



**QUESTION | I HAVE BEEN ASKED TO REHAB GRADE II AND III MCL INJURIES DIFFERENTLY BY DIFFERENT SURGEONS IN THE FIRST 6 WEEKS FOLLOWING INJURY. SOME ARE HINGE BRACED 0-90 DEGREES AND ASKED TO REHAB INCLUDING NORMAL EXTENSION. OTHERS ARE HINGE BRACED 30-90 AND ASKED TO GET QUADS STATIC CONTRACTION BUT NO EXTENSION PAST 30 DEGREES. IS IT NECESSARY TO LIMIT EXTENSION? IN MY EXPERIENCE THIS CAUSES A LOSS OF NORMAL EXTENSION, ALLOWING A QUADS LAG AND ENDING UP WITH STIFFNESS IN SLIGHT FLEXION THAT IS HARD TO RESTORE.**

**ANSWER |** MCL injuries are common. Unfortunately several classification systems for medial-sided ligament injuries are used. No single system is used consistently in the literature but of them use clinical valgus stress testing to define the grade of injury. These systems describe 3 grades of MCL injury but the amount of instability is classified differently among the varying systems.

### Classification

#### *Grade I*

Generally speaking a Grade I injury indicates a microscopic tear of the superficial and deep MCL with no resultant instability or laxity.

#### *Grade II*

A Grade II injury is an incomplete tear with microscopic and gross disruption of fibers of the superficial or deep MCL. These knees will have a definite endpoint to valgus stressing at 30° of flexion but may have 5° to 15° of valgus instability. There is no instability in extension and no rotational instability.

#### *Grade III*

A Grade III injury is a complete tear of the MCL complex. Valgus stress at 30° shows more than 15° of instability and there may be instability in full extension or rotational instability. There is a loss of the valgus endpoint.

### Xray Measurement

All of these systems rely purely on clinical examination. There has been some work done looking at the amount of medial joint space gapping on valgus stress xrays. These measurements have been correlated with the degree of injury and eventually the current classification systems may need to be redefined.

### MRI

MRI classification of MCL tears focuses mainly on the superficial MCL. A grossly intact ligament with peri-ligamentous oedema is considered a grade I injury. A grade II injury is a partial tear with surrounding oedema; and a grade III injury is a complete tear of the ligament. Most MRI classifications do not allow for deep MCL and posterior oblique ligament (POL) injuries. Unfortunately MRI grading of the injury does not always correlate with the degree of symptoms experienced by the patient.

## Examination

Stability to valgus stress of the knee is an accurate and reliable assessment of MCL stability however an acutely injured knee is extremely difficult to examine accurately. The patient may have an effusion, lack extension or have pain that prevents their knee reaching the required degree of flexion or extension for an accurate examination. Adding to the difficulty of the examination is the presence or absence of other injuries such as the ACL (which provides resistance to valgus stress in full extension) or posteromedial structures of the knee.

There have been attempts to make the diagnosis more accurate by adding elements of the history to the examination. An example of this is that if you are unable to weight bear immediately after the injury to (due valgus instability) you are likely to have complete tear. If are able to weight bear initially but later become unable to because of pain then you are likely to have a partial tear. The feel of the end point resistance (hard, mushy, absent) is used to determine whether there is functional integrity of the ligament or partial or complete disruption.

The valgus stress test is described in 2 parts.

In the first part the knee is kept in full extension and a valgus stress is applied.

- In isolated superficial MCL injuries there will be no laxity. An injury involving the entire MCL complex or combined with an ACL tear will cause significant valgus laxity with the knee in full extension.

The second part of the test applies the same valgus stress with the knee flexed to 30°.

- Any asymmetry is considered a positive finding and medial laxity of 3 to 5mm (compared to the other side) shows an injury to the superficial MCL.
- Laxity of 5 to 7 mm suggests injury to the deep MCL, POL, and posteromedial corner.
- More than 7 mm of laxity shows injury to the ACL.
- More than 20 mm of laxity shows tears to both cruciates and the medial complex.

Always look for increased tibial rotation with valgus stressing. It is crucial to determine whether the rotational component of the MCL complex injury is generated from damage to the posteromedial or posterolateral structures.

The Swain test is performed with the knee flexed to 90° and the tibia externally rotated. When the knee is externally rotated in flexion, the collateral ligaments are tightened while the cruciates are relatively lax. Pain along the medial side of the joint indicates injury to the MCL complex (many patients with chronic medial-sided laxity after injury have pain along the medial joint line with this test. Persistent pain is an indication of inadequate healing).

An isolated MCL tear should not create a joint effusion. There should be tenderness at the femoral or tibial insertion of the MCL with local oedema only. An intra-articular effusion suggests an injury to the ACL, articular cartilage or possibly a patella dislocation (MCL tenderness can occasionally be from a MPFL injury).

## Mechanism of Injury

There are 2 main mechanisms that produce isolated MCL injuries.

1) The most common injury is a direct valgus stress with a blow to the outside of the thigh or leg while the foot is planted. This is usually from a contact sport such as football and rugby and does not usually produce much tibial rotation or translation. The direct valgus stress probably damages the superficial MCL and deep MCL before disrupting the posterior oblique ligament (POL).

2) The second injury pattern involves a valgus stress coupled with tibial external rotation. This is usually from non contact sports that require cutting and pivoting (skiing, netball, basketball and soccer). The POL and posteromedial corner are probably injured first with the deep and superficial MCL affected last with this mechanism.

*It is very common for more than one structure to be damaged with a high-energy injury.*

## Healing based on animal models

The superficial MCL is extra-articular (and extra-synovial) which makes it more likely to heal than the ACL (which is bathed in synovial fluid). Using animal models, researchers have demonstrated a consistent and controlled healing process for the superficial MCL. There are 4 overlapping phases: haemorrhage, inflammation, repair and remodeling. Clinical healing is common after several weeks but microscopic remodeling continues for up to 1 year as collagen fibers continue to align along the long axis of the ligament and the collagen matrix matures.

## Early Mobilisation

Early mobilization is an important component of non-operative treatment. Mobilization after ligament injury improves the longitudinal alignment and concentration of cells and collagen and increases the ultimate load of the healing tissue. When compared with immobilization, active motion significantly reduces laxity and increases the tensile strength of the healing superficial MCL.

Although the MCL itself is a static structure, the MCL complex is dynamically reinforced by the pes anserinus in extension. This reinforcement prevents excessive tibial external rotation during flexion. With active extension, the superficial MCL is supported proximally by direct attachments to the vastus medialis. The semimembranosus tendon has several expansions which attach directly to the MCL. These help to support the superficial MCL and the POL with active flexion.

The number of dynamic reinforcing fibers varies widely which explains why certain people with good muscular support can still function successfully after an injury.

## Biomechanics

The superficial MCL provides most of the static stability of the medial side of the knee. Cutting the superficial MCL in full extension does not increase valgus rotation but it does from 15° to 90° of knee flexion.

The proximal superficial MCL is the primary stabilizer to valgus force at all angles but the amount of valgus load on the distal MCL depends on flexion angle and is greatest at 60°.

The menisofemoral ligament of the deep MCL is a secondary stabilizer to valgus stress at all angles.

#### Combined ACL / MCL Injury

##### *ACL/PCL Intact*

Cutting any part of the MCL does not affect AP translation of the knee if the ACL and PCL are intact.

##### *ACL Torn*

At 30° of knee flexion there is no affect on AP translation.

At 90° cutting the superficial MCL significantly increases AP translation compared to an isolated ACL tear.

##### *ACL/POL torn*

Cutting the deep MCL and POL allows increased AP translation at all degrees of knee flexion.

##### *ACL Reconstructed*

MCL deficiency causes increased forces on a reconstructed ACL and can cause the repair to stretch out. Reconstructing the ACL significantly reduces the force in the MCL in response to an anterior load.

#### Literature review

The lack of consistency in classification makes it difficult to compare the results of treatment strategies for grade II and grade III injuries. This is probably why there are no decent meta-analyses or systematic reviews of treatment strategies for MCL injuries.

### **Clinical Management**

Traditional treatment of MCL tears was based on the thought that the ligament would heal in a lengthened position if the knee was allowed to achieve full extension. This has not been borne out by any of the recent biomechanical studies or clinical trials. While it is important to protect the MCL from valgus stress there is no need to limit the patients ROM.

To allow adequate healing of the MCL the knee should be immobilized for 1 to several days (depending on symptoms and injury grade). This should be followed immediately by controlled knee flexion and extension exercises. A hinged knee brace is frequently used to stabilize the knee and provide pain relief while allowing early range of motion and muscle strengthening. Weight bearing helps the healing process but should only be done while in the brace and with adequate arm supports.

#### **Grade I and II Injury**

The rehabilitation protocols for grade I and II injuries are similar (except for the length of time for the patient to progress through the various stages). Generally speaking, return to competition is allowed once the patient is: pain-free with full range of motion, has no instability; and has muscle strength comparable with the uninjured side.

Patients with isolated grade I injuries return to play as early as 10 days and those with grade II injuries about 4 weeks. An incomplete MCL complex injury usually does not result in functional problems for the knee.

The results after nonoperative management of a complete MCL injury are not entirely uniform. There are certain circumstances in which surgical treatment is necessary, such as if the superficial MCL is torn from its tibial insertion and becomes displaced outside the pes anserinus tendons. This means that the ligament is unable to reattach to its insertion on the tibia and will not heal properly.

It is not clear whether the long term outcome for knees with grade III MCL injuries is improved with surgery.

### Summary

- MCL injuries are common.
- Most can be treated with a brief period of rest followed by mobilisation in a hinged brace with weight bearing as pain allows.
- Occasionally surgical repair of an MCL injury is needed.

Dr Doron Sher