

**EDITORIAL**



**Medial Collateral Ligament Injury;  
A New Classification Based on MRI  
and Clinical Findings. A Guide for  
Patient Selection and Early Surgical  
Intervention**

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**M**edial collateral ligament (MCL) injury, is one of the most common ligament injuries of the knee. This injury mostly results from a valgus force in sport events, motor vehicle accidents or fall from height (1). MCL injury occurs either in isolation or together with other knee ligaments such as O'Donogou unhappy triad or knee dislocations. If not well diagnosed and treated, might end up with persistent instability, pain and loss of function (2, 3).

Restoration of function and going back to the pre-injury level of function is the aim of treatment in ligament injuries of the knee. The ideal outcome would be a stable, pain free knee with good range of motion.

However, medial side injuries are heterogenous. The complex anatomy of this region has led to difficulty in planning with a standard algorithm for treatment (4). Knowing the MCL anatomy makes it much easier to understand the patho anatomy and choosing the right method of treatment whether conservative or surgical, based on clinical examination and MRI

findings to achieve a stable knee with near normal function and return to pre-injury level of activity as soon as possible.

There are multiple soft tissue structures in medial side that play an important role in relation to each other to retain medial side stabilization and resist against valgus forces.

Superficial MCL, the largest structure, Posteromedial capsule (PMC) and it's thickening that is often referred as posterior oblique ligament (POL) , and deep MCL as the thickening of joint capsule play an important role in stability of the medial side of the knee. Pes anserinus specifically semi membranous and hamstrings also help the posteromedial corner stability (5-7).

MCL as a most identifiable structure usually considered as the most important unit in the treatment process. The MCL is like the sale of a boat, becomes wider and thinner as it descends towards it's tibial attachment. We assume that if the mast is not vertical, the sale is not in full mast and not working properly.

An old MCL injury classifications defined by American

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Figure 1. Type I Pre avulsion injury.



Figure 2. Type II Avulsion injury.

Medical Association (AMA) in 1966, was rather confusing because of difficulty in comparison of treatment results (8). Hughston in 1976 standardized MCL injury classification, and revised by him in 1994.

In severity grading system, grade I is few fibers injury, local tenderness without instability, grade II is more fiber damage and more extent tenderness but without or slight instability and abnormal motion. And grade III is complete tear with distinct instability (9).

Instability in grade III divides in three degrees of severity with valgus stress examination in 30 knee flexion. 1+ with 3-5 mm, 2+ with 6-10 mm and 3+ with >10 mm medial joint space opening. With grade III injuries, we usually have associated ligament injury especially ACL tear (10, 11).

We think none of each injury grading is complete and it has always been a dilemma for the orthopedic surgeons as to which patient with a medial collateral ligament injury would benefit from an early or late intervention.

According to different type of classification, whether MCL is injured in isolation or in combination with other ligaments, several treatment options with wide spectrum of nonoperative to surgical repair or reconstruction have been reported (12-14).

MRI is now a valuable investigation tool, not only tells us whether the MCL is ruptured or not, but also shows the exact site of the injury and other concomitant ligaments,

soft tissue or bony lesions (15). We now choose the best initial method of treatment for acute phase in an injured knee with MCL rupture in relevant to clinical and MRI findings.

Based on the above mentioned points, we have devised a classification which gives us a better understanding of the injury pattern of MCL and choosing correct mean of treatment which suits the patient best.

Our proposed classification, based on the MRI finding:

Type I: Pre-avulsion injury, considered as a bone contusion in the medial femoral epicondyle, because of a distraction force with no separation. The patient has local tenderness with a negative valgus stress test. MRI shows bone edema at the site of MCL insertion with no separation. The trauma is not sufficient enough to separate bone or ligament from its attachment. Treatment is conservative with a short time of immobilization and pain relief [Figure 1].

In type II more severe energy does lead to bony avulsion of MCL from the medial femoral condyle. This could be easily seen on the MRI scan, and also in a plane radiograph. Patient has more pain and swelling at the site of injury and early surgical intervention usually has the best outcome in this group [Figure 2].

In type III we have midsubstance rupture of MCL usually in a zigzag pattern. This usually happens in knee dislocation type IIIM. The medial capsule is also ruptured. Clinically, the patient has more extensive



Figure 3. Type III MCL injury.



Figure 4. Type IV Distal rupture of MCL and bone contusion.

tenderness in joint line. Valgus stress test is positive, there is echymosis in the medial side of joint. , MRI shows discontinuity of MCL and joint capsule, soft tissue edema and knee effusion. Treatment in this type is optional, some prefer conservative treatment. We prefer early surgical intervention (within 14 days) with repair of the MCL together with the joint capsule and medial meniscus if damaged [Figure 3].

This mainly is applied when we are treating a knee dislocation of IIIM (KDIIIM) or a type IV dislocation in which by early repair of the MCL and joint capsule a multi directional and rotational instability is turned to a single direction instability and makes future treatments much easier.

Type IV MCL injury is considered as a MCL detachment from distal side and is usually shredded and hanging around in the pes ancerinus site of insertion. Clinically, the symptoms are the same as type III, but with less swelling and echymosis. The tenderness is more distally, the MRI shows soft tissue swelling and edema in the area and discontinuity of the MCL distally [Figure 4].

The treatment option in this type is same as type III, we recommend surgical repair because conservative treatment does not seem to be efficient.

Type V MCL injury is sleeve rupture of the MCL together with the medial capsule in which medial femoral condyle is buttonholed in the capsule. Clinically the patient is not able to walk properly, is not able to

extend the knee, and there is dimpling of the skin in the medial side of the knee [Figure 5].

In this type, MRI shows rupture of the MCL and capsule with edema in the soft tissues of the medial side and opening of the medial joint space. Plane radiograph could also show opening of the medial joint space [Figure 6].

This type of injury needs prompt surgical treatment to free the femoral condyle and repair the capsule and MCL.

The basis for our grading system is summarized table 1.

In the clinic, by gentle examination of the patient as far as the pain allows by applying a stress valgus force we could make a preliminary diagnosis as to what has happened to the knee. Examination under anesthesia is also helpful to make more accurate diagnosis, and to examine for other ligament injuries.

MRI is now the most reliable and accurate investigation tool, this not only shows the exact site of the injury to the MCL, but also shows other ligament or soft tissue and bony injuries. The next step of treatment is based on the MRI findings.

It's worth-mentioning that repair of the capsule in the initial phase of treatment is very important and plays basic role in the stability of the knee in future , whether other ligament injuries are treated with early repair or reconstruction. In our practice The golden time for early repair of the medial side ligament injury of the knee is the first two weeks, preferably after the





Figure 5. Type V MCL injury. (A) Skin dimpling (B) Medial femoral condyle buttonhold in the capsule.

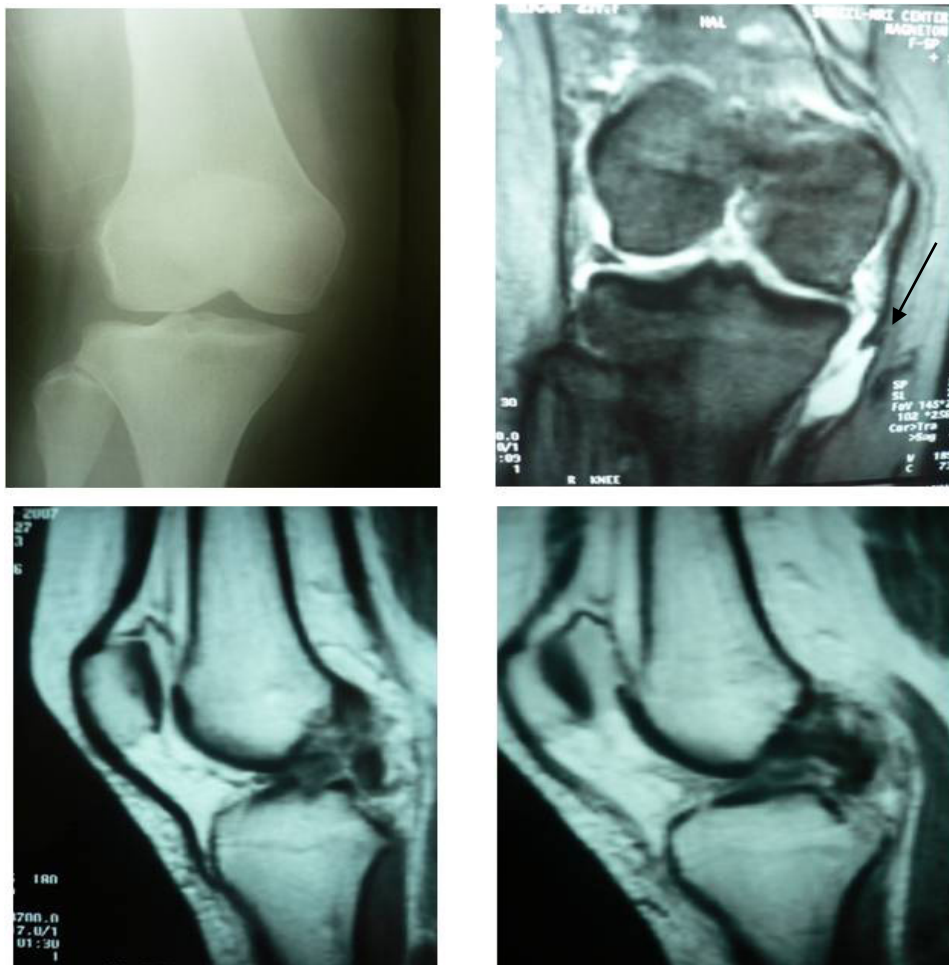


Figure 6. Plain radiograph and MRI Scan of KDIIM knee dislocation with rupture of MCL and capsule (typeV).

**Table 1. summary of new MCL classification**

	MCL injury	Clinical findings	MRI findings
<b>Type I</b>	Preavulsion injury femoral side	Little tenderness – little soft tissue swelling- a stable knee	Bone edema in medial femoral epichondyl
<b>Type II</b>	Avulsion injury from femoral side	Sever tenderness – echymosis – distinct soft tissue swelling	Bone avulsion of MCL proximally, soft tissue edema, MCL lax distally
<b>Type III</b>	Midsubstance tear	Med. Joint line tenderness –sever tenderness – different level of medial instability – joint effusion	Massive soft tissue edema - torn MCL
<b>Type IV</b>	Distal detachment	More distal tenderness and edema	Distal soft tissue edema – MCL lax proximally
<b>Type V</b>	Proximal sleeve detachment of MCL and capsule with buttonhole of the medial femoral condyle	Severe tenderness – skin dimpling -limited ROM	Medial joint opening, soft tissue edema, rupture of MCL and capsule

first week which the soft tissue swelling is subsided

and the patient is in stable condition.

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