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KNEE INJURIES IN AIKIDO

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Muscles and ligaments provide the knee with strength and stability. The location and design of the stabilizing structures make the knee prone to injury from direct trauma, biomechanical problems, and pathology.

THE NATURE OF COMMON INJURIES

Injuries generally result from one direct trauma or from repetitive traumas. Acute injuries from direct trauma — fractures, strains, sprains, dislocations, subluxations, and cartilage tears — may result in pain, swelling, and bleeding into the joint. Repetitive trauma may cause chronic conditions — such as bursitis, tendonitis, and degenerative arthritis — which usually result in pain and may be accompanied by swelling. Typically, these injuries are the results of poor biomechanics, abnormal stresses, muscular imbalances, postural problems, overuse, or improper training and conditioning.

Fractures

Fractures of several types can occur in the knee. A fall on the kneecap can cause "burst" fractures. Blows to the side of the leg or twisting injuries can cause simple or compound fractures of the tibia, fibula, or femur. Fractures of the bone-cartilage junction can also occur — as can avulsion fractures, which involve separation of the bone where muscles or ligaments attach.

Ligament Injuries

Ligament injuries, or *sprains*, involve stretching or tearing of the ligament fiber. The severity of such injuries is usually classified as Grades I, II, or III. Involving few fibers, Grade I sprains cause local tenderness, swelling, and pain when stressing the ligament. Grade II sprains, which involve more severe tearing, are characterized by local tenderness and loss of function with swelling. Grade III sprains involve severe tearing of fibers. Here there is marked swelling, blood in the joint, and immediate and total loss of function.

The ligaments of the knee consist of two principle groups, as is shown on this diagram:

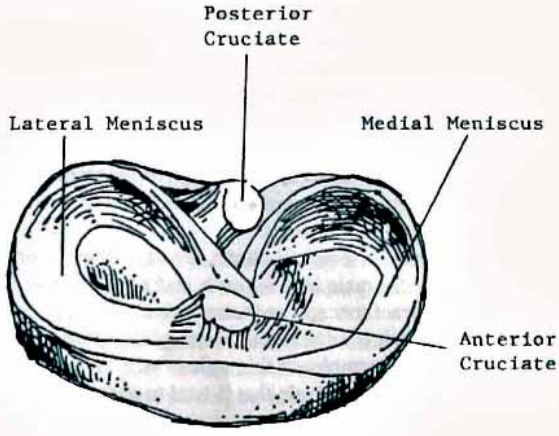

FIGURE 2: Meniscus Cartilage (From Above)

One group of ligaments is inside the knee joint (intra-articular). These ligaments, which consist of the anterior and posterior cruciates, provide rotational stability, prevent hyperextension, and check forward and backward displacement of the lower leg (tibia). The cruciate ligaments are particularly vulnerable in techniques that require twisting or torquing with the knees bent, and they can also be injured by direct blows to the front of the knee when extended. Cruciate ligament injuries

typically result in instability, pain, and blood in the joint.

The second group of ligaments is outside the knee joint (extra-articular). This ligamentous complex, which consists of the collateral ligaments (sides of knee) and the oblique popliteal ligament, also stabilize the knee. Providing side-to-side stability, the collateral ligaments are particularly susceptible to blows to the sides of the knee. For example, *koshinage ukemi* can be particularly hazardous if *uke* lands of the side of the leg when the leg is extended.

Muscle Injuries

Muscle tears, or *strains*, may occur anywhere along the muscle or its tendons. Severe trauma may even pull the muscle away from its attachment to the bone. The severity of the muscle tear will determine the clinical picture with respect to pain, swelling, and recovery time.

The movements of the knee are controlled by the action of some 20 muscles. Lack of flexibility, improper warm-up, lack of conditioning, poor *ukemi* skills, muscular imbalances, and previous injuries to the back and nerves can all result in susceptibility to muscular injuries.

Cartilage Injuries

The knee sits on two C-shaped pieces of cartilage called the medial meniscus and the lateral meniscus (See figure.). The menisci provide lubrication and nutrition, and they also aid the knee in weight bearing and shock absorption. They also decrease wear on the bone, reduce joint friction, and prevent the joint capsule from entering the joint space.

Of the menisci, the medial is most prone to injury. A common cause of such injury is rapid bending of the knee to full flexion with the foot turned outward. Such motion can result in a tear in the cartilage, and the tears can cause clunking sounds on bending the knee and pain. As Cartilage has a poor blood supply, it has a poor regeneration capacity.

Repetitive Trauma Injuries

Continuous overuse, over stretching, or micro-trauma to an area can lead to pain, swelling, inflammation, and the formation of adhesions and scar tissue. Most often affected are soft tissue structures such as muscles, ligaments, tendons, and bursa. Old injuries of a minor nature to cartilage and bone may also be aggravated by repetitive activities.

INJURY PREVENTION AND TREATMENT

Many injuries can be prevented. Stretching, conditioning, and warming-up help. Supports and braces may also prevent injuries.

Some exercises should be approached slowly. It may also be useful, for example, to ease into prolonged periods of sitting *seiza* by practicing *seiza* for shorter periods to allow the knees to adapt.

Biomechanical problems due to previous injuries, neurological problems, or congenital problems may require special conditioning or training considerations. Health-care intervention to restore normal joint function or correct biomechanical problems may be required.

Treatment for minor injuries should focus on reducing pain and swelling and on restoring normal function. Minor injuries can often be treated by using rest, ice, compression, and elevation (RICE). Health care intervention should be sought when there is blood in the joint, persistent pain and swelling, joint locking, or clunking noises.

Ice therapy reduces swelling, decreases blood leakage and controls pain. Ice applications should range from 10-15 minutes (depending on tissue depth) every 1-2 hours with a thin towel over the skin to prevent ice burn. To avoid frostbite, the tissue must be allowed to warm up between applications.

Compression wraps or braces assist in controlling swelling and provide support for injured tissue. Braces may allow (careful) training during the healing process. Knee braces — ranging from simple neoprene slip-on supports to more sophisticated braces with mechanical supports — are available through doctors' offices, sporting goods stores, and medical supply stores.

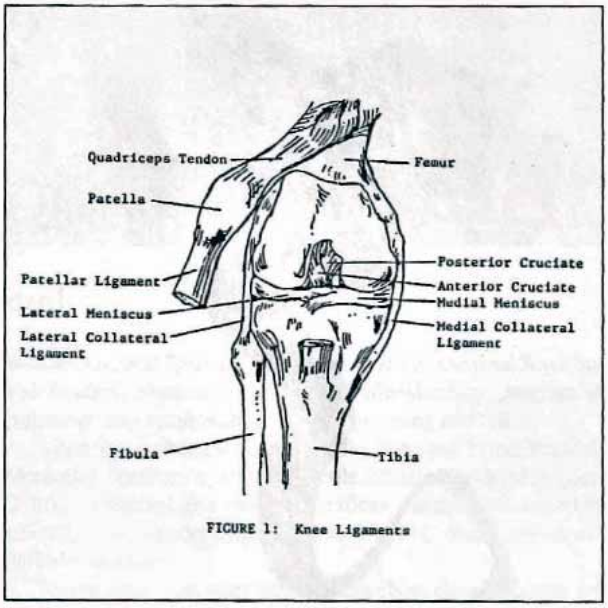

FIGURE 1: Knee Ligaments

Elevation helps drain swelling. To be effective, the elevation should raise the swollen limb higher that the heart.

Over-the-counter anti-inflammatories and pain medications