Current Best Practice for Management of Medial Collateral Ligament Injury

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Abstract: Medical collateral ligament injuries are among the most common knee injuries for the athletic population. Immobilization once was the accepted course of treatment for MCL injuries but research has demonstrated the ineffectiveness of this approach.

The knee is second only to the ankle in frequency of injuries in competitive sports and often more severe. Ruptures to the anterior cruciate ligament (ACL) are the most devastating injury to the knee while the medial collateral ligament (MCL) is the most frequently injured (Pickett & Altize, 1971). Although ACL injuries present greater structural deficiency resulting in more time lost when compared to MCL injuries, damage to the MCL is more common. A ruptured MCL often results in considerable structural deficit and may be considered a season-ending injury with return to full activity rates ranging from 4 to 9 weeks (Indelicato, Hermansdorfer, & Huegel, 1989; Jones, Henley, & Francis, 1985). Accepted current practice for treatment and rehabilitation of MCL injuries includes no surgical intervention and a protective hinge brace which allows the knee to flex and extend while limiting medial or lateral stresses on the knee. The brace is removed daily for therapeutic modalities and rehabilitative exercise. However, we have experienced physicians who continue to use immobilization techniques such as long leg casts for management of MCL injuries. This practice precludes appropriate application of modalities and therapeutic exercise and results in delayed recovery time. The purpose of this critical inquiry is to provide best evidence currently available on management of MCL injuries.

Background and Significance

Anatomy of the Knee

The knee is a modified hinge joint supported statically by four main ligaments ACL, posterior cruciate ligament, MCL, lateral collateral ligament. The knee allows motion in the anterior to posterior plane with minimal rotation during flexion and extension. Due to popularity among lay people, the most well known ligament is the ACL, which prevents the tibia from sliding anteriorly on the femur. The posterior cruciate ligament prevents just the opposite, a posterior glide of the tibia on the femur. The lateral collateral ligament protects the lateral aspect of the knee by preventing a varus (medial to lateral) force (Moore, 1996). The MCL is the major stabilizing structure for the medial aspect of the knee joint protecting the knee from valgus (lateral to medial) forces. The MCL is divided into deep and superficial portions separated by a bursa, which is a small jelly filled sac that reduces friction that allows movement between the two segments. The superficial portion of the ligament arises proximally from the medial epicondyle on the femur and attaches 4-5 cm distal to the joint line on the medial surface of the tibia. The deep portion lies just beneath the superficial portion and has a firm attachment to the medial meniscus and the fibrous capsule surrounding the knee joint (Moore, 1996). The MCL can be disrupted in three ways; the attachment is avulsed from the femoral epicondyle, a mid substance tear, or the attachment is avulsed from the tibial shaft.

Evaluation of MCL Injuries

The integrity of the MCL is tested clinically with the valgus stress test. This test involves applying a valgus force to the lateral aspect of the knee while the knee is flexed approximately

20° and again with the knee in full extension. A positive test at 20° of knee flexion results in pain or gapping of the joint indicating an injury of the MCL, a positive test at full knee extension involves pain and gapping indicating involvement of the MCL, ACL, and medial capsule (Starkey & Ryan, 1996). Magnetic resonance imaging is used to determine the location of the disruption and the severity of the injury. The results of MCL testing are rated with three grades when an injury is present.

Severity of ligament injuries is graded depending on several specific criteria. Grade I MCL sprains involve a stretch of the ligament in association with pain, swelling, and minimal deficits in stability. Grade II MCL sprains involve a partial tear of the ligament with noticeable deficits in stability and a positive valgus stress test. Grade III MCL sprains involve a complete tear of the ligament resulting in loss of medial stability and a positive valgus stress test with significant gapping. Grade III injuries often involve additional structures such as the ACL, medial capsule, and medial meniscus (Shelbourne & Patel, 1995).

Ligamentous Repair

One of the main rehabilitation goals of any injured joint is to restore range of motion which is decreased as a result of swelling and pain. Early joint motion is encouraged and the knowledge of the extent to which a joint can be mobilized is determined by a better understanding of ligamentous repair. Early joint mobilization exercise limits the loss of range of motion (ROM) and allows the strengthening phase of rehabilitation to occur earlier, ultimately returning the patient to daily activities more rapidly. Current research has determined that soft tissue injury requires motion for proper alignment of collagen during the healing process. Collagen, a fibrous tissue used during connective tissue repair, is produced at the site of injury and adheres to the remaining soft tissue in random unorganized patterns. Movement in the joint is necessary to realign the collagen increasing the strength and function of the repaired ligament. If the joint is immobilized the collagen will remain in an unorganized pattern reducing the tensile strength of the ligament ultimately weakening the structural integrity of the knee joint (Woo et al., 1987).

Immobilization has been used as a treatment tool for a variety of injuries and has proven to be effective in returning athletes to functional and competitive levels. However, early mobilization allows increased joint ROM while soft tissue heals and considered current standard of care. Physicians most often place reconstructed ACLs in constant passive motion for 20 hr per day immediately following surgery due to the advantages of maintaining ROM in the joint (Noyes & Barber-Westin, 1995). Immobilization of joints has an adverse effect on not only the repairing collagen but also the existing ligaments. The mass of collagen repairing the MCL will decrease with immobilization of joints and undoubtedly has a direct effect on the structural stability of the ligament (Amiel, Akeson, Harwood, & Mechanic, 1980). The strength of the bone-ligament-bone complex significantly decreases with immobilization not only within the ligament itself but also at the bony attachment of the ligament. Strength deficits and MCL failure were demonstrated after immobilization of the knee for nine weeks in rabbits when a valgus stress was applied to the knee (Woo et al., 1987). Early mobilization is considered the current best practice for management of ligamentous injuries for the knee

Methods

Information was gathered through PubMed, MedLine, and FirstSearch. Key words included medial collateral ligament, knee, immobilization, injury, treatment, rehabilitation, and management. Content was analyzed, outcomes were synthesized, and findings were critically

applied to current best clinical practice in order to promote changes that will foster effective and efficient methods of providing athletic training services (Portney & Watkins, 2000).

Current Clinical Research on Ligament Injury

Combined ACL and MCL Injuries

Concomitant ligament damage is common at the knee because of the variety of mechanisms capable of damaging the structures. The MCL is often a secondary result of a more serious ACL injury. A retroactive study was performed comparing outcomes for three treatment methods: surgical repair of ACL and MCL, surgical repair of ACL but not MCL, and non-surgical treatment (Hillard-Sembell, Daniel, Stone, Dobson, & Fithian, 1996). Surgical repair of ACL but not MCL resulted in identical structural stability as surgical repair of the ACL and MCL, with both groups scoring the same on the valgus stress test. Loss of ROM in the knee was three times greater in knees with ACL and MCL repaired compared to knees that did not repair the MCL, only the ACL (Hillard-Sembell et al., 1996). Not repairing the MCL results in greater ROM regained after surgery and equal structural stability when compared to surgically repairing the MCL.

Clinical research on functional outcomes associated with operative and non-operative interventions provide evidence upon which to base clinical practice (Shirakura et al., 2000). Different management of combined ACL MCL injuries was used to examine valgus stability and functional return to activities. MCLs injuries that were repaired operatively were placed into continuous passive motion and MCLs that were not repaired were forced into a cast for two weeks while none of the ACLs were repaired. The results favored the operative management of the injury but this can be disputed because the non-operative group was forced into immobilization. Functional and activity scores favored the operative group compared to the non-operative group. Valgus stress testing revealed no significant difference between the operative and non-operative management course of the MCL (Shirakura et al., 2000). These findings are skewed due to the fact that the non-operative management was forced into immobilization, which has been shown to reduce the structural stability of the knee, and more importantly decrease ROM. The decrease in ROM and stability of the knee can be directly attributed to lower functional scores caused by immobilizing the knee.

Comparisons of surgical techniques revealed that MCL surgery is not necessary in cases where both superficial and deep portions of the ligaments are damaged (Noyes & Barber-Westin, 1995). MCL injuries with varying degrees of severity were compared using an operative approach and a non-operative approach. The results of ligamentous testing favored the non-surgical MCL group for anterior displacement and the valgus tests on the MCL compared to the operative group. No significant difference was found in anterior displacement between the two approaches to MCL injuries. The non-operative treatment had significantly greater results when compared to the valgus stability of the operative treatment. The non-operative treatment was 6% stronger when a moderate valgus stress was applied to the knee and 21% stronger when a substantial valgus stress was applied to the knee (Noyes & Barber-Westin, 1995).

Immobilization Management of MCL Injuries

Controversy exists over the best approach to treatment of MCL injuries in regard to immobilization versus protected mobilization. Canine knees were treated with three interventions: surgical disruption with immobilization for six weeks; surgical disruption without immobilization; or a control group with a sham operation in which the surgery is performed without actual repair of the MCL (Inoue et al., 1990). Collagen concentrations for both surgical groups returned to the collagen levels of the control group. Structurally, knees that were not

immobilized resulted in better varus and valgus stress stability compared to immobilization. The immobilized knees were 17% weaker compared to the non immobilized knees which confirms the immobilization technique to treat MCLs is not recommended (Inoue et al., 1990).

Conservative Management of MCL Injuries

Conservative management has proven to be an effective course of action for treating MCL injuries. Results were measured using scales to determine the functional progress and activities performed on the knee. The functional progress of the knee was measured using the Lysholm's test on a scale of 0-100 while patient activities were measured using Tegner's test on a scale from 0-10. Following conservative treatment functional scores on the Lysholm's scale were all above 95% up to ten years after the initial MCL injury. Tegner scale scores were a mean of 7 out of 10 over the span of ten years after the initial injury. Knee laxity demonstrated no significant differences at any of the follow up examinations comparing the injured knee to the uninjured knee with conservative management (Lundberg & Messner, 1996).

Football players opting for the conservative approach to MCL injuries have demonstrated drastic differences in outcome from cast immobilization compared to brace immobilization. An observational study of 21 collegiate football players with complete MCL tears investigated the effects of 2 weeks of immobilization in a long leg cast followed by a traditional rehabilitation program on functional knee outcomes and return to full activity. Functionally all the knees recovered to a level where the athlete seldom experienced limitations during athletic activities. Stability of the knee also returned to near pre-injury activities where all the knees had less than 5mm of gapping during valgus stress testing compared to the opposite knee at 46 months post injury (Indelicato, Hermansdorfer, & Huegel, 1989). The draw back to casting an MCL injury is that the average time to return to full-contact football drills was 9.2 weeks where it has been documented to take 4-8 weeks to recover (Arnheim & Prentice, 200). Greater success was demonstrated returning athletes to competition in isolated MCL tears using a brace to immobilize the knee compared to the cast technique.

The brace immobilization technique was used to manage high school football players with isolated grade III MCL injuries. The athletes were placed in an immobilized brace for one week with a varus stress placed on the knee. Full stability of the knee returned in a mean of 4.1 weeks after the injury with all of the athletes returning to competition a mean of 4.9 weeks after the injury (Jones, Henley, & Francis, 1985). The brace technique returned the players to full competition twice as quickly compared to the cast technique, which could amount to a significant portion of the season. Bracing the knee allows the brace to be removed for daily activities and rehabilitation where a knee in a cast allows no such treatment options. Compared to the long-leg casting technique, the ability to remove the brace in combination with a week less of mobilization resulted in reduced knee recovery time.

Discussion

Management for injuries to the MCL has transitioned over the last 30 years moving form surgical intervention with prolonged immobilization to a conservative approach with protected mobilization. ACL surgery without repairing the MCL increases ROM compared to a concomitant operative approach of repairing both ligaments suggesting that surgically repairing the MCL is unnecessary (Hillard-Sembell et al., 1996). The results reveal that both combined surgery and the isolated ACL surgery display similar gapping. Conversely, functional scores compared favorably for surgically repairing the MCL as opposed to not surgically repairing the MCL, but the study had a flaw of different treatment protocols (Shirakura et al., 2000). The limitation in this investigation was that the non-surgically treated knees were immobilized while

the knees that were operated on were placed in constant passive motion. The fact that the non-operative group was immobilized discredits the findings supporting MCL surgery due to the fact that it has been proven that immobilization treatment adversely affect ROM and ligament tensile strength (Hillard-Sembell et. al, 1996) ultimately reduces the function of the knee. Canines were used to explore the differences in tensile strength between a disrupted MCL that was immobilized compared to a disrupted MCL that was allowed to move freely after surgery. Collagen concentration following regeneration was the same for surgical and non-surgical groups and thus advocated a non-surgical approach. Surgically repaired knees that were not immobilized demonstrated 17% stronger tensile strength with valgus stress testing compared to knees that were immobilized making surgical repair of complete MCL tears unjustifiable (Inoue et al., 1990). Immobilization and surgery have proven to be unnecessary following injuries to the MCL due to their undesirable affects on the stability and function of the knee.

Return to play criteria is always a concern for Athletic Trainers and physicians when athletes are injured. Football players using the conservative approach in combination with varying types of immobilization were investigated in two separate studies. The management program using a brace for immobilization for a week returned the athletes to competition in half the time required for athletes restricted by a cast for two weeks. The longer an athlete is immobilized following a MCL injury the longer it takes the athlete to return to competition. Once an athlete is injured it is the concern of the athletic trainer and the physician to return the athlete to functional activity as soon as safely possible. The most effective course of action for MCL injuries is to manage the injury non-operatively and conservatively with protective mobilization.

Conclusions and Implications for the Field

MCL injuries are among the most common knee injuries treated in the field of sports medicine by athletic trainers and physicians (Pickett & Altize, 1971). It is the duty of the sports medicine professional to stay up to date with current practices based on the current research and literature. To date, research demonstrates the best course of action in managing MCL injuries is conservative treatment with protective mobilization. With this knowledge it is known that some physicians still implement the casting technique when managing MCL injuries. It has been demonstrated that immobilization decreases ligament strength and ROM (Inoue et al., 1990), placing the knee at a greater risk of re-injury. The current literature suggests that disruption to the MCL recovers no differently when it is surgically repaired compared to treatment without surgical implications. Even when the MCL injury is combined with an ACL injury, the evidence supports that surgical repair of the MCL will yield no greater results than that of the conservative approach (Hillard-Sembell et al., 1996; Noyes et al., 1995; Shirakura et al., 2000). Return to play is the ultimate goal of the sports medicine professional when managing an athlete's MCL injury. It was clearly evident that prolonged immobilization with a cast doubled the time lost of football players when compared to bracing MCL injuries (Indelicato et al., 1989; Jones et al., 1985). The evidence strongly supports non-operative approach in conjunction with protective mobilization to best manage MCL injuries and provides a solid foundation upon which all sports medicine professionals should base current best practice.

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