a pregnant patient: case report and review of literature

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Acetabular fractures in pregnant patients are usually rare scenarios. The management of traumatized pregnant patients is challenging due to their specific physiological and anatomical body changes, the possible exposure to teratogenic radiation, and risky therapeutic interventions. We report a 27-year-old pregnant patient with a gestational age of 22 weeks presented with a T-shape acetabular fracture after road traffic accident. The fracture was surgically managed by open reduction and internal fixation using combined posterior and modified Stoppa approaches to the acetabulum. A normal viable infant was delivered through cesarian delivery 10 weeks after trauma. Modified Stoppa approach for acetabulum can be used safely in acetabular fracture fixation in pregnant patients with less invasiveness, similar scar of cesarian section, better visualization of the quadrilateral plate of the acetabulum, and less maternal morbidity.

Keywords:
acetabular fracture, modified Stoppa approach, pregnant patient

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Introduction

During reproductive age, trauma is the leading nonobstetric cause of mortality in women. Of pregnant women, only 8.3% are affected by trauma. Hospital admission is usually needed in only 1% of the injured pregnant women, but unfortunately, about one-fourth of them die from their traumatic injuries. Orthopedic traumatic injuries of pregnant patients are associated with a higher rate of infant and maternal mortality, and elevated risks of spontaneous abortion, placental abruption, and preterm birth [1–6].

Acetabular fractures are among the most challenging injuries managed by orthopedic surgeons. The main target of acetabular fracture management is obtaining a stable anatomical reduction with a functional, painless mobile hip. The outcome is strongly correlated with the accuracy of fracture reduction [7,8].

Despite the rare coincidence of acetabular fractures with pregnancy, but its presence requires a better understanding of maternal and fetal physiology, and unique management protocol to lessen the expected negative impact of trauma and fracture treatment on both fetal and maternal well-being.

We report a case of a pregnant lady with T-shape acetabular fracture operatively fixed using combined posterior and modified Stoppa approaches to the acetabulum.

Case presentation

A 27-year-old pregnant lady in the 22nd weeks of pregnancy presented after a road traffic accident. On arrival, the patient was initially evaluated and managed according to the advanced trauma life support protocol associated with obstetric team consultation. Her main complaint was right hip and left-knee pain and swelling. Clinically, there was no sign of neurovascular injury. FAST ultrasound examination of the abdomen was performed followed by fetal ultrasonographic assessment, which showed no fetal distress, placental abruption, or rupture of membranes.

In addition to standard trauma series of radiographs (chest radiograph, anteroposterior pelvis, and lateral cervical spine), Judet views (right iliac and obturator oblique views), left-knee radiograph, and computed tomography scan for pelvis and left knee were requested after discussion with obstetricians and radiologists and obtaining a consent from the patient.

Management plan

After primary adequate stabilization of the patient medical condition, further detailed study of radiographic images (radiograph, computed tomography scan) revealed significantly displaced

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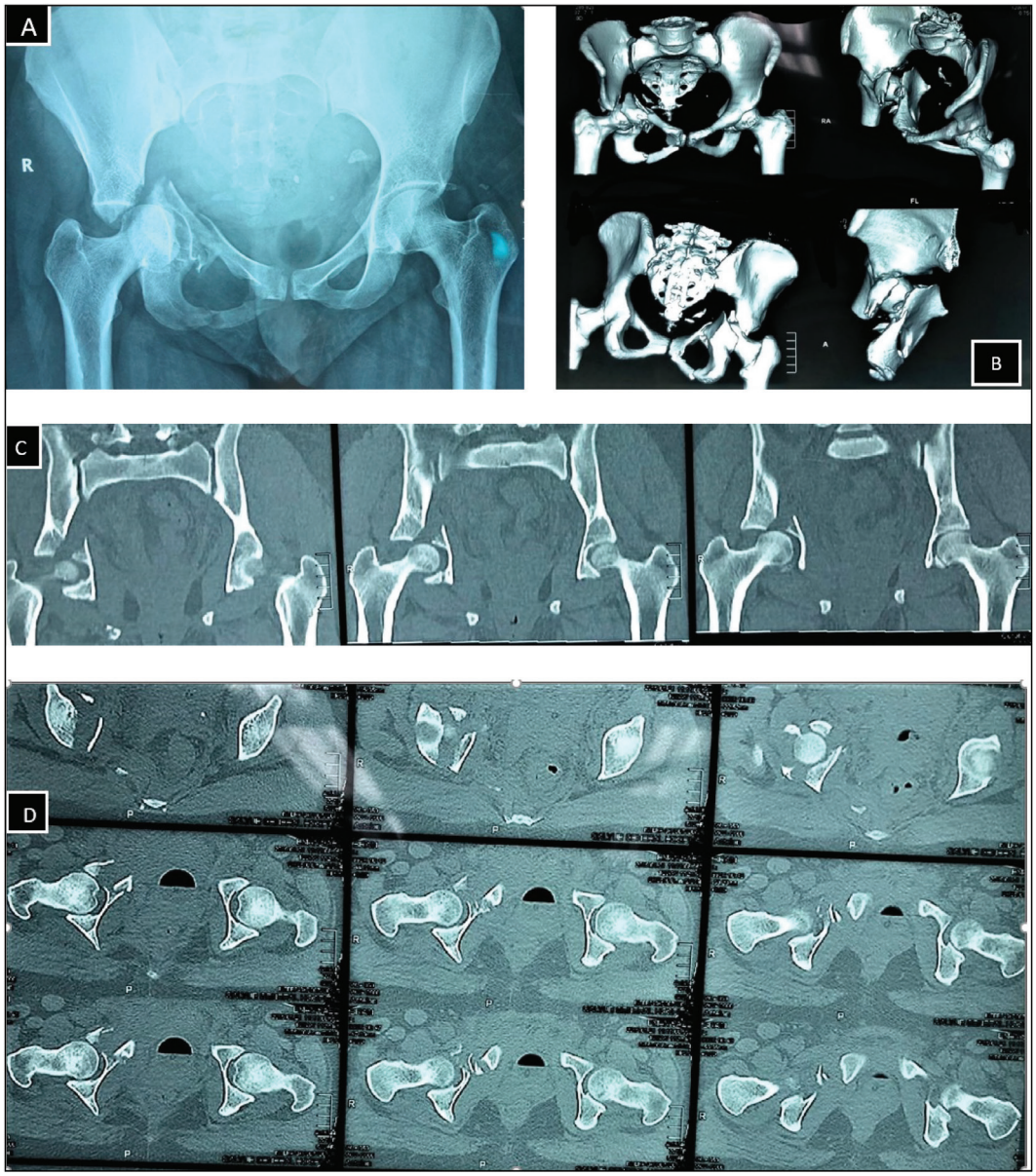
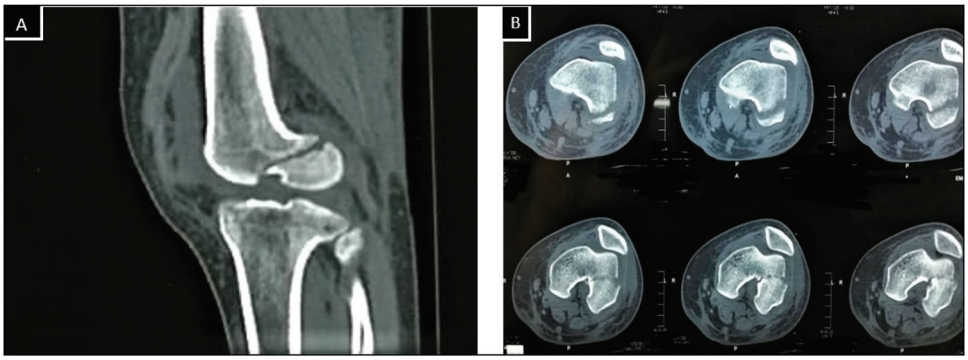
T-shaped right acetabular fracture and left distal femur coronal intraarticular (Hoffa) fractures (Figs 1, 2). The optimal orthopedic management plan was open reduction and internal fixation of distal femur Hoffa fracture and then posterior column internal fixation through posterior hip approach in one session followed

Figure 1



(a) Anteroposterior radiograph of the pelvis showing displaced right acetabular fracture. (b, c, d): Three-dimensional, coronal, and axial computed tomography scan images showing T-shape right acetabular fracture.

Figure 2



(a, b) Sagittal and axial view computed tomography (CT) scan of the left knee showing distal femur coronal intraarticular (Hoffa) fracture.

by anterior column fixation using modified Stoppa approach in another session.

Surgical approach

First-session surgery: about 48 h after the accident, under general anesthesia, with minimal use of fluoroscopy, the patient was positioned laterally over a radiolucent table. Open reduction and internal fixation of the Hoffa fracture was performed using T-plate and screws through posterior approach of the distal femur followed by open reduction and internal fixation of the posterior component of the acetabular fracture through posterior Kocher–Langenbeck approach [9] by 4.5-mm reconstruction plate.

Second-session surgery

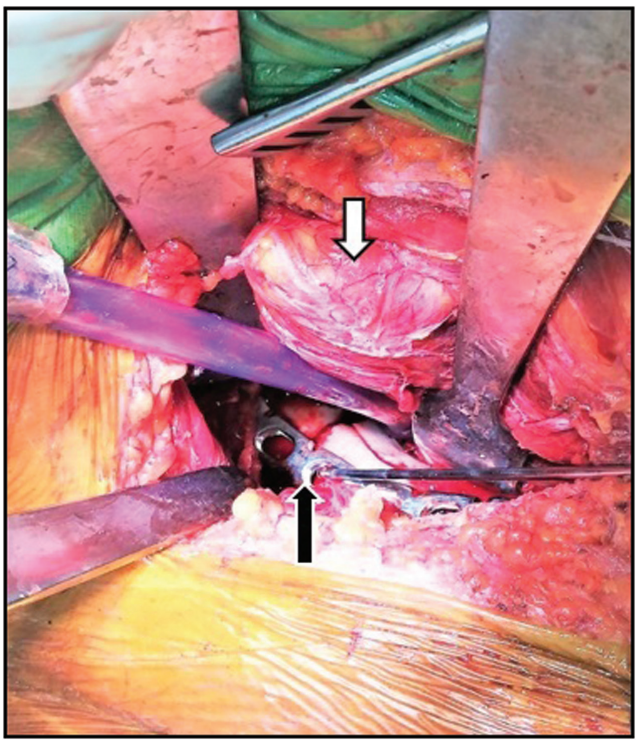
After another 4 days, the patient was taken to the operation theater for the second-session fixation of the anterior component of the acetabular fracture with a standby obstetric team ready for any possible need for emergent obstetric intervention. Modified Stoppa approach [10] was chosen with a skin incision of about 8-cm length and two fingerbreadths above the symphysis pubis followed by development of proximal subcutaneous flap to improve visualization. Then both recti were split from symphysis pubis to expose the linea alba that was longitudinally incised along the midline. Uterine fundus level was observed above the level of the umbilicus. Blunt dissection of the uterus was performed to clear it from the surrounding tissues and retracted using saline-soaked gauze and traditional retractors. Corona mortis was identified in the back surface of the superior pubic rami, which was noticed to be engorged and then ligated. The obturator nerve was identified and protected not to be entrapped in the fracture site. The fracture was subperiosteally identified and then reduced using reduction clamps. In such a contracted field, we were obliged to insert the reduction clamps separated into two halves and to be reassembled inside the wound cautiously not to injure the tensely enlarged gravid uterus. After obtaining near-anatomical reduction of the fractures, a 4.5-mm reconstruction plate was applied for internal fixation of the fracture (Figs 3–6).

Follow-up

The medical condition of the patient and her fetus was immediately evaluated after both fixation sessions and continued throughout the postoperative period by the obstetric team. Anteroposterior and pelvic oblique radiographs were requested and performed on the first postoperative day to document the quality of fracture reduction and fixation (Fig. 7).

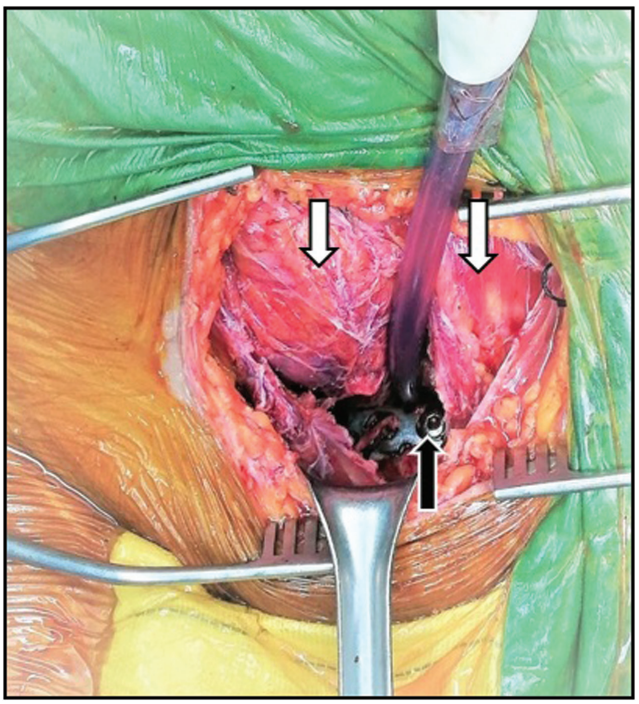
Safe antibiotics were allowed after the first session and continued for 5 days only after the second session, and a prophylactic dose of low-molecular-weight heparin (60 U subcutaneously/24 h) was started after trauma and continued for 35 days after the second surgery. This dose is discontinued 12 h before and after each surgery

Figure 3



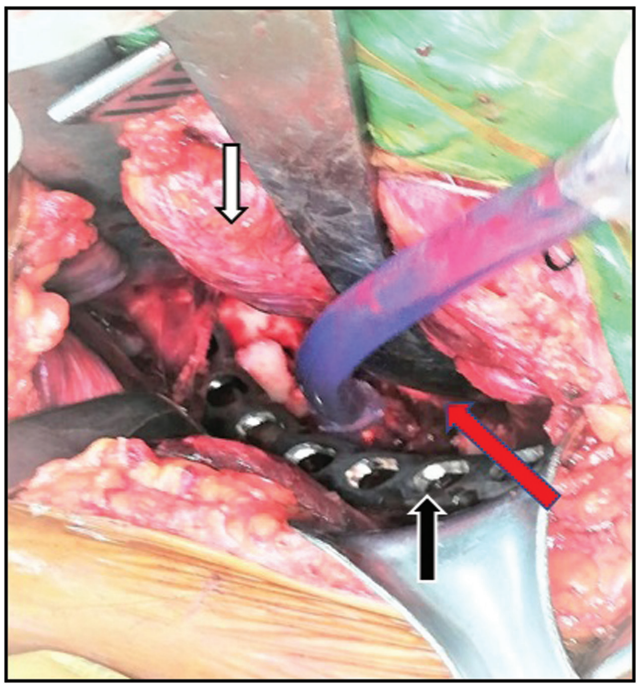
Intraoperative photo showing the fracture reduction, the applied plate (black arrow), and the gravid uterus (white arrow).

Figure 4



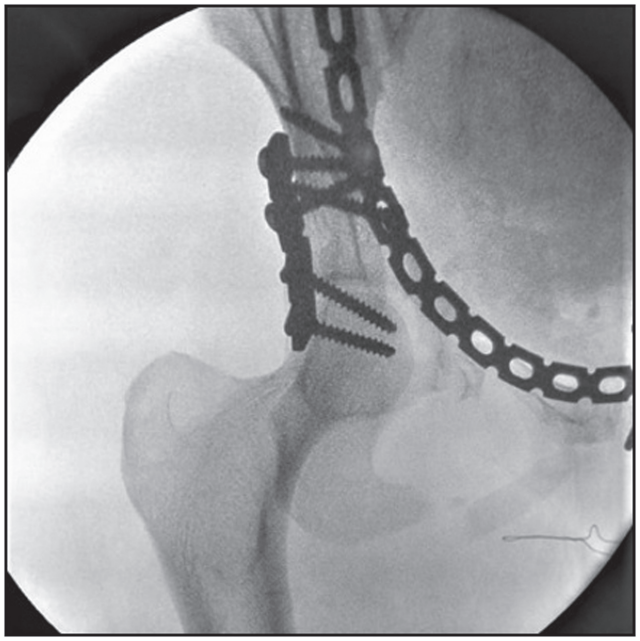
Intraoperative photo showing the gravid uterus (white arrows) and the fixed applied plate (black arrow).

Figure 5



Intraoperative photo showing the plate (black arrow), obturator nerve (red arrow), and uterus (white arrow).

Figure 6



Intraoperative fluoroscopic picture confirming the fracture reduction and plate in the proper position.

to decrease the risk of bleeding. Local bupivacaine was injected locally after each session. In addition, parenteral paracetamol (1 g/6 h) was prescribed. The estimated blood loss was about 500 ml during the first-session surgery (posterior approach) and 700 ml during the second session (anterior approach). One unit of crossed-match blood was transfused after the first operation and another unit was given during the second-session surgery. Tranexamic acid was not used during or after surgery. Early range of motion was permitted for both knee and hip from day 1. Toe-touch weight-bearing was allowed after one-and-a-half months. Cesarian delivery occurred after two-and-a-half months after trauma with a viable normal child. The baby's Apgar score at birth was 9 (active, pink baby, the pulse over 100 b/min, and has vigorous cry but minimal response to the stimulus).

Full weight-bearing was allowed with crutches 3 months after trauma (2 weeks after delivery) followed by walking with one stick after 1 month. Then walking unsupported was advised after another 1 month.

Serial radiographs were obtained after delivery for the follow-up of fixation and fracture healing (Fig. 8). After 1 year, Majeed score [11] was 91 (pain 25, work 16, sitting 10, walking aids 12, gait unaided 12, walking distance 12, and sexual intercourse 4). Harris hip score [12] was 96 (pain 40, range of motion 5, limping 11, supported gait 11, gait distance 11, upstairs 4, wearing socks 4, sitting 5, public transport 1, and no deformity 4).

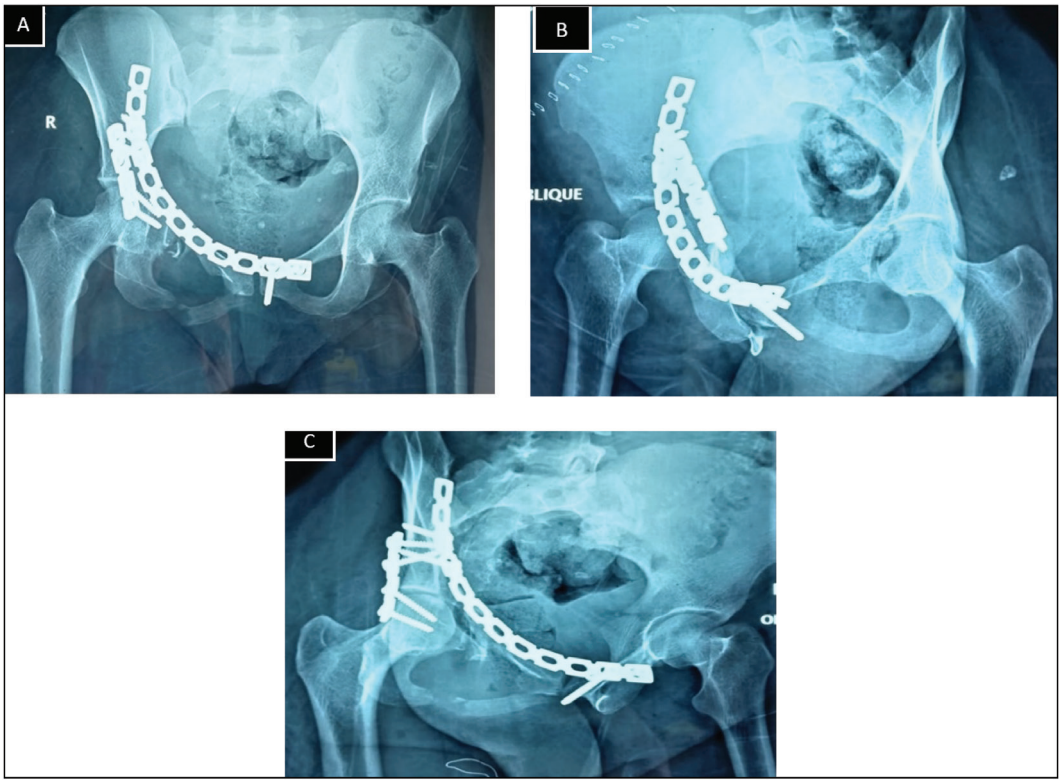
Discussion

The management of traumatized pregnant women is very unique due to several points that must be considered by the responsible treating medical team. Some of these points are the complex physiologic adaptations of the pregnant patient, concurrent treatment and monitoring of two patients (mother and fetus), the risk of radiation and teratogen exposure, the significant anatomic and physiologic alteration of abdominal and pelvic structures by the increasing size of the gravid uterus, and the obligatory need of multidisciplinary team with multiple specialties with modification of standard trauma protocol [6–8,13].

Nonoperative treatment of displaced acetabular fractures in pregnant patients (bedrest with most probable future need for prosthetic replacement), which was a safer option many years ago, is no longer accepted nowadays. Many studies with adequate follow-up periods reported a superior outcome of operative fixation of the displaced acetabular fractures with less-preferable results when surgical management delays after 3 weeks [7,8,14,15]. So, the current standard care of displaced acetabular fracture is the early anatomical reduction and surgical fixation.

The patient in our report was in the end of the second trimester (22 weeks) with uterus above the umbilicus

Figure 7



(a, b, c) Anteroposterior, iliac oblique view, and obturator oblique view) postoperative pelvic radiograph images showing anterior and posterior fixation of the right acetabular fractures.

and her fractured acetabulum was of T-shape type that is best to be approached by combined posterior (Kocher–Langenbeck) approach and anterior (ilioinguinal or Stoppa) approach. We chose the modified Stoppa approach that provides better visualization of the quadrilateral plate for medial wall reduction as the gravid uterus was on an intra-abdominal position. In addition, the modified Stoppa approach has the same wound of the possibly needed cesarian delivery in case of accidental uterine rupture. It also has less morbidity, invasiveness, and hazards than other anterior acetabular approaches.

Several imaging modalities are routinely used for the assessment of trauma patients. Although radiological studies may carry some risks to the fetus, they have several important advantages in the evaluation of maternal injuries. These studies decrease the need for nonobstetric laparotomy that leads to a 26% incidence of preterm labor in the second trimester. Early detection of maternal injuries is so crucial to provide the early and aggressive management of these injuries and probable subsequent shock that results in increased both maternal and fetal morbidity and mortality. Furthermore, imaging tools are greatly beneficial for guiding many noninvasive or surgical therapeutic procedures [16,17].

According to the revised (2018) American College of Radiology (ACR) and the Society for Pediatric Radiology (SPR) practice parameter for imaging pregnant or potentially pregnant adolescents and women with ionizing radiation, it was reported that no harmful radiation effects are expected to occur to the developing fetus of more than 11 weeks of gestational age at the radiation doses of below 50 mGy (threshold dose). Moreover, the estimated fetal radiation doses from conventional abdominal radiograph and CT scan of the abdomen and pelvis are 1–3 and 25 mGy, respectively, which are still much lower than the hazardous threshold dose [17–21]. This justifies the judicious use of the imaging modalities (conventional radiograph, CT scan, and intraoperative C-arm fluoroscopic imaging (to optimize the management of traumatized pregnant patients.

The incidence of fracture acetabulum during pregnancy is not a common event, and most of the literature that described this rare scenario were case reports. Yosipovitch *et al.* [22] used an extended iliofemoral approach for fixation of associated both-column acetabulum fracture in a pregnant patient in her 20th week of gestation with a normal delivery at full term. Charnell *et al.* [23] reported a pregnant patient of 34 weeks of gestational age in which operative fixation

Figure 8

(a, b, c):One-year postoperative radiograph images showing the complete union of right acetabular and left distal femoral fractures.

of the patient's associated both-column acetabulum fracture was performed through ilioinguinal approach immediately after cesarean delivery in the same setting. Young *et al*. [13] preferred to surgically fix posterior-wall acetabulum fracture with concomitant hip dislocation 2 days after cesarean delivery using Kocher–Langenbeck approach in an 18-year-old female at the 35th week of gestation.

Kocher–Langenbeck surgical exposure was also used by Porter *et al*. [24] in fixation of eight pregnant patients with variable posterior wall and column-fracture acetabulum.

Conservative management was chosen by Almog *et al*. [25] that described two cases in which acetabular fractures were treated conservatively with satisfactory outcomes in one case and posttraumatic arthritis in the other.

Kloen and colleagues reported a case of fracture acetabulum in a pregnant woman in the 26th week with right femoral fracture and an ipsilateral complex (transverse/posterior wall) acetabular fracture. Within 24 h after the accident, a retrograde femoral nail was placed followed by open reduction and internal fixation of her acetabular fracture through a Kocher–Langenbeck approach 2 weeks later. Her pregnancy was uneventful and she delivered a healthy child vaginally at term [26].

Conclusion

To our knowledge, this is the first reported case in which modified Stoppa approach was used successfully for fixation of T-shape acetabular fracture in the pregnant patient with less fetal and maternal morbidities.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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