Case Report

Posterior Hip Dislocation Following Forced Hyperflexion: A Case Report With Morphometric CT Scan Analysis

Mehrdad Ghorbanlou[1*], Fatemeh Moradi[2]

1. Department of Anatomy, School of Medicine, Iran University of Medical Sciences, Tehran, Iran.
2. Department of Biology and Anatomical Sciences, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

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ABSTRACT

Introduction: As a ball-and-socket synovial joint supported by a deep acetabulum, labrum, joint capsule, ligaments, and related muscles, the hip joint resists dislocation; however, dislocations occur during heavy trauma. This study aimed to describe a case of hyperflexion-induced hip dislocation.

Case Presentation: A 36-year-old female was referred to the emergency department with a typical adducted, flexed, internally rotated, and shortened right femur position, showing a possible posterior hip dislocation. The patient explained hip dislocation following forced hyperflexion of the hip joint during a domestic physical altercation. The patient declared no prior joint dislocations, showing that she was not inherently prone to joint dislocations. A computed tomography (CT) scan was used to diagnose hip dislocation and check its correct position following closed reduction. CT device was a Hitachi–Supria 16/32 (Hitachi Medical Systems Europe [Holding] AG, Zug, Switzerland). Axial sections of 5 mm thickness were obtained from the pelvis and reconstructed in a 3-dimensional view. Following a CT scan, a posterior dislocation without severe injury to the bony structures was evident, and after a closed reduction, a CT scan showed the correct position of the hip joint.

Conclusion: Against the common belief that a heavy motor-vehicle collision is the cause of posterior hip dislocations, this study demonstrates that hyperflexion of a normal hip can also cause posterior hip dislocation.

*** Corresponding Author:**
Mehrdad Ghorbanlou, Assistant Professor.
Address: *Department of Anatomy, School of Medicine, Iran University of Medical Sciences, Tehran, Iran.*
E-mail: *Mehrdad.ghorbanlou@gmail.com*

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Introduction

Considered as a synovial ball-and-socket articulation, the hip joint is composed of the concave acetabulum and sphere-like head of the femur [1]. Since the hip joint is a weight-bearing articulation, stability is more pronounced at the expense of lower range of motion in contrast to the glenohumeral joint, as the other ball-and-socket joint, in which wider range of motion is evident at the expense of lower stability [2]. The hip joint is supported anteriorly by the iliofemoral ligament – and posteriorly by the ischiofemoral ligament [1]. Stronger anterior support by the iliofemoral ligament leads to posterior dislocations in 90% of cases [3].

As is evident in the literature, most hip dislocations are caused by motor-vehicle accidents in which the victim is in the position of hip flexion, and upon impact, the thigh hits the dashboard, sending a posteriorly directed force to the joint and causing a posterior dislocation [1, 4, 5]. Patients experiencing a posterior hip dislocation demonstrate the typical position of an adducted, flexed, internally rotated, and shortened femur at the injured side [1]. Hip dislocations are considered time-sensitive medical emergencies needing immediate reduction to prevent further complications, such as vascular compression, which may lead to avascular necrosis of the femoral head [1, 3].

Case Presentation

A 36-year-old female was referred to the emergency department with a typical position of an adducted, flexed, internally rotated, and shortened right femur, showing a possible posterior hip dislocation. The patient explained the hip dislocation following forced hyperflexion of the hip joint during a domestic physical altercation. The patient declared no prior joint dislocations, showing that she was not inherently prone to joint dislocations. Following a computed tomography (CT) scan, a posterior dislocation without severe injury to the bony structures was evident, and after a closed reduction, a CT scan showed the correct position of the hip joint (Table 1).

The patient underwent a CT scan before and after closed reduction. Axial sections with 5mm thickness were obtained and then reconstructed at 1.25 mm to provide thinner sections for further multiplanar reconstruction in sagittal, coronal, and 3-dimensional formats. CT imaging device was Hitachi–Supria 16/32 (Hitachi Medical Systems Europe [Holding] AG, Zug, Switzerland) with 51 kW power, 75-cm gantry bore, 180-cm scan range, 5 mega hit unit (MHU) X-ray tube, and 0.675-mm minimum slice thickness [6]. Internal software of the CT device was used to measure Wiberg's central edge, Sharp, and Tönnis angles, acetabular depth/width ratio, and femoral head coverage indices [7] (Figure 1).

Measurements of the acetabulum and femoral head indices demonstrated normal ranges for Wiberg's central edge angle (37.5°), Sharp angle (37°), Tönnis angle (6.5°), acetabular depth (14.4 mm), acetabular width (47.4 mm), acetabular depth/width ratio (30.37 mm), and femoral head coverage (87%) (Figure 2).

Discussion

There are two classifications of hip dislocation: Congenital and acquired [1]. Congenital dislocation occurs in utero when a dysplastic hip is forced against mother's abdomen [8]. Acquired dislocations are classified as native dislocations and occur following total hip displacement [1]. Native dislocations mostly (80-90%) occur

Table 1. Acetabular and head of femur parameters

Parameters	Values
Wiberg's central edge angle (degrees)	37.5
Sharp angle (degrees)	37
Tönnis angle (degrees)	6.5
Acetabular depth (mm)	14.4
Acetabular width (mm)	47.4
Acetabular depth/width ratio (mm)	30.37
Femoral head coverage (%)	87

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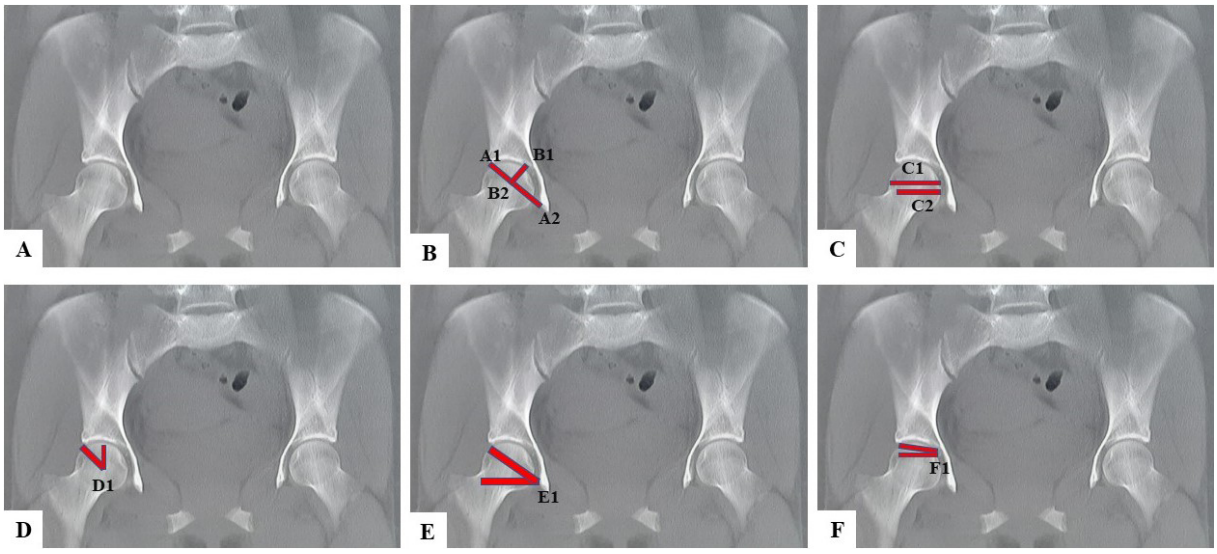


Figure 1. Coronal reconstruction of the hip, (A) Without measurements; (B) Width (A1-A2) and depth (B1-B2) of the acetabulum; (C) Femoral head coverage C2/C1×100; (D) Wiberg's central edge angle (D1); (E) Sharp angle (E1); (F) Tönnis angle (F1)

with posterior displacement of the head of the femur; therefore, anterior dislocations, whether pubic-type or obturator-type, rarely occur [1, 9].

Anthropometric studies of the hip measurements demonstrate normal Wiberg's central edge angle of 25o-40o, Sharp angle of 33o-38°, Tönnis angle of 3o-13o, acetabular depth of 9-18 mm, acetabular width of 40-55 mm, acetabular depth/width ratio of 25-35 mm, and femoral head coverage of 78-87% [10, 11]. Our study demonstrated acetabular and femoral measurements within the normal range. Hip stability relies on acetabular parameters, and it is reported that approximately 25% of hip joint osteoarthritis is caused by hip dysplasia [12, 13].

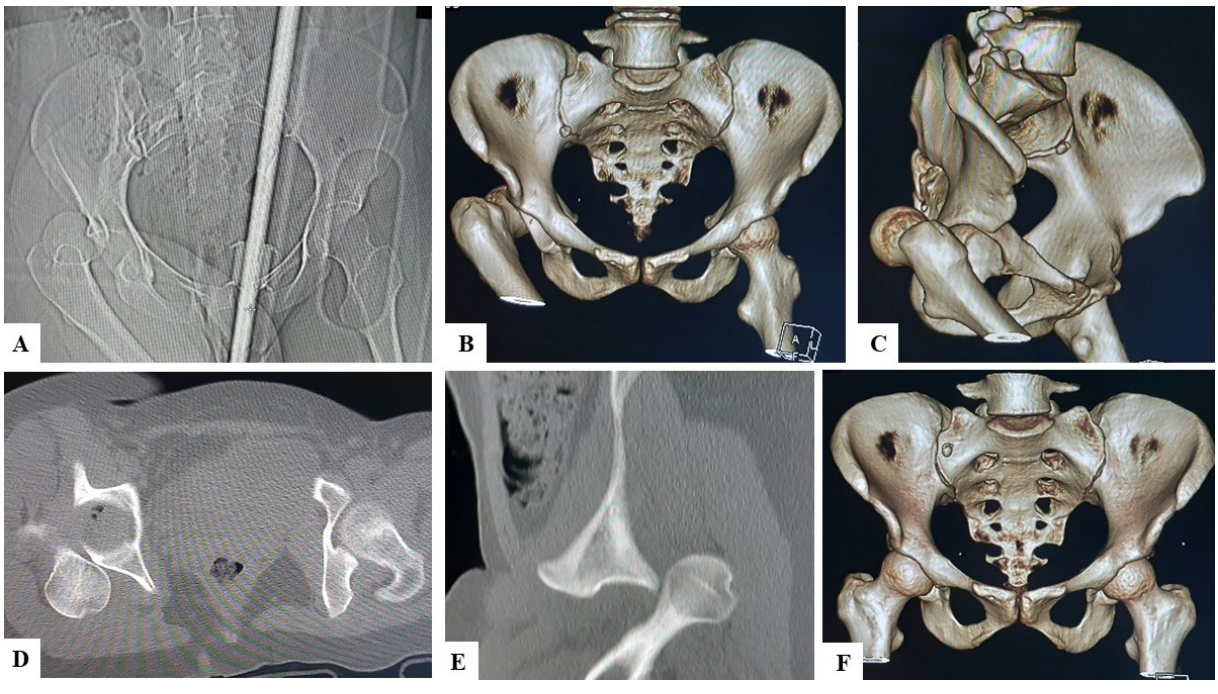


Figure 2. Hip dislocation and reduction, (A) Computed tomography (CT) scanogram of the right dislocated hip; (B, C) 3-dimensional reconstruction of the right dislocated hip; (D) Axial view; (E) Sagittal view; (F) 3-dimensional reconstruction of the reduced right hip

Although high-energy impacts are required for hip dislocation, few cases of native low-energy hip dislocation have been reported, which can occur in patients with neuromuscular disorders, such as hypertonia, muscular atrophy, or cerebral palsy, and patients with joint laxity syndrome [14]. Even in patients without previous diseases, low-energy impacts can result in a dislocated hip [15]. The most common mechanism includes axial load of the femur with the hip in flexion and abduction, thus leading to a posterior dislocation [16].

Hip dislocation is an emergency that is time-sensitive and requires a precise history of the patient and complete neurovascular assessment [1]. Damage to vessels supplying the femoral head may lead to avascular necrosis of the femoral head [17]. Posterior dislocation may impact the sciatic nerve, and anterior dislocation may damage the femoral neurovascular components [3, 18]. Although the appearance of the dislocated limb and the patient's explanation of the patient's condition help you through the diagnosis, conventional x-ray and, more precisely, the CT scan are helpful in detecting the details of the injury [3, 18]. A post-reduction CT is crucial to confirm the proper reduction of the dislocated hip [3, 18].

Conclusion

This study presented a rare case of hip dislocation through hip hyperflexion and discussed the possible hip dislocation in non-motor-vehicle accidents in an individual without previous dislocation of any joints, with acetabular and head of femur measurements within the normal range.

Ethical Considerations

Compliance with ethical guidelines

There were no ethical considerations to be considered in this research.

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Authors' contributions

All authors contributed equally to the conception and design of the study, data collection and analysis, interpretation of the results, and drafting of the manuscript. Each author approved the final version of the manuscript for submission.

Conflict of interest

The authors declared no conflict of interest.

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