

## A Successful Treatment Of Femoral Neck Open Fracture In Middle-Aged Adult: A Case Report

### Genç erişkinde femur boyun açık kırığının tedavisi: Olgu sunumu

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#### ABSTRACT

**Background:** We report an atypical case of a middle-aged adult male who wounds with gunshot injury of the proximal femur with femoral neck loss.

**Case presentation:** We present a 41-year-old male patient who wounds with a high-energy ballistic injury and had also nerve injury due to blast effect. We present our treatment stages by protecting the patient from infection and by complying with the damage-controlled surgery principles.

**Conclusion:** Those gunshots involving major joints, especially the one on the hip, could be lethal. The comminuted femoral neck and periarticular soft tissue injuries made open reduction with internal fixation difficult. The nature of the high-energy ballistic injury increases the possibility of infection that may have contributed directly to prosthesis failure. As a result, we have treated the patient with three-stage surgery. The patient underwent total hip arthroplasty, and the patient lived a functional, satisfying life after surgery.

**Keywords:** Open fracture, femoral neck, middle-aged adult, ballistic wound.

#### ÖZET


**Aka Plan:** Ateşli silah yaralanması sonucu genç erişkin proksimal femurunda femur boyununun kaybının da eşlik ettiği atipik kırığı vaka olarak sunuyoruz.

**Vaka sunumu:** Yüksek enerjili balistik yaralanma ile yaralanan ve ayrıca blastik etki nedeniyle sinir yaralanması gelişen 41 yaşında erkek hastayı sunuyoruz. Hastayı enfeksiyondan koruyarak ve hasar kontrollü cerrahi prensiplerine uyarak tedavi aşamalarımızı sunmaktayız.

**Tartışma:** Büyük eklemleri ilgilendiren ateşli silah yaralanmaları özellikle kalça ekleminde ölümcül olabilir. Femoral boyun kemik dokusunda kayıp ve çevre yumuşak doku hasarı açık redüksiyon ve internal fiksasyonu zorlaştırır. Yüksek enerjili balistik yaralanmaların doğası gereği ve enfeksiyon riski nedeniyle protez başarısızlığına neden olur. Sonuç olarak hastayı üç aşamalı cerrahiyle tedavi edildi. Hastaya total kalça artroplastisi uygulandı ve hasta ameliyattan sonra fonksiyonel ve tatmin edici bir hayat yaşadı.

**Anahtar Kelimeler:** Açık kırık, femur boyun, genç yaş erişkin, ateşli silah yaralanması.

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## BACKGROUND

Femoral neck fractures that account for only 2-3% of all femoral neck fractures in adults younger than age 50 years are uncommon and often the result of high-energy trauma (1). Fractures have been reported to be related to stress fractures (2). Open reduction and internal fixation using cancellous bone screws (for the younger patients) and hemiarthroplasty (for the elderly patients) gives the best short-to-midterm results (3). Gun shooting, especially in major joints of the hip area, can be fatal due to concurrent trauma to major neurovascular tracts (4,5). There is no data on the incidence of open femoral neck fractures in the literature. However, there are a few cases of the isolated proximal end of the femoral open fracture have been described in the literature.

Herein, we report the case of a middle-aged patient who survived a high-energy ballistic injury resulting in a comminuted proximal end-stage of femoral fracture with femoral neck loss. It should be noted that its treatment is long and troublesome, as it is an open fracture and does not allow fixation in the early period. It is known that early debridement and external fixation methods are preferred in open fractures. We also treated the patient with three-stage surgery. The patient underwent total hip arthroplasty, and the patient lived a functional, satisfying life after surgery.

## CASE PRESENTATION

A 41-year-old male patient was admitted to the emergency department with a high-energy ballistic wound. A medical interview revealed that he has no evidence of active bleeding and stable vital signs. Two ballistic wounds where an entrance wound (2 cm x 2 cm) was noted in the left anterior thigh lateral to the femoral neurovascular bundle with a clear skin edge were identified on physical examination. The exit wound (2 cmX5 cm) was located in the left gluteal region and appeared round with a mildly irregular border at the gluteal maximus muscle. Ipsilateral dorsalis pedis and tibialis posterior pulse were symmetric to the right side.

It was observed in the neurological examination that the left femoral nerve was intact and paretic in the

left sciatic nerve examination. According to the Modified Medical Research Council Muscle Grading Scale was 3/5 of the extensor hallucis longus motor force. Additionally, the left ankle plantar and the dorsiflexion motor force were evaluated as 4/5. It was observed in the neurological examination that the left femoral nerve was intact but paretic and concerning the Modified Medical Research Council Muscle Grading Scale, 3/5 of the extensor hallucis-longus motor force and left ankle plantar, and the dorsiflexion motor force was evaluated as 4/5.

An initial radiograph was shown seeding with numerous metal pellets around the right femoral neck was noted without the presence of a bullet head. A displaced, comminuted femoral neck and fracture of the left proximal femoral was observed on an antero-posterior (AP) radiograph of the pelvis (**Figure 1**).



**Figure 1.** AP radiograph when he was admitted to the emergency department.

The mentioned fracture could be classified neither as a femoral neck fracture nor as an intertrochanteric femur fracture. According to the AO classification, under the presence of a complex neck fracture in addition to the existing fragmented reverse intertrochanteric fracture, the fracture could be classified together with both classifications 31A2.3 and 31B2.2r (6).

The initial wound was closed with debridement in the emergency department. Cefazolin sodium, gentamicin, and ornidazole were chosen and adminis-

tered based on the high-energy ballistic injury and the threat of possible contamination after debridement. No lead poisoning has been observed in the short and long term. Early osteosynthesis could not be performed and then the patient was followed up with tibial skeletal traction.

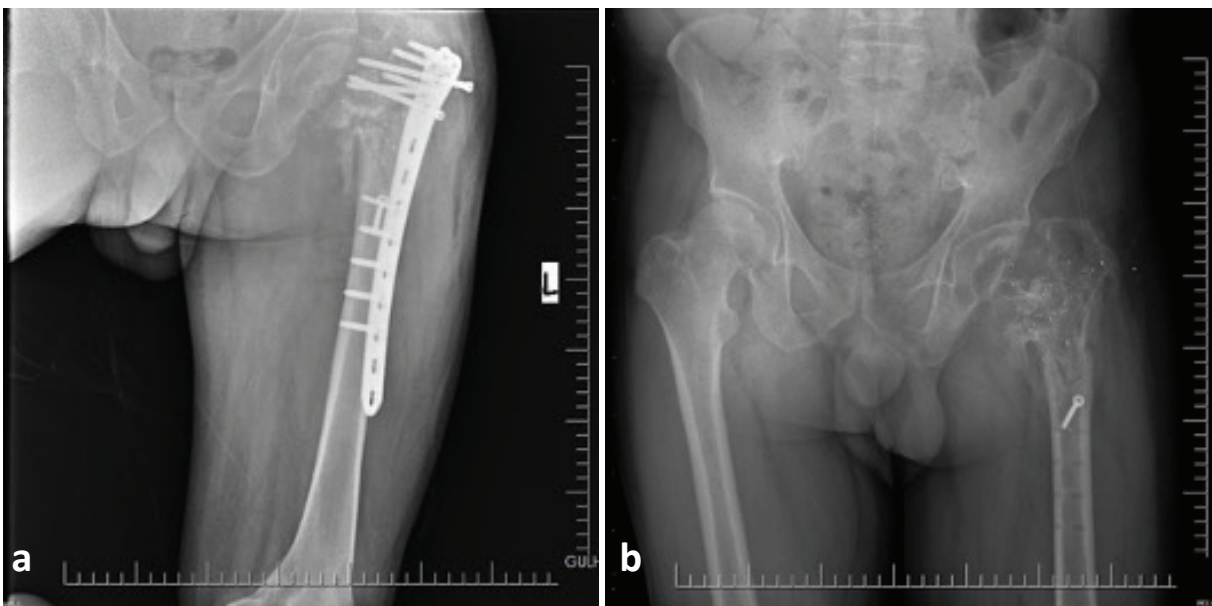
In the first stage, surgery was performed when the patient's white blood cell count, neutrophil percentage, sedimentation rate, and C-reactive protein (CRP) level returned to normal levels under antibiotic treatment. To protect the trochanter major and the integrity of the proximal lateral wall of the femur, interfragmentary screw and plate screw osteosynthesis were performed as a first stage-surgery (**Figure 2a**). The sciatic nerve exploration was also performed at the same time. As a result of exploration, it was observed that the sciatic nerve was not in the injury site and the nerve damage was the result of the blastic effect of the injury.

After surgery, the patient was recommended non-weight body mobilization. In the rehabilitation program, closed-kinetic chain exercises and TENS (Transcutaneous Electrical Nerve Stimulation) were applied to prevent muscle strength loss. In the fol-

low-up, ENMG (Electroneuromyography), Modified Medical Research Council peripheral cervical scales, DN4 questionnaire (Neuropathic Pain Diagnostic Questionnaire), and serial radiographs were used to evaluate callus formation, muscle strength, and nerve healing. Complete blood count, sedimentation rate, and CRP follow-ups were evaluated for possible infection during each control examination.

In the sixth week of the injury, the patient was prescribed pregabalin 2x150 because of the patient's score of 6 on the DN4 questionnaire. After 3 weeks, symptoms did not seem to be relieved and pregabalin was increased to 2x300.

Surgery was staged to reduce the risk of infection of the definitive treatment. After 10 weeks from the first stage, when callus formation was seen on radiographs, only plate and screws were removed in the second stage of the treatment (**Figure 2b**). Besides, a culture and microscopic study were performed from the surgical area and the plaque perimeter. In this case, no signs of infection were encountered. Afterward, the current rehabilitation program was continued during the postoperative follow-up.



**Figure 2.**

a: Interfragmentary screw and plate screw osteosynthesis to protect the trochanter major and the integrity of the proximal lateral wall of the femur  
b: Plate and screws were removed, one of the interfragmentary screws could not be removed

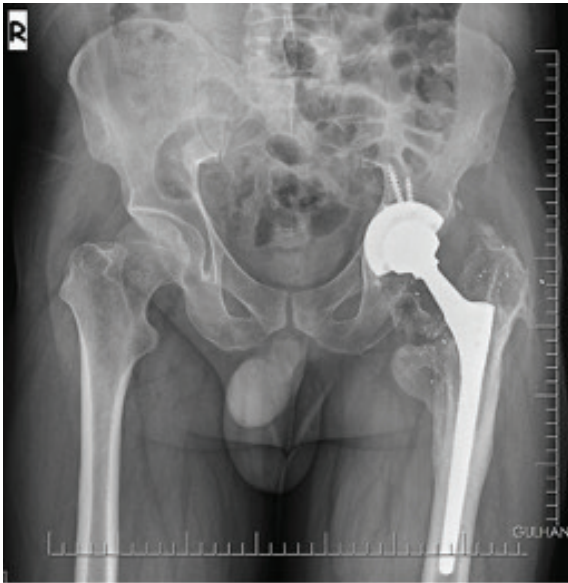


Figure 3. AP radiograph after total hip replacement surgery

3 months after implant removal, the patient underwent total hip replacement surgery (Figure 3). After total hip arthroplasty, the patient could be mobilized on the postoperative first day. It was observed that there was no limb length difference. After the injury, the partial sciatic damage of the patient was continued and for this reason, Pregabalin 2x300 mg was continued for up to 6 months and was gradually reduced. Drug treatment could be terminated in the third postoperative month, but continued. In the current form, the patient is completed one year after the injury, and the patient can be mobilized independently.

## DISCUSSION

The conventional ballistic injury classification has grouped gunshot wounds by the ammunition velocity: high energy (>2,000 ft/s) and low energy (<2,000 ft/s). Firearm-related injuries involving an extremity occur in 46% of assaults and 72% of unintentional injuries (7). Therefore, the characteristics of this patient's ballistic injury may be compatible with a long-range rifle wound. Broad-spectrum empiric antibiotics and thorough debridement play a key role in the success of treatment in open fractures and gunshot wounds.

The management of the bone and the soft tissues in a patient with an open fracture is the major determi-

nant of fracture healing and functional restoration of the injured extremity. Selection of fracture fixation depends on the fractured bone, the location of the fracture (intra-articular, metaphyseal, or diaphyseal), the extent of soft-tissue injury and contamination, and the physiologic status of the patient. More than one fixation method may be applicable for the management of a specific injury; therefore, a surgeon's expertise and the availability of implants also should be considered (8).

In high-energy firearm injuries, the damage of the blast effect may be greater than the damage seen from the injury. Although neuropathic pain combined with peripheral nerve injury is difficult to treat, combined medication and rehabilitation may have increased the success of the treatment.

Lead poisoning can be seen in ballistic wounds especially seeding with numerous metal pellets. De Araújo et al. found a significantly higher frequency of memory loss, irritancy, weakness, trembling, tingling limbs, bad mood, joints pain, myalgia, daylight drowsiness, and abdominal pain among retained bullet fragments associated cases but did not find any relation to retained bullet fragments duration (9). In the case under consideration for this patient, no signs of lead poisoning were found in the short and long term.

Gunshots involving major joints, especially the hip, could be lethal due to concurrent trauma to major neurovascular tracts (4,5). The comminuted femoral neck and periarticular soft tissue injuries made open reduction with internal fixation difficult. Open reduction and internal fixation with cancellous bone screws (for the younger patients) and hemiarthroplasty (for the elderly patients) yield the best short-to-midterm results (3). The nature of the high-energy ballistic injury increases the possibility of infection that may have contributed directly to prosthesis failure (7). As a result, we have treated the patient with three-stage surgery. The patient underwent total hip arthroplasty, and lived a functional, satisfying life after surgery.

## COMPLIANCE WITH ETHICAL STANDARDS

Each author warrants that the article entitled “A Successful Treatment Of Femoral Neck Open Fracture In Middle-Aged Adult: A Case Report” is original and has no conflict of interest and has no relevant financial interests in this manuscript.

We also warrant that all procedures performed in studies involving human participants were following the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards and informed consent was obtained from all individual participants included in the study.

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