SAS Journal of Surgery
Abbreviated Key Title: SAS J Surg
ISSN 2454-5104
Journal homepage: https://www.saspublishers.com

OPEN ACCESS

Orthopaedics

Pelvic Ring Fracture in Adolescent Girls Following a Fall from a Height: A Report of Five Cases

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DOI: https://doi.org/10.36347/sasjs.2026.v12i03.017 | **Received:** 07.02.2026 | **Accepted:** 25.03.2026 | **Published:** 28.03.2026

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Abstract **Original Research Article**

Pelvic ring fractures are serious injuries. They encompass a wide variety of lesions, differing in their mechanisms, anatomical presentations, therapeutic implications, and prognoses. These injuries are most often found in young male patients who are victims of road traffic accidents; this is not the case for our patients. The management of these injuries is a medical and surgical emergency, as they involve not only bone damage but also serious visceral injuries that threaten the patient's life. In this study, we report five cases of pelvic trauma in young women who fell from a height.

Keywords: Pelvic trauma, adolescent girls, fall from a high place, Niamey.

INTRODUCTION

Pelvic ring fractures are serious and frequent injuries, representing 1.5 to 5% of all osteon-articular fractures [1,2]. They can compromise the life-threatening prognosis due to complications, especially hemorrhagic ones, and the functional prognosis due to bone, urological, visceral, and neurological complications. The overall mortality rate of pelvic trauma is between 5 and 15%, but can reach 50% [3-6]. They are caused by high-energy trauma. They constitute a medical-surgical emergency because they cause highly polymorphic lesions, both in their anatomical presentation and in their context and therapeutic implications. They can be life threatening. They very often occur in the context of poly-trauma, associated with other injuries that can severely affect the already serious clinical picture. Pelvic ring fracture is a fracture of young adult males, victims of road traffic accidents [7]. The occurrence of these injuries in adolescent girls within a short period, all victims of falls from a height, is exceptional. We report five cases of adolescent girls who fell from a height and sustained pelvic ring fractures. We will describe the clinical, therapeutic, and prognostic aspects through a review of the literature.

MATERIALS AND METHODS

It was a prospective study; descriptive one, conducted in the Department of Traumatology, Orthopedics, and Reconstructive Surgery at the National Hospital of Niamey, Niger, over a six-month period from January 21, 2025, to June 21, 2025. The study included five adolescent girls, aged between 17 and 23 years, who were diagnosed with a pelvic ring fracture following a fall from a height and were treated in our department during the study period. The parameters studied were clinical, para clinical, therapeutic, and follow-up. Functional outcome was assessed after a mean follow-up of six months using the Majeed score, which evaluates quality of life and return to independence after pelvic trauma.

Components of Majeed's score (out of 100 points):

- Pain (0-30 points)
- Work (0-20 points)
- Seated position (0-10 points)
- Walking/Walking Assistance (0-30 points)
- Sexual intercourse/Bladder (0-10 points)

Interpretation of results (functional translation):

- Excellent: 85-100 points
- Good: 70-84 points
- Passable: 55-69 points

- Low: < 55 points

RESULTS

This study involved five young female patients. The average age was 19.8 years, with a range from 17 to 23 years. The injury mechanism was uniformly violent, systematically resulting from a fall from a height: two cases of second-story window falls during a fire, two falls from a tree, and one accidental fall into a 20-meter well. The average time to emergency room admission was approximately 79 minutes, ranging from 45 minutes for victims of urban fires to 2 hours for rural traumas.

Clinically and in terms of injury, the picture of polytrauma was found in two out of five, associating with the pelvic fracture lesions of the appendicular skeleton (femur, humerus, elbow, calcaneus) or axial (lumbar spine), Figure 1.

Figure 1: fracture of the femur, humerus and elbow

The initial hemodynamic status was stable in the majority of patients, with the exception of one case of hypovolemic shock on admission. One patient presented with a complex open pelvic injury with severe perineal, vaginal, and sphincter injuries (Figure 2), requiring specific management.

Figure 2: wounds of the pelvis after debridement with, in A wound of the pubic symphysis and in B wound of the vagina of the perineum and anus.

Radiographic assessment, supplemented by computed tomography (CT) in four patients (Figure 3), revealed predominantly unstable lesions, including fractures of the obturator rings, symphysis disjunctions, and sacroiliac or sacral injuries.

Figure 3: Fracture of the obturator ring, symphysis separation and fracture of the sacrum

The main epidemiological, clinical and par clinical results are summarized in Table I.

Table I: Summary of clinical and par clinical epidemiological data of patients

Case	Age / Profession	Circumstances & Timeframe	Clinical (Initial assessment of injuries)	Para clinical (Radiological Assessment)
1	19 years old Student	**Defenestration** (2nd floor, fire) Timeframe: 45 min	**Open polytrauma** - Stable hemodynamic status - Complex wound of the perineum/vagina/anus (severed sphincters) - Closed left thigh joint	**Whole body CT scan** - Symphysis disjunction - Sacroiliac dislocation - Mid-diaphysis fracture of the left femur
2	22 years old Student	**Defenestration** (2nd floor, fire) Timeframe: 45 min	**Severe polytrauma** - Shock (TA 90/60) - Left arm fracture with radial nerve palsy - Ankle screws (open to the right) - Lower back pain	**Whole body CT scan** - Fx shutter frame G - Fx L3 not displaced - Fx humerus G displaced - Calcaneal fractures (complex G, open D)
3	17 years old (Work)	**Fall into a well**(20m) Delay : 1 hour	**Closed trauma** - Stable state - Total impotence of the lower limbs - Pain in the pelvis and thigh (right side)	**TDM Pelvis** - Fx of the two shutter frames - Symphyse disjunction - Fx diaphysis femur D
4	18 years old Not specified	**Tree falls** (Mango) Delay: 1 hour 45 minutes	**Closed trauma** - Stable state - Pubic symphysis depression - Functional impotence	**Radio Basin** - Fx of the two shutter frames
5	23 years old Housewife	**Tree falls** (Firewood) Delivery time: 2 hours	**Closed trauma** - Stable state - Sacrum and left elbow pain - Pelvic limb impotence	**Radio + TDM** - Iliopubic branch + sacrum D - Complex elbow joint (humeral plate, olecranon, radial head)

The therapeutic approach was surgical for the entire series. After an initial phase of medical stabilization and traction or hammock placement, definitive pelvic osteo-synthesis was performed after a mean delay of 9.6 days (range 7–12 days). One patient required damage control surgery upon admission for debridement of perineal lesions and a protective colostomy prior to bone fixation. Osteosynthesis systematically consisted of anterior fixation with a screw plate (Figure 5).

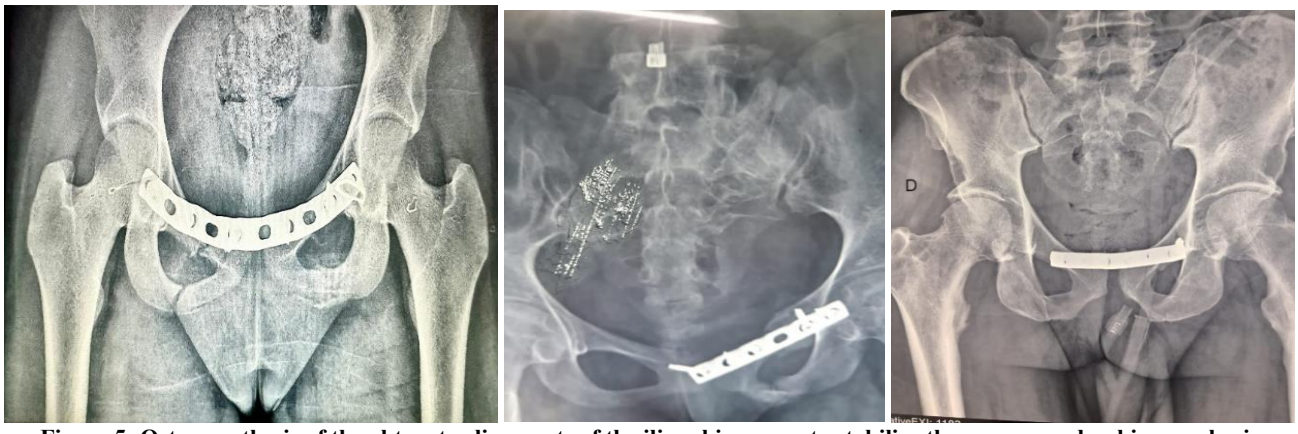

Figure 5: Osteo-synthesis of the obturator ligaments of the iliopubic ramus to stabilize the sacrum and pubic symphysis

The postoperative course was favorable for all patients, with no deaths recorded. Bone consolidation was achieved within a consistent timeframe of 3 months, allowing for functional recovery and independent walking around the 4th month.

Evolutionary aspects

These patients were reviewed and evaluated according to Majeed's criteria, resulting in a 100% follow-up rate. The mean follow-up was 5.40 months, with a range of 5 to 6 months. Functional outcomes were satisfactory (excellent and good) in 97.37% of cases.

Table II summarizes the therapeutic and evolutionary aspects.

Table II: Summary of medical, surgical, and outcome data

Case	Medical Treatment & Waiting Time	Surgical Treatment (Timeframe & Procedure)	Suites & Evolution
1	Resuscitation, antibiotics, painkillers Glued traction (femur) + Hammock	**J0 (Damage Control):** Debridement, colostomy. **J10 (Final):** Pelvic/femoral osteosynthesis + perineal/vaginal/anal repair	- Entero-bacteriaceae infection (treated) - Restoration of digestive continuity at 1 month - Consolidation: 3 months - Good anal continence
2	Resuscitation, antibiotics Plaster cast (arm) + Hammock	**Day 10:** Osteosynthesis of the pelvis, both ankles and humerus	- Simple sequences - Exeat on day 14 - Consolidation: 3 months -Functional recovery: 4 months
3	Analgesics, LMWH Glued traction + Hammock	**Day 7:** Osteosynthesis of the pelvis (3 small plates) + femur (large plate)	- Simple sequences - Exeat on day 10 - Verticalization at day 30 - Wandering at 2 months
4	Analgesics, LMWH Hammock	**Day 9:** Osteosynthesis using a screw plate (two iliopubic branches)	- Simple sequences - Wandering at 2 months - Consolidation: 3 months
5	Painkillers Wait 12 days	**Day 12:** Pelvic osteosynthesis (plate) + Elbow (tensioning/pinning)	- Simple sequences (implicit) - Favorable development (consolidation and recovery within the usual timeframe for the series)

DISCUSSION

Pelvic fractures are potentially serious, frequent, and associated with high mortality; we found five cases in one month. Their occurrence in adolescent girls over such a short period and following a fall from a height is exceptional. Two of our patients fell from a tree, two from the second floor of a building, and one into a well. For most authors [1, 2, 3, 4, 5], this is a fracture typically seen in young males who are victims of accidents, particularly road traffic. Despite the fact that all patients fell from a height, the mechanism was direct in two out of five (40%). This rate differs from that of Abdoul Wahab AM [1], who found a direct mechanism in 88.89% of cases. This difference could be explained by the different circumstances surrounding the injury. In our series, two out of five patients were admitted with polytrauma, within 45 minutes, had fallen from the second floor of a building. One patient fell within two hours, the fourth after 1 hour and 45 minutes, and the fifth after 24 hours. As in our series (40%), pelvic fracture is very often associated with polytrauma, according to many authors, though with rates lower than ours, ranging from 10% to 20% [1, 5, 6]. Clinically, functional impairment and pain were present in 100% of cases. Verneuil's sign was positive in all our patients. One patient presented with a perineal tear exposing the bladder and uterus, and a transection of the anal sphincters requiring a colostomy and perineal repair. In our series, the urinary and digestive systems were spared in all cases. Four out of five patients presented with an associated injury, representing 80%. These clinical data are comparable to those reported in the literature [1, 4, 6]. The etiology of our patients' injuries was 100% falls from a height. Our results contradict those of Abdoul Wahab [1] in Niger in 2018, who found 77.78% to be road traffic accidents, and those of Mousine E. with 60% road traffic accidents. Basraoui D. in Morocco in 2007 found only 10% to be falls from a height due to suicide attempts, while Tonetti J. in the French Alps found up to 55% to be falls from a height. Contrary to our findings, pelvic trauma remains a pathology linked to road traffic accidents, making the patients in our series an exception. All our patients underwent standard anteroposterior pelvic radiography, which allowed for the diagnosis of the pelvic fracture. However, due to the anatomical complexity of the region and especially the overlapping of digestive structures exacerbated by the frequently present reflex ileus, CT scanning in four out of five patients supplemented radiography. In addition, as Gill K [7] stated, CT scanning allows for a more precise analysis of the lesions. In our series, we found two patients with type B fractures and three patients with type C fractures, according to the Tile and Pennal classification [8]. This means that all the pelvic fractures in our study were unstable. Our results are close to those of Tonetti [5] in France, who found 94% of cases to be Tile type C. However, our results differ from those of many authors, including Melton [9], who found 40.57% simple fractures and only 11.42% complex fractures. Abdoul Wahab [1] in Niger found only 59% of the pelvic fractures in his series to be unstable. From a therapeutic standpoint, when the patient's general condition was favorable, they were kept in intensive care with temporary immobilization of the lesions using traction, plaster casts, or a hammock. These immobilizations stabilized the lesions. Osteosynthesis was deferred in all cases. This two-stage approach allows for surgery on a

stable patient and reduces the overall mortality rate of pelvic fractures, which was zero in our series. All our patients underwent internal fixation with a plate and screws. This is because all the fractures are located on the anterior part of the pelvic ring, with varying degrees of sacroiliac joint involvement. This osteosynthesis allows for effective reconstruction of the pelvic inlet in young women who need it for childbirth. The rate of osteosynthesis and the type of bone fixation vary among authors. As in our series, Tonetti performed 100% bone fixation, but via a percutaneous posterior approach, combined in seven cases with reduction and osteosynthesis using a plate and screws; and via open reduction through an anterior ilioinguinal approach after reduction. However, some authors have performed osteosynthesis at lower rates, such as Muluem in Cameroon in 2021 [10], who performed 77.41% of osteo-syntheses in his series with 66% of plates screwed in place, and Abdoul Wahhab in Niger, who performed only 59% osteosynthesis in his study, of which 81.25% were plates screwed in place. This technique is used by many authors because it gives satisfactory results [1, 10, 11, 12]. In terms of outcomes, the medium-term progress was good in all our patients after a 3-month follow-up. In all cases, pelvic ring reconstruction was satisfactory, with no sequelae compromising the future obstetric health of these young women. Three girls were able to walk without weight bearing or a limp after 2 months, and the other two after 3 months. Functional outcomes were satisfactory (excellent and good) in 97.37% of cases according to the Majeed score. Our results should be interpreted with caution, as our follow-up data is too short; a longer follow-up period is needed to obtain a definitive result.

In Resume:

Pelvic fractures are rare in adolescent girls who have fallen; they are more commonly seen in young males who have sustained high-energy trauma. We report five cases in one month at the National Hospital of Niamey. The association of a pelvic fracture with a fall, and so many cases in such a short period, is very rare.

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