

## Case Report

## Osteochondral avulsion fracture of the posteromedial tibial plateau

G. Caggiari<sup>\*</sup>, E. Ciurlia, S. Ortu, R. Sirianni<sup>1</sup>, L. Bonini<sup>1</sup>, F. Pisanu, C. Doria, M. Manca<sup>1</sup>

Orthopaedic Department, Sassari University Hospital (Italy), Viale San Pietro 43b, Sassari, Italy

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## ABSTRACT

Posteromedial tibial plateau avulsion fracture caused by semimembranosus muscle is not easy to detect by X-ray. The literature regarding this issue is poor, also mechanism is extensively disputable. This lesion was often connected to an anterior cruciate ligament (ACL) rupture and medial meniscal horn lesion. In this work, we described a posteromedial tibial plateau avulsion fracture at the semimembranosus insertion. In particular, we referred to the surgical treatment of those transversal osteochondral fractures.

## Clinical case

A 23 years old male reported a knee injury while was playing soccer. The traumatic mechanism was due to a collision with another player during a change of direction. The patient arrived at the emergency room walking with an antalgic gait and a crutch the day after the injury. ROM of the knee was limited in flexion and extension both actively and passively with a Tegner Lysholm Knee Scoring Scale of 25. At the physical examination he presented a swelling of the knee and a severe and permanent pain during weight-bearing, on the affected leg. Moreover, he reported knee instability with episodic ROM gap when trying to improve flexion.

He couldn't use stairs and perform movements like squat, ROM was 10°–80° with negative instability tests.

X-ray evaluations presented a posteromedial tibial plateau fracture with a disruption of a bone portion (Fig. 1A, B, C) in association with an anteromedial detachment of a bony fragment. A three-dimensional CT scan was realized to define the exact position and dimension of the fragment that was rotated at 90° in the sagittal plane with the articular surface oriented anteriorly (Figs. 2, 3). An MRI exam was not performed in reason of a possible overestimation of the fragment, as confirmed by literature, even if this analysis might have given more information about muscle relationships and ligament conditions [1].

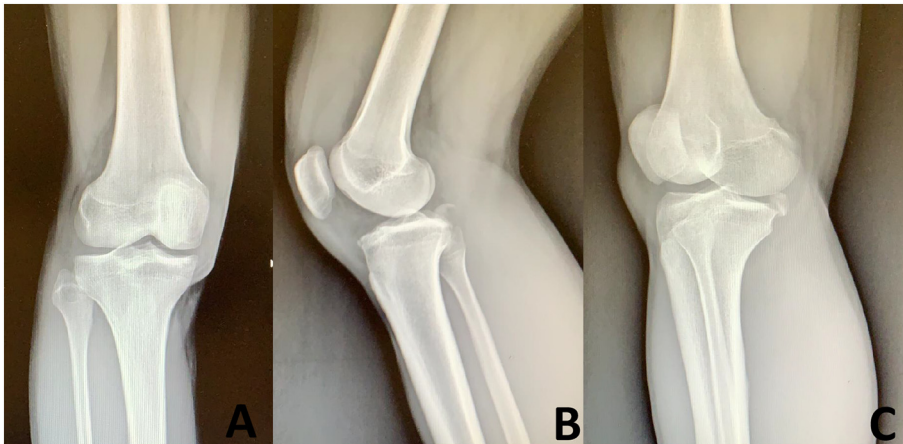
## Surgery technique

Surgery was performed under general anesthesia. The patient was placed in the supine position with a high thigh tourniquet not inflated. We opted for direct and open surgery access, without any arthroscopic surgery time, since the injury was a true articular bony lesion [2]. A posteromedial approach to the knee was performed through a curved incision from medial femoral epicondyle to the posteromedial tibial border with the knee slightly flexed. After fascia incision, the conjoined medial knee tendons (pes anserinus) were identified and exposed and the articular capsule was dissected between menisci and tibial plateau rim. At this point, the osteochondral fragment was visualized, and fracture surface was debrided. The avulsed fragment was de-rotated and reduced in its

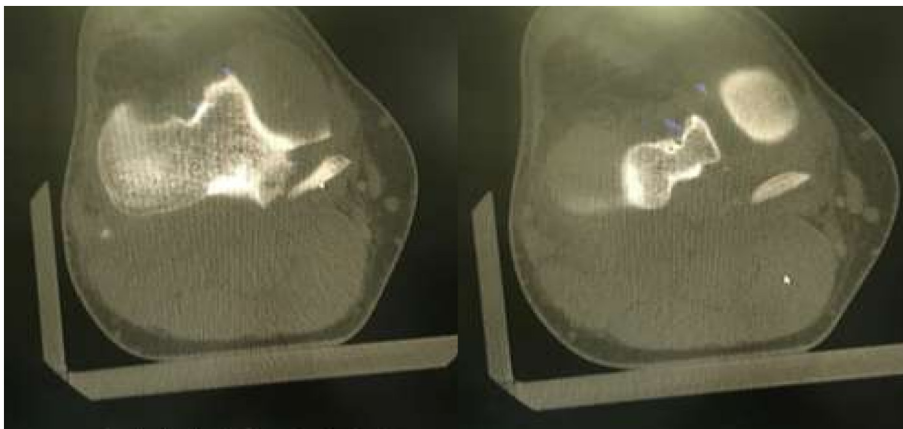
<sup>\*</sup> Corresponding author at: Sassari, S.v. La Landrigga 34b, Italy.

E-mail address: [gianfilippocaggiari@gmail.com](mailto:gianfilippocaggiari@gmail.com) (G. Caggiari).

<sup>1</sup> Orthopaedic Department – Versilia Hospital (Italy) – Lido di Camaio via Aurelia n. 335.



**Fig. 1.** 23 years old male patient reported a knee injury while was playing soccer. (a) Anteroposterior X-ray view showing an anterolateral depression fracture. (b) Lateral X-ray view with a posteromedial tibial plateau fracture. (c) 30° extra-rotated lateral view with a better visualization of the fragment.



**Fig. 2.** Transverse scans of computed tomography demonstrate a fracture of the posteromedial tibial plateau.



**Fig. 3.** CT images delineating the displaced fragment. Note that the displaced fragment has rotated 90° in the sagittal plane.

original position without reattachment of semi membranous fiber to obtain a good stability in all directions.

Once the fragment was reduced in its anatomical position, the stability of the osteochondral piece was excellent in the coronal and axial planes in reason of the intrinsic stability ensured by the subchondral surface. Instead, the stability in the sagittal plane was not appropriate due to directional force line of the residual semimembranosus muscle during knee flexion. For this reason, we utilized a bone reduction forceps and a periosteal elevator to push down the avulsed fragment in its original position. After the reduction with 2 K-wire (Fig. 4), we synthesized the fracture with 2 HCS screws (2,4 × 3,0 mm), directed supero-inferiorly from lateral to medial, independently of distal femoral condyles impediment. The anteromedial depression fracture was reduced with 3 HCS screws



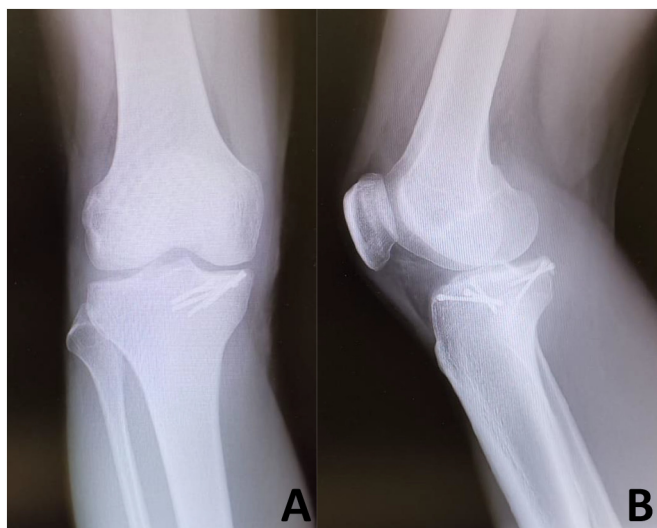
**Fig. 4.** Fluoroscopic intraoperative lateral knee image showing reduction of posteromedial osteochondral fragment with 2 K-wires.

( $3 \times 36$  mm;  $2,4 \times 30$  mm;  $2,4 \times 30$  mm) inserted through the same surgical approach (Fig. 5). The posterior articular capsule was sutured with Vicryl # 1 simple interrupted stitches. Knee was then immobilized with an adjustable knee brace at 20 degrees of flexion. We did not use an intraarticular injection of PRP, growth factors or hyaluronic acid [5].

We treated this fracture differently to other authors that highlighted surgical issues related to getting access to the fragment [3,4].

### Discussion

This pattern of fracture, with a rotation of the avulsed fragment, is not usual in daily clinical and surgical activities. In this case, the treatment is completely different compared to common tibial plateau fractures, in which it is possible to adopt multiple surgical solutions [6,7]. For this issue, literature is poor, and a pathogenic mechanism is still not clear. Yao et al. and Vanek et al. firstly



**Fig. 5.** (a, b): The anteromedial depression fracture was reduced with 3 HCS screws ( $3 \times 36$  mm;  $2,4 \times 30$  mm;  $2,4 \times 30$  mm) inserted through the same surgical approach. Plain radiographs ((a) frontal and (b) lateral views) at 6 month follow-up showing bony union.



Fig. 6. The patient recovered flexion and extension to control at 6 months.

described this type of lesion due to semimembranosus but in association with an ACL rupture [8,9]. Chan et al. connect this lesion to ACL. Yao et al. and Chan et al. supposed a pathogenic mechanism in external rotation and valgus direction for this lesion [10], while Vanek observed similar pattern of fracture in a cadaveric study with an external rotation and varus direction [9]. Only two studies had described a posteromedial tibial plateau fracture in association with PCL rupture [11,12]. In our clinical case, there was no association with ACL rupture or a meniscal lesion.

Several studies reported a posteromedial tibial plateau avulsion fracture in association with a PCL rupture, medial meniscal lesion, and laceration of the posterior articular capsule [12]. Meanwhile, other authors described a case of similar avulsion fracture pattern in connection with damage of PCL and medial meniscus (posterior horn) [11]. ACL was intact in both cases [13]. Systemic environment can be another cause of bone healing failure and non union, but it is essential to respect biomechanical principles to reduce failure percentage [14].

In our case study, the osteochondral fragment was composed by a major chondral portion and a relatively small bone component.

We did not use intra articular injection of PRP, growth factors or hyaluronic acid from the postoperative period until 6 months after surgery for the pathogenetic mechanism and treatment applied [15,16]. Post operative period was normal.

At 12 weeks after surgery, an X-ray evaluation showed complete healing of the fracture.

At 6 months follow up, the patient had no pain or knee anterior instability with a negative posterior drawer test at the physical examination (Fig. 6). The knee was stable for the entire range of motion without swelling obtaining 94 at Lysholm score, so the patient returned to his pre-injury physical activity with the general protections.

## Conclusions

We described an uncommon clinical case about posteromedial tibial plateau avulsion fracture and the surgical technique applied to treat the lesion. We believe that osteosynthesis, like the one we have shown, is optimal for this fracture especially in reason of the obtained clinical results. Traumatologists have to evaluate in detail this uncommon fracture pattern as it can be underestimated with clinical examination or imaging. Any missed diagnosis will lead to chronic pain, functional limitation and articular incongruity at the end.

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