Rehabilitation Guidelines for Meniscal Repair of Root and Complex Tears

There are two types of cartilage in the knee; articular cartilage and meniscus cartilage. Articular cartilage is made up of collagen, proteoglycans and water which lines the end of the bones that meet to form a joint. The primary function of the articular cartilage is to provide a smooth gliding surface for joint motion. Rubbing articular cartilage on articular cartilage is approximately 5 times more smooth, or with less friction, than rubbing ice on ice.

The meniscus cartilage in the knee includes a medial (inside) meniscus and a lateral (outside) meniscus. Together they are referred to as menisci. The menisci are wedge shaped, being thinner toward the center of the knee and thicker toward the outside of the knee joint (Figures 1–3). This shape is very important to its function. The primary function of the menisci is to improve load transmission. A relatively round femur sitting on a relatively flat tibia forms the knee joint. Without the menisci the area of contact force between these two bones would be relatively small, increasing the contact stress by 235-335% (Figure 4). The menisci also provide some shock absorption, lubrication and joint stability. The menisci are composed of an anterior horn, body and posterior horn, with each horn anchored to the tibia by a strong anterior and posterior root. The posterior roots provide secondary stability to the knee

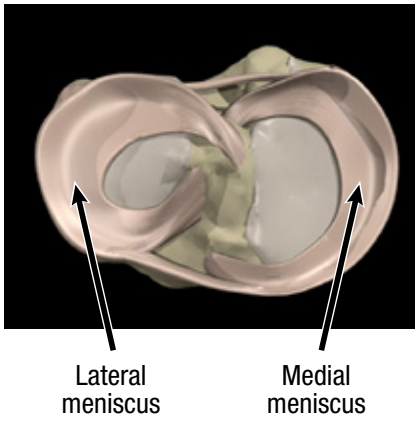

Figure 1 *Meniscus cartilage (shown here from above the knee, without the femur)*

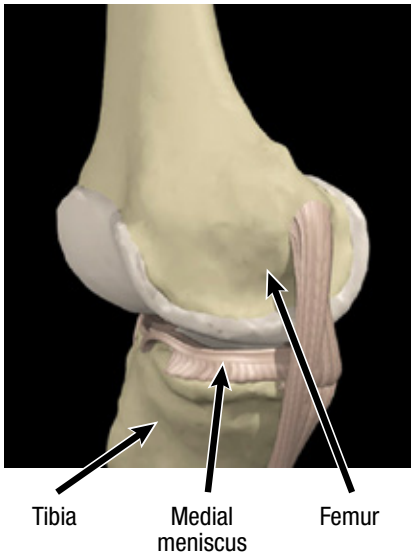

Figure 2 *Medial (inside) view of the knee*

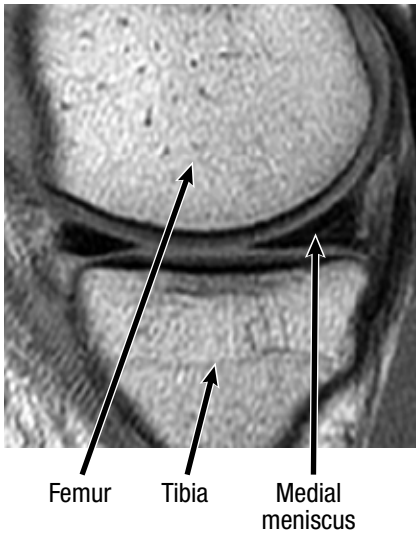

Figure 3 *Normal MRI (saggital view) of the knee, lateral (outside) view*

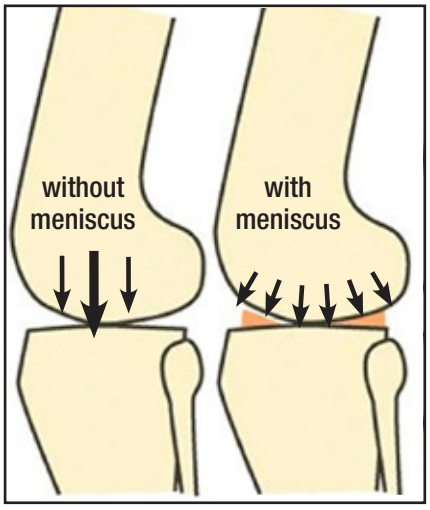

Figure 4 *Schematic representation of the meniscal effect on contact pressure in the knee. Contact area is increased by 50% with addition of menisci. This reduces contact pressures.*

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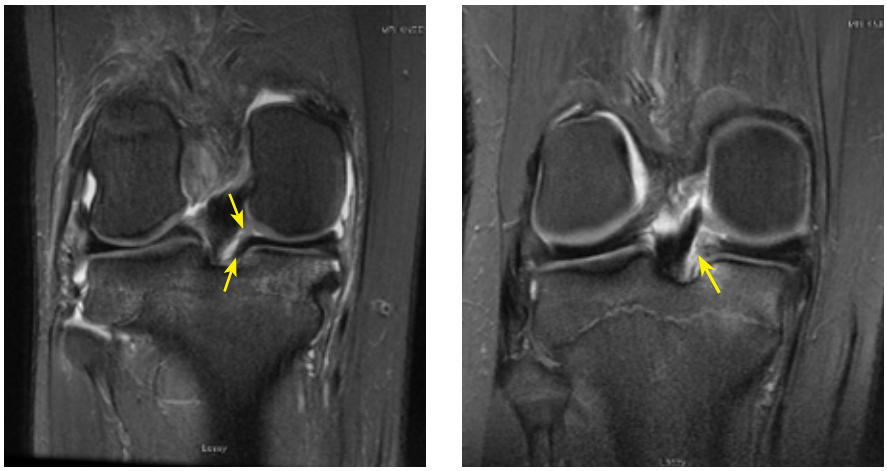

Figure 5 *MRI images of an intact and torn meniscal root. Image #1 shows an intact medial meniscus root connecting to the tibia. Image #2 shows a torn medial meniscal root.*

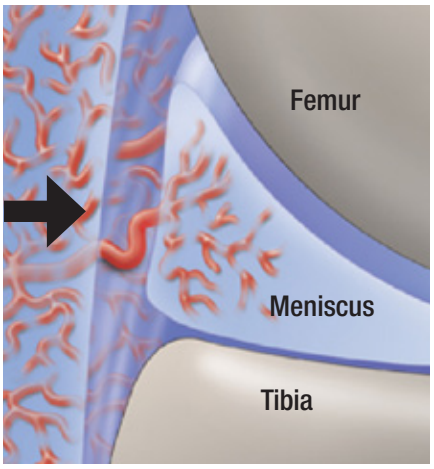

Figure 6 *Perimeniscular capillary plexus (thick arrow) providing blood supply to the outer third of the meniscus.*

and support against tibial rotation. The function of these are extremely important in protecting the articular cartilage (Figure 5). Studies have shown that meniscal root tears have a high incidence of recurrent meniscal injury and stress, which continues to weaken the meniscal tissue over time.

This process of tissue degeneration makes it very unlikely that a surgical repair will heal or that the surrounding meniscus will be strong enough to hold the sutures used to repair it. One report showed that less than 10% of meniscal tears occurring in patients greater than 40 years of age were repairable. Symptoms of a degenerative meniscus tear include swelling, pain along the joint line, catching and locking. Most often degenerative tears are surgically removed. Occasionally a patient may be able to regain function through rehabilitation without surgery progressing to knee arthritis.

There are two categories of meniscal tears: acute traumatic tears and degenerative tears. Degenerative tears most commonly occur in middle-aged people. Acute traumatic tears occur most frequently in the athletic population as a result of a twisting injury to the knee when the foot is planted. Symptoms of an acute meniscus tear include swelling, pain along the joint line, catching, locking and a specific injury. Often times these tears can be diagnosed by taking a thorough history and completing a physical examination. An MRI may be used to assist in making the diagnosis.

If an athlete suffers a meniscal root tear, the three options for treatment include: non-operative rehabilitation, surgery to trim out the area of torn meniscus or surgery to repair (stitch together) the torn meniscus. Root tears are repaired whenever possible based on their importance in limiting future knee arthritis. Repair can be achieved by a transtibial tunnel repair, a suture anchor repair or a side to side repair. Figure 6 shows the blood vessels (perimeniscular capillary plexus) entering the outer portion of the meniscus. This blood supply is necessary for a tear or a repair to heal. After meniscal surgery, rehabilitation with a physical therapist or athletic trainer is needed to restore range of motion, strength, movement control and guide the athlete's return to sport. When the meniscus root is repaired there will be a prolonged period of restricted weight bearing and range of motion to protect the healing tissue.

The following rehabilitation guidelines are presented in a criterion based progression. Specific time frames, restrictions and precautions are given to protect healing tissues and the surgical repair/reconstruction. General time frames are also given for reference to the average individual, but individual patients will progress at different rates depending on their age, associated injuries, pre-injury health status, rehabilitation compliance and injury severity. The size and location of the meniscal tear may also affect the rate of post-operative progression.

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Rehabilitation Guidelines For Meniscal Repair for Root Tears

PHASE I (Surgery to 8 weeks after surgery)

Appointments	• Rehabilitation appointments begin 3-5 days post-operatively and then approximately 1 time per week
Rehabilitation Goals	• Protection of the post-surgical knee • Eliminate effusion (swelling) • Restore leg control
Precautions	• Weightbearing: touch down weight bearing (TDWB) with crutches • Brace: post-operative extension brace for 6 weeks. Wean from brace locked to unlocked to no brace after 6 weeks and as patient establishes leg control, pain control and safe gait mechanics. • Range of Motion (ROM): Goal of 0-90°
Passive and Assisted Range of Motion Exercises	• Knee extension on a bolster • Prone hangs • Supine wall slides with no push into wall • Knee flexion off the edge of the table assisted by other leg or person
Suggested Therapeutic Exercise	• Quadriceps sets • Hamstring sets • Straight leg raises • 4 way leg lifts in standing with brace on for balance and hip strength • Heel slides to 90° • Abdominal isometrics
Cardiovascular Exercise	• Upper body circuit training or upper body ergometer
Progression Criteria	• 8-10 weeks after surgery • Pain-free gait without crutches • No effusion (swelling)

PHASE II (begin after meeting Phase I criteria, usually 8 weeks after surgery)

Appointments	• Rehabilitation appointments are once every 1-2 weeks
Rehabilitation Goals	• Single leg stand control • Normalize gait • Good control and no pain with functional movements, including step up/down, squat, partial lunge (between 0° and 60° of knee flexion)
Precautions	• No forced flexion with passive range of motion with knee flexion or weight bearing activities that push the knee past 60° of knee flexion • Avoid post-activity swelling • No impact activities

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Suggested Therapeutic Exercise	• Non-impact balance and proprioceptive drills • Stationary bike • Gait drills • Hip and core strengthening • Stretching for patient-specific muscle imbalances • Quadriceps strengthening, making sure that closed chain exercises occur between 0° and 60° of knee flexion
Cardiovascular Exercise	• Non-impact endurance training: stationary bike, Nordic track, swimming, deep water running or cross trainer
Progression Criteria	• Normal gait on all surfaces • Ability to carry out functional movements without unloading affected (injured) leg or pain, while demonstrating good control • Single leg balance greater than 15 seconds

PHASE III (begin after meeting Phase II criteria, usually 12-16 weeks after surgery)

Appointments	• Rehabilitation appointments are once every 1 to 2 weeks
Rehabilitation Goals	• Good control and no pain with sport and work specific movements, including impact
Precautions	• Post-activity soreness should resolve within 24 hours • Avoid post-activity swelling • Avoid posterior knee pain with end range knee flexion
Suggested Therapeutic Exercise	• Low amplitude low velocity agility drills: forward and backward skipping, side shuffle, skater's quick stepping, carioca, cross overs, backward jog, forward jog • Closed chain strengthening for quadriceps and glutes - progressing from double leg strengthening to single leg strengthening: lunge progressions and single leg squat progressions • Single leg balance exercises and progressions, progressing from stationary to deceleration in to holding posture and position • At approximately 12-14 weeks initiate low amplitude landing mechanics: med ball squat catches, shallow jump landings, chop and drop stops, etc • Hip strengthening - especially oriented at neuromuscular control in prevention of hip adduction at landing and stance • Core strength and stabilization - especially orientated at preventing frontal plane trunk lean during landing and single leg stances
Cardiovascular Exercise	• Replicate sport or work specific energy demands
Return To Sport/Work Criteria	• Dynamic neuromuscular control with multi-plane activities without pain or swelling

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PHASE IV (begin after meeting Phase III criteria, usually 20-24 weeks after surgery)

Appointments	• Rehabilitation appointments are once every 2-4 weeks
Rehabilitation Goals	1. Normal multi-planar high vel without side to side differences or compensations. 2. Normal double leg landing control without side to side differences or compensations. 3. Adherence to home exercise program (HEP)
Precautions	• No active reactive swelling or joint pain that lasts more than 12 hours
Suggested Therapeutic Exercise	• Progressive agility drills: forward and backward skipping, side shuffle, skater's quick stepping, carioca, cross overs, backward jog, forward jog • Landing mechanics - progressing from higher amplitude double leg to single leg landing drills. Start uni-planar and gradually progress to multi-planar • Movement control exercise beginning with low velocity, single plane activities and progressing to higher velocity, multi-plane activities • Unanticipated movement control drills, including cutting and pivoting • Agility ladder drills • Strength and control drills related to sport specific movements • Sport/work specific balance and proprioceptive drills • Hip strengthening - especially oriented at neuromuscular control in prevention of hip adduction at landing and stance • Core strength and stabilization - especially orientated at preventing frontal plane trunk lean during landing and single leg stance • Stretching for patient specific muscle imbalances
Cardiovascular Exercise	• Progressive running program. Design to use sport specific energy systems
Return To Sport/Work Criteria	• Patient may return to sport after receiving clearance from the orthopedic surgeon and the physical therapist/athletic trainer. Progressive testing will be completed. The patient should have less than 15% difference in Biodex strength test, force plate jump and vertical hop tests, and functional horizontal hop tests

These rehabilitation guidelines were developed collaboratively by UW Health Sports Rehabilitation and the UW Health Sports Medicine Physician group.

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