

Ballistic Fractures of the Femoral Neck: Treatment and Outcomes

Sally Jo MD; Mitchel Obey MD; Marschall B Berkes MD; Christopher McAndrew MD; Anna Noel Miller MD
Washington University in St. Louis, 63110, MO, United States

Purpose: Treatment recommendations for femoral neck fractures in the young and elderly have been previously established, with positive outcomes. However, there is a paucity of literature discussing the management of femoral neck fractures due to gunshot injuries, and treatment is often based on expert opinion. The goal of this study was to review our experience in managing a series of patients with ballistic fractures of the femoral neck, and to discuss their outcomes and complications following various internal fixation methods.

Methods: Between 2009 and 2019, 20 patients were treated for femoral neck gunshot fractures (OTA 31B) at 1 Level-I trauma center. Patients had a mean age of 26 years (range, 16-46) and body mass index (BMI) 24.5 (range, 18.1-31.7). 95% were male. 14 patients were treated operatively via the following fixation methods: proximal femoral locking plate (PFLP; 3 patients), sliding hip screw (3), open reduction and internal fixation (ORIF) with cannulated screws (2), antegrade femoral nail (2), closed reduction and percutaneous pinning (CRPP; 1), ORIF (1), total hip arthroplasty (1), and cephalomedullary nail (1). Six patients with unicortical incomplete fractures were treated nonoperatively with 6 weeks of toe-touch weight-bearing precautions. Mean follow-up was 21 months (range, 0-89.4). Garden and Pauwel classifications were used. Complications specifically evaluated for included infection and nonunion.

Results: The average ISS was 15 (range, 4-50). Eight patients had at least 1 fracture in addition to the femoral neck, and 4 patients had a vascular injury that required repair. Shrapnel remained in the bone or soft tissue for 6 patients without any symptoms. All incomplete femoral neck fractures treated nonoperatively healed without complications. For fractures treated operatively, 53% were displaced. Transcervical vertical shear (Pauwel 3) was the most common fracture pattern, constituting 71% of operative fractures. There were 3 cases of nonunion, 2 of which required revision surgery. Two were aseptic nonunions after treatment with CRPP and PFLP. One was a septic nonunion with *Enterococcus cloacae* after irrigation and debridement of a groin wound prior to PFLP. There was 1 peri-implant fracture after PFLP.

Conclusion: Ballistic fractures of the femoral neck disproportionately affect the young. Vascular injuries and polytrauma are frequently associated, and a multidisciplinary, team-based approach should be used in the care of these patients. Incomplete fractures with unicortical involvement may be treated nonoperatively with weight-bearing precautions, and with good radiographic results. Complete fractures commonly exhibit a vertical shear pattern, for which a variety of fixation methods may be used. Fixation with PFLP was associated with the most complications in this small series; however, data was not significant due to the small numbers available for evaluation.