

THE JOURNAL OF BONE & JOINT SURGERY

JB&JS

This is an enhanced PDF from The Journal of Bone and Joint Surgery

The PDF of the article you requested follows this cover page.

Hoffa Fragment Associated with a Femoral Shaft Fracture. A Case Report

Ryan Miyamoto, Eric Fornari and Nirmal C. Tejwani

J. Bone Joint Surg. Am. 88:2270-2274, 2006. doi:10.2106/JBJS.E.01003

This information is current as of October 6, 2006

Reprints and Permissions

Click here to [order reprints or request permission](#) to use material from this article, or locate the article citation on jbjs.org and click on the [Reprints and Permissions] link.

Publisher Information

The Journal of Bone and Joint Surgery
20 Pickering Street, Needham, MA 02492-3157
www.jbjs.org

HOFFA FRAGMENT ASSOCIATED WITH A FEMORAL SHAFT FRACTURE

A CASE REPORT

BY RYAN MIYAMOTO, MD, ERIC FORNARI, MS, AND NIRMAL C. TEJWANI, MD

Investigation performed at the Department of Orthopaedic Surgery, Hospital for Joint Diseases, New York, NY

A coronal plane fracture of the femoral condyle (creating a so-called Hoffa fragment) has been well described in association with fractures of the supracondylar-intercondylar region of the distal part of the femur¹. This fracture has implications with regard to preoperative planning, the choice of surgical approach, implant selection, and functional outcomes.

Coronal plane fractures of the distal part of the femur are markers of high-energy injury mechanisms. Their presence warrants a thorough workup for other injuries associated with high-energy trauma such as fractures of the spine, pelvis, femoral neck, tibial plateau, ankle, and calcaneus. A Hoffa fracture can often be missed on plain radiographs. Nork et al. showed that up to 30% of coronal plane fractures were missed on plain radiographs of distal femoral fractures, often necessitating the use of computerized tomography for identification and preoperative planning².

While the association of a Hoffa fragment with a supracondylar-intercondylar femoral fracture has been well characterized, we are unaware of any previous reports on the isolated occurrence of a coronal plane fracture of a femoral condyle in association with an ipsilateral femoral shaft fracture. We report on a patient who sustained a femoral shaft fracture with an ipsilateral coronal plane fracture of the medial femoral condyle. The patient was informed that data concerning the case would be submitted for publication.

Case Report

A thirty-three-year-old right-hand-dominant man was riding a motorcycle when he was struck by a tractor trailer. He was immediately transported to a level-I trauma center, where he described severe pain in the left leg and arm. Gross deformities of the left arm and thigh were identified on physical examination. Both injuries were closed, and both extremities were neurovascularly intact. A transverse fracture of the left humerus was treated with a coaptation splint. A small effusion was present in the left knee, but there was no discrete tenderness to palpation over the patella or the medial or lateral joint lines. An anteroposterior radiograph of the left femur revealed a midshaft transverse fracture (Fig. 1). A skeletal traction pin was placed in the distal part of the left femur for provisional stabilization. After traction was applied, a radiograph of the left knee revealed a nondisplaced Hoffa fragment

of the medial femoral condyle and a proximal fibular fracture (Fig. 2). The patient was taken to the operating room for de-



Fig. 1
Radiograph showing a transverse fracture of the middle third of the left femoral shaft.



Fig. 2
Lateral radiograph of the left knee, demonstrating a minimally displaced coronal plane fracture of the medial femoral condyle.

finitive fixation of the left femoral fractures.

General anesthesia was administered, and the patient was placed supine on a radiolucent operating table. Before fixation of the fractures, the femoral shaft fracture was stabilized manually by one surgeon while a second assessed the knee. The knee was stable through a full range of motion and to both varus and valgus stress. The coronal plane fracture of the medial femoral condyle was confirmed under fluoroscopy. No fracture of the femoral head, neck, or intertrochanteric region was present. The patient underwent intramedullary nailing of the femoral shaft fracture with an antegrade piriformis locked femoral nail without complications (Fig. 3). We purposely used a femoral nail that was slightly shorter than usual so that its distal tip would not displace the medial condyle fracture, which was monitored fluoroscopically throughout the femoral nailing procedure. One proximal and two distal locking bolts were then placed without disruption of the Hoffa fragment.

The coronal plane fracture was addressed next. Internal fixation was performed with two screws placed under fluoroscopy from anterior to posterior, and good alignment of the condylar fracture was achieved (Figs. 4-A and 4-B). The knee

was reexamined and noted to be stable. There was no displacement of the fracture with stability testing.

Postoperatively, the patient remained non-weight-bearing for six weeks but was allowed to begin active and passive range-of-motion exercises on the first postoperative day. At the most recent follow-up examination (at three months), the patient reported no pain at the knee or hip. Physical examination revealed a full, painless range of motion of the knee, and radiographs showed good healing of the fractures with no step-off at the articular surface.

Discussion

The coronal plane fracture of the femoral condyle was initially described in 1904 by Hoffa³. The fracture is often missed on plain radiographs and is best seen on computed tomographic scans⁴. It is important to identify such a fracture because surgical fixation is the preferred method of treatment; nonoperative management often leads to malunion, nonunion, and further displacement of the fracture fragment⁵. Internal fixation of unicondylar fractures allows stable reconstruction of the distal articular surface of the femur and permits an early postoperative range of motion of the knee with very good long-term results⁶⁻⁸.

Although isolated bilateral unicondylar and unilateral bicondylar coronal plane fractures have been described, Hoffa fractures most frequently present as unilateral, unicondylar injuries associated with a supracondylar or intercondylar fracture of the distal part of the femur^{2,9-11}. This association requires that the orthopaedic surgeon be aware of the possibility of a coronal plane fracture when a patient presents with a distal femoral fracture and that the appropriate radiographic workup and preoperative planning be performed. This possibility of a Hoffa fracture does not necessarily come to mind when an orthopaedic surgeon sees a patient with an isolated femoral shaft fracture.

Butler et al. noted three Hoffa fractures in their study of intramedullary nailing of ipsilateral femoral shaft and distal femoral fractures¹². All three fractures occurred in association with an intercondylar femoral fracture. In one patient, the Hoffa fracture was recognized intraoperatively and open reduction and internal fixation of the fragment was performed prior to the intramedullary nailing. In the other two patients, the coronal plane fracture was not discovered until after the intramedullary nailing had been done. In both of those patients, a second operation was necessary and posttraumatic arthritis was seen at the time of follow-up. In addition, those two patients had the lowest knee function scores in the study. The authors concluded that any patient with an intercondylar fracture should, at the very minimum, be evaluated with lateral and oblique radiographs of the knee preoperatively to aid in the detection of a coronal plane fracture.

Barei et al. analyzed fixation techniques for noncontiguous fractures of the femoral neck, femoral shaft, and distal part of the femur¹³. All of the patients in the study had sustained high-energy injuries and had a Pauwel type-III (vertical) femoral neck fracture in addition to fractures of the femoral shaft and the distal part of the femur. The authors



Fig. 3

Postoperative radiograph of the left femur, showing good alignment of the fracture.

emphasized the need for acute fixation of the femoral neck component of the triad of injuries, with fixation of the fractures of the shaft and the distal part of the femur to be performed when the patient's general condition had been stabilized. Additionally, the authors noted that fixation of the fractures of the femoral neck and the distal part of the femur frequently dictated the type of fixation used for the femoral shaft fracture.

We found no reports of an isolated association between a Hoffa fracture and a femoral shaft fracture in our search of the English-language literature. This report illus-

trates that a coronal plane fracture can coexist with an ipsilateral femoral shaft fracture despite the absence of a supracondylar, intercondylar, or femoral neck component. We strongly recommend a complete set of knee radiographs, including anteroposterior, lateral, and oblique views, for all patients with a femoral shaft fracture in order to avoid missing this injury. In addition, we make radiographs of the distal part of the femur after placement of the traction pin. Finally, any knee abnormality, such as ecchymosis, effusion, or instability, observed during the physical examination should alert the physician to the possibility of an



Fig. 4-A



Fig. 4-B

Figs. 4-A and 4-B Anteroposterior and lateral radiographs of the knee, showing internal fixation of the coronal plane fracture in excellent alignment.

associated injury and should trigger a more extensive workup preoperatively as well as a thorough knee examination intraoperatively.

Ideally, radiographs of the knee should be made before placement of a traction pin, as the pin could displace a Hoffa fracture fragment, especially one of the medial condyle. Additionally, a traction pin placed into a Hoffa fragment would do little to reduce or stabilize it and could contaminate the fracture site. We were fortunate that neither of these complications occurred in our patient. Our protocol of obtaining a complete set of knee radiographs allowed us to identify the unexpected injury preoperatively, adequately plan the surgical approach, and avoid a reoperation. ■

Ryan Miyamoto, MD
Department of Orthopaedic Surgery, NYU-Hospital for Joint Diseases,
301 East 17th Street, New York, NY 10003. E-mail address:
miyamr01@med.nyu.edu

Eric Fornari, MS
SUNY-Downstate School of Medicine, 450 Clarkson Avenue, Brooklyn,
NY 11203. E-mail address: Eric.Fornari@downstate.edu

Nirmal C. Tejwani, MD
Department of Orthopaedic Surgery, NYU-Hospital for Joint Diseases,
550 First Avenue, NBV 21W37, New York, NY 10016. E-mail address:
Nirmal.tejwani@nyumc.org

The authors did not receive grants or outside funding in support of their research for or preparation of this manuscript. They did not receive payments or other benefits or a commitment or agreement to provide such benefits from a commercial entity. No commercial entity paid or directed, or agreed to pay or direct, any benefits to any research fund, foundation, educational institution, or other charitable or nonprofit organization with which the authors are affiliated or associated.

doi:10.2106/JBJS.E.01003

References

1. Baker BJ, Escobedo EM, Nork SE, Henley MB. Hoffa fracture: a common association with high-energy supracondylar fractures of the distal femur. *AJR Am J Roentgenol.* 2002;178:994.

2. Nork SE, Segina DN, Aflatoon K, Barei DP, Henley MB, Holt S, Benirschke SK. The association between supracondylar-intercondylar distal femoral fractures and coronal plane fractures. *J Bone Joint Surg Am.* 2005;87:564-9.

- 3.** Hoffa A. Lehrbuch der Frakturen und Luxationen. Stuttgart: Ferdinand Enke-Verlag; 1904. p 453.
- 4.** Allmann KH, Althoefer C, Wildanger G, Gufler H, Uhl M, Seif el Nasr M, Langer M. Hoffa fracture—a radiologic diagnostic approach. *J Belge Radiol.* 1996;79:201-2.
- 5.** Kumar R, Malhotra R. The Hoffa fracture: three case reports. *J Orthop Surg (Hong Kong).* 2001;9:47-51.
- 6.** Ostermann PA, Neumann K, Ekkernkamp A, Muhr G. Long term results of unicondylar fractures of the femur. *J Orthop Trauma.* 1994;8:142-6.
- 7.** Lewis SL, Pozo JL, Muirhead-Allwood WF. Coronal fractures of the lateral femoral condyle. *J Bone Joint Surg Br.* 1989;71:118-20.
- 8.** Holmes SM, Bomback D, Baumgaertner MR. Coronal fractures of the femoral condyle: a brief report of five cases. *J Orthop Trauma.* 2004;18:316-9.
- 9.** Calmet J, Mellado JM, Garcia Forcada IL, Gine J. Open bicondylar Hoffa fracture associated with extensor mechanism injury. *J Orthop Trauma.* 2004;18:323-5.
- 10.** Papadopoulos AX, Panagopoulos A, Karageorgos A, Tyllianakis M. Operative treatment of unilateral bicondylar Hoffa fractures. *J Orthop Trauma.* 2004;18:119-22.
- 11.** Agarwal S, Giannoudis PV, Smith RM. Cruciate fracture of the distal femur: the double Hoffa fracture. *Injury.* 2004;35:828-30.
- 12.** Butler MS, Brumback RJ, Ellison TS, Poka A, Bathon GH, Burgess AR. Interlocking intramedullary nailing for ipsilateral fractures of the femoral shaft and distal part of the femur. *J Bone Joint Surg Am.* 1991;73:1492-502.
- 13.** Barei DP, Schildhauer TA, Nork SE. Noncontiguous fractures of the femoral neck, femoral shaft, and distal femur. *J Trauma.* 2003;55:80-6.