CASE REPORT

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Arthroscopy-assisted treatment of Hoffa fracture associated with ipsilateral femoral shaft, tibial eminence and Malgaigne fractures

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Hoffa fracture associated with ipsilateral femoral shaft fractures is a rare clinical entity. We present a previously unreported multi-trauma case with a unique fracture combination of ipsilateral Hoffa, tibial eminence, femoral shaft and Malgaigne fractures. The Malgaigne fracture was treated non-operatively while the other three fractures were operated with arthroscopic and assisted techniques. Despite the use of minimally invasive techniques, the patient experienced postoperative soft tissue problems. In follow-up, all fractures healed with a good functional outcome. The application of a minimally invasive technique in such a high-energy trauma is crucial for prevention of soft tissue complications.

Key words: Eminence fracture; femoral fracture; hoffa fracture; malgaigne fracture; retrograde femoral nail.

A Hoffa fracture is a type of supracondylar distal femoral fracture with a fracture line in the coronal plane.[1] Such fractures have a high-energy mechanism and care must be taken to evaluate the whole extremity from the calcaneus to the pelvis. The association between Hoffa fractures and distal supracondylar and intercondylar femoral fractures has been presented in different studies.[2] However, only one case has presented Hoffa fractures associated with an ipsilateral femoral shaft fracture.[3]

We report an unusual type of Hoffa fracture in a patient with ipsilateral tibial eminence, femoral shaft and Malgaigne fractures.

Case report

A 31-year-old female was hit by a truck and crushed between the truck and a wall. In the emergency room, she was conscious, cooperative and all vital signs were stable. There was no evident cranial, thoracic, or abdominal injury. She described severe pain in the right knee, thigh and hip. The right lower extremity was held in external rotation. A severe contusion was evident in the medial aspect of the distal thigh and there were two skin lacerations on the lateral aspect of the right knee. The right foot, ankle and cruris were pain-free. The knee and the distal thigh were severely swollen and fracture crepitus

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Fig. 1. **(a)** X-ray showing distal femoral shaft and Hoffa fractures of the right knee. **(b)** CT image showing tibial eminence and Hoffa fractures of the right knee. **(c)** X-ray showing Malgaigne fracture of the pelvis. (d) CT image showing the posterior involvement of the sacroiliac joint.

Fig. 2. Perioperative fluoroscopy image showing short distal locking screw not interfering with the cannulated screws fixing the Hoffa fracture.

could be palpated on the distal third of the femur. The pelvic compression test was positive with pain on the right groin. Distal pulses on both lower extremities were palpable and neurological assessment was normal.

Plain radiographs and computed tomography (CT) revealed tibial eminence, medial femoral condyle, femoral shaft and pelvic fractures of the right lower extremity (Fig. 1). Fractures were classified as tibial eminence Type 2 fracture, medial femoral condyle coronal plane fracture (Hoffa), distal third femoral shaft fracture (Winquist Type 2), non-displaced ramus pubis-ischium pubis and posterior iliac fractures (Malgaigne fracture). Due to the lacerations located on the lateral aspect of the right knee, the femoral shaft and intra-articular fractures were classified as Gustilo Type 2 open fractures.

Open wounds were debrided and sutured in the emergency room. Surgery was planned for the tibial eminence, Hoffa and femoral shaft fractures. Provisional stabilization of the lower extremity was performed by skeletal traction through the tibial tubercle. Conservative treatment was planned for the pelvic fractures.

Under general anesthesia, the patient was placed in the supine position on the operation table. After proper draping, anteromedial and anterolateral arthroscopy portals were prepared on the right knee. A gravity pump was used for joint irrigation. Using arthroscopic visualization, the Hoffa fracture was reduced to its anatomical position and stabilized with K-wires. Under fluoroscopic guidance, two 5.0 mm titanium cannulated screws were placed through anterior stab incisions for fixation of the Hoffa fracture. The distal femoral shaft fracture was then reduced and fixed with a retrograde intramedullary nail through a 3 cm medial parapatellar incision with the help of arthroscopic and fluoroscopic visualization. The most distal locking screw of the intramedullary nail was chosen short to prevent engagement with the screws fixing the Hoffa fracture (Fig. 2). After distal and proximal locking of the intramedullary nail, reduction and stability of the femoral shaft and Hoffa fractures were carefully evaluated using fluoroscopy. The tibial eminence fracture was addressed in the next step. Arthroscopic cannulas of 7 mm were placed in the anterolateral and anteromedial portals. The tibial eminence was reduced and two tibial tunnels were prepared in the medial and lateral borders of the eminence using an anterior cruciate ligament tibial guide pin (Smith & Nephew Endoscopy, Mansfield, MA, USA) and a 4.5 mm cannulated drill. No.2 non-absorbable sutures were passed through the anterior cruciate ligament using a suture lasso (Arthrex, Inc., Naples, FL, USA). The medial and lateral free ends of the sutures were passed through the tibial tunnels using a guide pin (with a suture loop) as a suture shuttle

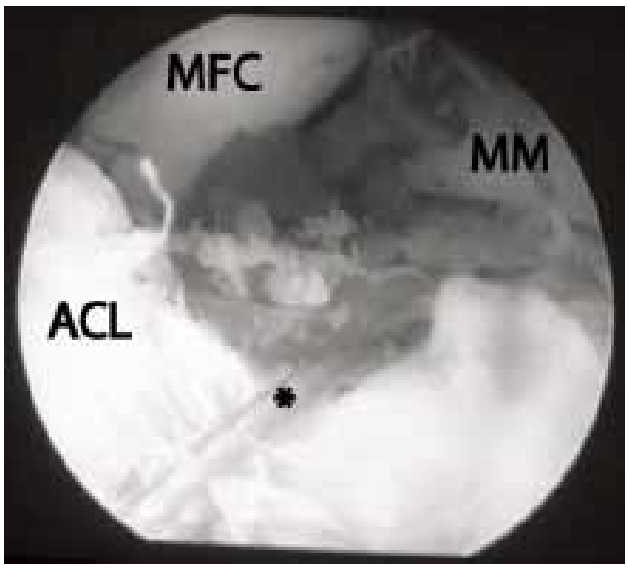

Fig. 3. Arthroscopy image showing the traction suture holding the tibial eminence. (ACL: anterior cruciate ligament, MFC: medial femoral condyle, MM: anterior horn of the medial meniscus, *suture holding the eminence in place).

in a retrograde manner. Sutures were tied on the anteromedial cortex of tibia and reduction and stability were controlled arthroscopically (Fig. 3).

Skin necrosis developed over the contusion area in the medial aspect of the distal thigh postoperatively (Fig. 4). The size of the lesion was approximately 10x3 cm and treated with a split thickness graft in the postoperative 3rd week.

The patient underwent non-weight bearing therapy for 6 weeks with passive and active range of motion exercises. At the 3rd month follow-up, she described no pain in her knee, thigh and hip. The patient was able to actively flex her knee and hip 100 degrees without pain (Fig. 5). Plain radiographs revealed good healing in all fractures without articular step (Fig. 6). At the second year follow-up, patient was pain-free. The Lachman and pivot tests and varus and valgus stress tests were negative.

Fig. 4. Postoperative skin necrosis over the medial aspect of the right thigh.

Discussion

Hoffa fractures are usually associated with supracondylar and intercondylar femoral fractures. We have presented a unique combination of ipsilateral Hoffa, tibial eminence, femoral shaft and Malgaigne fractures. Coronal type condylar fractures usually occur as a result of a high-energy axial loading on a flexed knee. The number of fractures in the right lower extremity indicated a

Fig. 5. **(a)** In the third month follow-up, patient had 100 degrees of active knee and hip flexion. **(b)** Right knee of the patient showing complete soft tissue healing.

Fig. 6. Follow-up X-rays showing complete union of the femoral shaft, Hoffa and eminence fractures.

high-energy trauma. In the present case, the patient was crushed between a truck and a wall. Initial direct trauma on the thigh during semi-flexion by the bumper of the truck may explain the Hoffa fracture, femoral shaft and tibial eminence avulsions. As the truck could not stop, the patient was crushed between the hood and the wall, which may explain the pelvic trauma.

The severe contusion of the soft tissues due to the compressive nature of trauma complicated this case. The timing of surgery in such cases is controversial and was delayed for one week in the present case. In order to prevent a possible soft tissue problem and avoid secondary knee stiffness, arthroscopy-assisted techniques were chosen for all three interventions. Arthroscopy-assisted techniques have been described for femoral condyle fractures and retrograde femoral nailing.[4,5] In the present case, the surgical plan was to start with the most difficult fracture (Hoffa) and to continue with the rest with a minimally invasive technique.

The Hoffa fracture was reduced using arthroscopic visualization and fixation was achieved with two cannulated screws. Femoral retrograde nailing was performed with arthroscopic assistance and only a small incision was made for intramedullary guide application. The tibial eminence fracture was fixed with a similar fixation technique described by Owens et.al[6] but the procedure was completed arthroscopically. Fractures and soft tissue injuries around the knee joint may cause fluid extravasation that can cause serious complications such as compartment syndrome. In order to prevent fluid extravasation, the leg was firmly draped below the knee level and a gravity pump was used with caution. Throughout the procedure, the proximal tibial soft tissues were palpated frequently in order to control a possible extravasation. No extravasation was observed during the surgery.

Arthroscopy-assisted fracture fixation has many advantages, such as superior visualization, limited soft tissue dissection, better evaluation of associated chondral and ligamentous injuries, and reduced morbidity.[7] Limitations include the need for more experience, risk of fluid extravasation and the need for special equipment.

In the postoperative period, skin necrosis developed over the contusion area on the medial aspect of the distal thigh, possibly formed due to the initial trauma. This necrosis was treated with a local, split thickness graft without any complication. A more extensive surgery in this patient could have ended with serious soft tissue complications. Postoperative early non-weight bearing physical therapy with passive joint motion provided a good functional outcome.

In conclusion, a unique case of Hoffa fracture combined with femoral shaft, tibial eminence and Malgaigne fractures can be successfully treated by arthroscopy-assisted techniques with a proper preoperative planning. The use of a minimally invasive technique in such a high-energy trauma is crucial for prevention of soft tissue complications.

Conflicts of Interest: No conflicts declared.

References

1. Kumar R, Malhotra R. The Hoffa fracture: Three case reports. J Orthop Surg (Hong Kong) 2001;9:47-51.
2. Nork SE, Segina DN, Aflatoon K, Barei DP, Henley MB, Holt S, et al. The association between supracondylar-intercondylar distal femoral fractures and coronal plane fractures. J Bone Joint Surg Am 2005;87:564-9. CrossRef
3. Miyamoto R, Fornari E, Tejwani NC. Hoffa fragment associated with a femoral shaft fracture. A case report. J Bone Joint Surg Am 2006;88:2270-4. CrossRef
4. Demirel M, Dereboy F, Ozturk A, Turhan E. Arthroscopically assisted intra-articular lateral femoral condyle fracture surgery. Arthroscopy 2006;22:690.1-4.
5. Gliatis J, Kouzelis A, Matzaroglou C, Lambiris E. Arthroscopically assisted retrodrade intramedullary fixa-

tion for fractures of the distal femur: technique, indications and results. Knee Surg Sports Traumatol Arthrosc 2006;14:114-9. CrossRef

6. Owens BD, Crane GK, Plante T, Busconi BD. Treatment of type III tibial intercondylar eminence fractures in skeletally immature athletes. Am J Orthop (Belle Mead NJ) 2003;32:103-5.
7. Atesok K, Doral MN, Whipple T, Mann G, Mei-Dan O, Atay OA, et al. Arthroscopy-assisted fracture fixation. Knee Surg Sports Traumatol Arthrosc 2011;19:320-9.