Rebound ACL Case Study

Acute femoral ACL rupture & osseous avulsion fractures
of the medial+lateral posterior meniscus root

Priv.-Doz. Dr. med. Dr. rer. nat. Thomas Stein

Executive senior physician in the department for Sport traumatology

- Knee- and shoulder surgery

Berufsgenossenschaftliche Unfallklinik Frankfurt am Main

Member of Ligament committee German Knee society (DKG)

Member of Research committee Society for Arthroscopy and Joint Surgery (AGA)

Frankfurt, Germany
email address

Indication

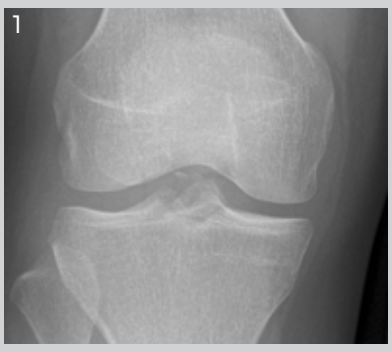
A 19 year old woman was primary treated in another hospital and came with on conventional radiographs (CR) based diagnosis of an emintia avulsions fracture to the ambulance to the local emergency room. The leg was initially stabilized in a conventional brace. The patient described an isolated knee torsions injury with valgus and external rotation at a bicycle accident, as she tried to avoid to fall.

The first preclinical survey let assume an acute anterior knee instability without any high grade concomitant ligament injuries.

Diagnostics

Clinical examination:
The initial inspection and palpation showed no injury of the integument, but a swollen capsule with existing joint effusion. There was no tenderness of palpation at the medial or lateral collateral ligaments (MCL and LCL). Without any signs of mechanical limitation indicating a bucket- handle meniscus injury, the joint effusion restricted the range of motion (ROM) to 0-0-45. The examination of the ligament status revealed in 0° and 30° flexion a stable medial ligament and lateral collateral ligament complex. The biceps femoris tendon showed no abnormalities. The examination of the anterior cruciate ligaments (ACL) detected positive results for the anterior Lachman test and the anterior drawer test (ADT). As result of the joint effusion and the painful examination status, the pivot shift test was not valid performable. All test for posterior cruciate ligament (PCL) and the posterolateral complex (PLC) were negative. The first clinical survey agreed to the preclinical diagnosis of an acute anterior knee instability.

Conventional radiographs
The external CR (knee anteroposterior view and lateral view) confirmed the internal radiology protocol and were re- assessed. The re- assessment of the lateral view revealed an osseous avulsion fracture directly posterior to the anatomic tibial anterior cruciate ligaments (ACL) insertion and anterior to the posterior cruciate ligament (PCL) insertion. The anteroposterior view detected multiple fracture lines at the eminentia region (pic 1+2).


1


2

FUNCTIONAL HEALING® BY ÖSSUR

Diagnostics

Computer tomography

The Computer tomography (CT) assessment revealed the dislocated osseous avulsion fracture of the medial posterior meniscus root (pic 3) and a minimally dislocated periostal avulsions fracture of the lateral meniscus root (pic 4). There was no eminentia avulsion fracture of the ACL detectable.

Magnetic resonance imaging

The Magnetic resonance imaging (MRI) assessment confirmed the CT diagnosis of acute osseous avulsion fracture of the medial (pic 5, white arrow) and a periostal avulsion of the lateral posterior meniscus root (pic 6, blue arrow). There were no signs of interior meniscus injuries. Additionally, the MRI clarified the clinical anterior knee instability and showed a proximal insertion- near ACL- rupture (pic 6, white arrow). The bone bruise signs loco typico (lateral condyle and posterolateral tibia) indicated an acute ligament rupture of the ACL. The were no further injuries of the medial and lateral collateral ligament complexes or the PCL/PLC. There were no signs of extended cartilage defects.

Treatment Overview / Treatment Goal

The acute dislocated avulsion fractures of the posterior medial and lateral meniscus roots display the indication for an early arthroscopic intervention. The therapy options for the ACL injury are the primary refixation and additive transarticular augmentation with FibreWire systems or the planned two- step ACL reconstruction.

The surgical goal was the one-step double transtibial root repair in combination with the arthroscopic transfemoral ACL-refixation with additive transarticular augmentation. Because of the acute tibia head fracture situation with strongly restricted postoperative rehabilitation existed an increased risk of an arthrofibrosis, therefore the one- step osseous root-repair in comination with an ACL- reconstruction was not planned. In case of a not repair-able ACL injury, the early ACL- reconstruction 8 – 10 weeks after root- repair was scheduled.

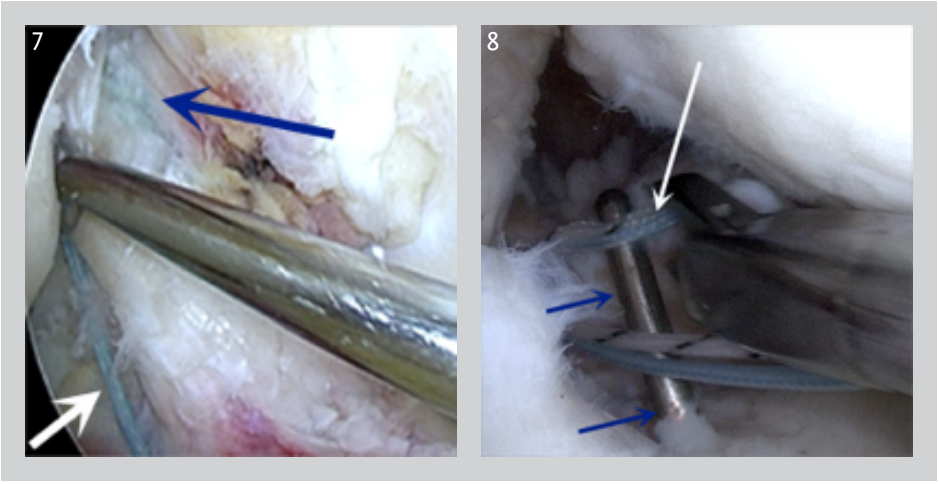
The postoperative rehabilitation protocol contents the initial stabilization with a dynamic ACL brace for 8 weeks without weight bearing. The dynamic stabilization including muscle building physiotherapy and neuromuscular practices start after the brace application.

Surgical Treatment

Arthroscopic procedure:

After applying the tourniquet, the portal placement was set analogue to an ACL reconstruction with an high para-tendinous anterolateral and a deep suprameniscal anteromedial portal, additionally the high anteromedial portal will be placed with regards to the posterior lateral meniscus root. The intraoperative situs confirmed the pre- operative diagnosis regarding the root- lesions and the proximal ACL injury.

ACL- refixation: For the ACL- repair, FibreWire No2 (FW, Arthrex) is used. For the ACL- repair, the FW No2 is shuttled through the distal ACL- remnant (shuttle-device Suture-Lasso, Arthrex). Using the tibial and femoral drilling guides, two 2.4mm drill wires are placed at the femoral and at the tibial ACL- insertion area.



The trans- femoral drill wires were used to retrieve the both ACL- refixation FW (size No2) and the both trans- articular FW No5. Addionally, the bone- marrow-stimulation procedure (micro- fracturing) was applied at the femoral ACL insertion area (pic 7 blue arrow = ACL refixation; white arrow = augmentation).

Root repair

The fracture zone of the osseous avulsion root lesions were debrided with the shaver, until each osseous fragments were reduce- able to the anatomic region with the probe. Two drill wires (diameter 2.4mm) were placed in each tibial fracture zone of the lateral and medial posterior meniscus root injury. Using the Suture- Lasso (Arthrex), a cross- U- stich with each two FW No2 were set directly about the osseous insertion at the fragment of the medial and the lateral meniscus horn. These FW No2 were shuttled throught the two drill wire holes of each meniscus root fracture zone (pic 8 blue arrow = Suture- retriever; white arrow = FW No2).

All trans- tibial suture placements were set superior to the pes anserinus tp preserve the hamstrings for a later ACL reconstruction. Picture 9 shows the overview of suture placements. Because of an old pretibial scare, the incision had to be performed in a horizontal line (pic 11).

After placing the knee in 30 degree of flexion and internal rotation, sutures are knotted in following order:

a) Trans- articular FW b) Trans- femoral ACL- refixation c) Trans- tibial root- repair medial and lateral

Post-Surgical Rehabilitation

The initial conventional brace is applied directly in the operation room after wound closing. The custom- made rebound orthosis can be assessed at the contralateral knee after surgery. After reduction of swelling and effusion, the custom- made orthosis can be applied.

The postoperative rehabilitation protocol contents the initial stabilization with this specific dynamic ACL brace for 12 weeks with partial weight bearing (PWB) from the 9th postoperative week and full weight bearing (FWB) from the 12th week. The dynamic stabilization including muscle building physiotherapy and neuromuscular practices start after the brace application.

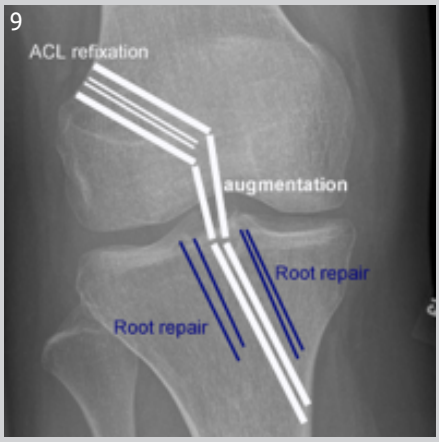
ITEM	PHASE I (week 1 – 2)	PHASE II (week 3-6)	PHASE III (7-12 week)	PHASE IV (week 13-52)	PHASE V (week 53 -)
Orthosis	Immobilizer–24h/day	Rebound–24h/day	Rebound–24h/day	Discontinue brace over time	—
Weight bearing	No WB	No WB	7+8 No WB 9+10 PWB 11 - FWB	FWB	FWB
ROM	0 -0- 30 passive	0 -0- 60 active	0-0-90 active 0-0-90 active	0 -0- free active	0 -0- free active
Physio	PRICE Muscle activation EMS NO CPM	Muscle activation EMS NO CPM	Muscle activation EMS NO CPM	dynamic stabilization muscle building neuromuscular practices	Return to sport: 90% of muscular strength neuromuscular recovery ligamental stability dynamic stabilization

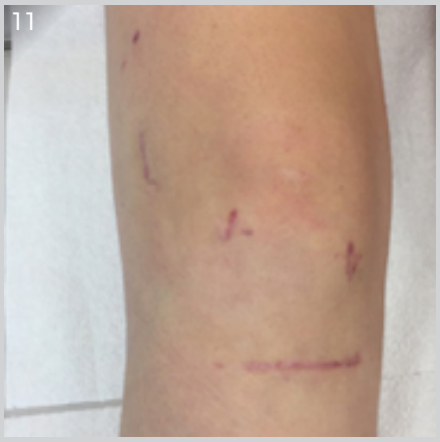
Reasons To Use The Rebound ACL Brace

The custom- made orthosis specifically protects the repaired menissu structures, while the ligamental healing process (ACL) is not able to protect the posterior horns of the menisci (secondary anterior stabilization). Herewith, the complete joint preserving restoration of the posterior meniscus horn avulsions fractures and the ACL- preserving ligament repair was successful.

Clinical Outcome

The applied treatment strategy results in a good ligamental consolidations. The ACL shows minimally remaining partial instability (Lachman+/ ADT+) without rotational instability. All clinical meniscus signs were negative. The radiologic follow up control documented the adequate consolidation of the posterior root fragments (pic 9+10) with a minimal invasive approach (pic 11). The goal of the postoperative rehabilitation remain to decrease the persisting dynamic instability and neuromuscular deficits.





Conclusion

The anatomic ligament repair with complex meniscus avulsion root repairs can be treated in an one- step- procedure with a dynamic orthosis treatment during the early rehabilitation phase.

FOLLOW ÖSSUR ON

TEL (949) 382-3883
CANADA (800) 663-5982
WWW.OSSUR.COM

ÖSSUR®
LIFE WITHOUT LIMITATIONS