The Healthcare Medicine Institute presents

Acupuncture for Knee Pain

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The Knee

Knee pain can be caused by rheumatoid arthritis, osteoarthritis, injuries to bone or soft tissue, malalignment, leg length discrepancies, joint hyperlaxity (hypermobility), and more. A history of prior knee injuries is a major risk factor for recurrent pain.

ACL (anterior cruciate ligament) trauma is a common type of knee injury, accounting for approximately two-thirds of all serious knee injuries. Moreover, an injured ACL can lead to additional knee injuries, such as meniscus tears or osteoarthritis. As a result, we will take a closer look at the etiology of ACL injuries later in this course.

Biomechanics

Tibiofemoral joint

The knee (tibiofemoral joint) is the largest joint in the body. It contains numerous ligaments and tendons traversing medially, laterally, anteriorly, and posteriorly, which permit movement but also provide stability. A synovial three-part hinge joint, the knee forms where the femur and tibia meet to move the lower leg. The cartilage of the knee acts as an important shock absorber. The structure we call the knee joint is a combination of three joints:

- The ***intermediate patellofemoral joint*** where the patella (bone) and the patellar surface of the femur meet.
- A ***first tibiofemoral joint*** in the lateral area where the lateral condyle of the femur, lateral meniscus, and lateral condyle of the tibia meet.
- A ***second tibiofemoral joint*** in the medial area where the medial condyle of the femur, medial meniscus, and lateral condyle of the tibia meet.

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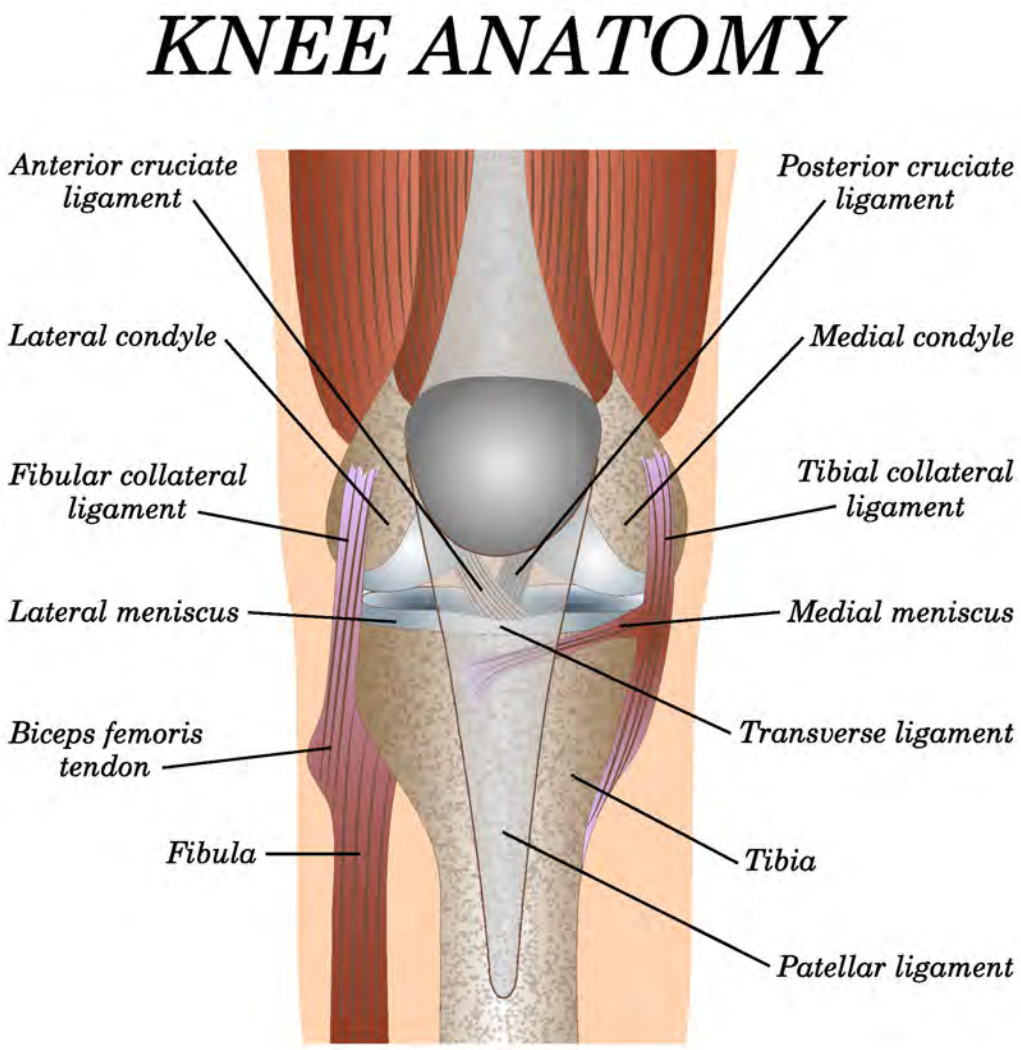
The primary movements of the knee are flexion and extension. As a hinge joint, the knee cannot hyperextend. However, the knee can medially rotate slightly, and when the leg is flexed, it can also laterally rotate.



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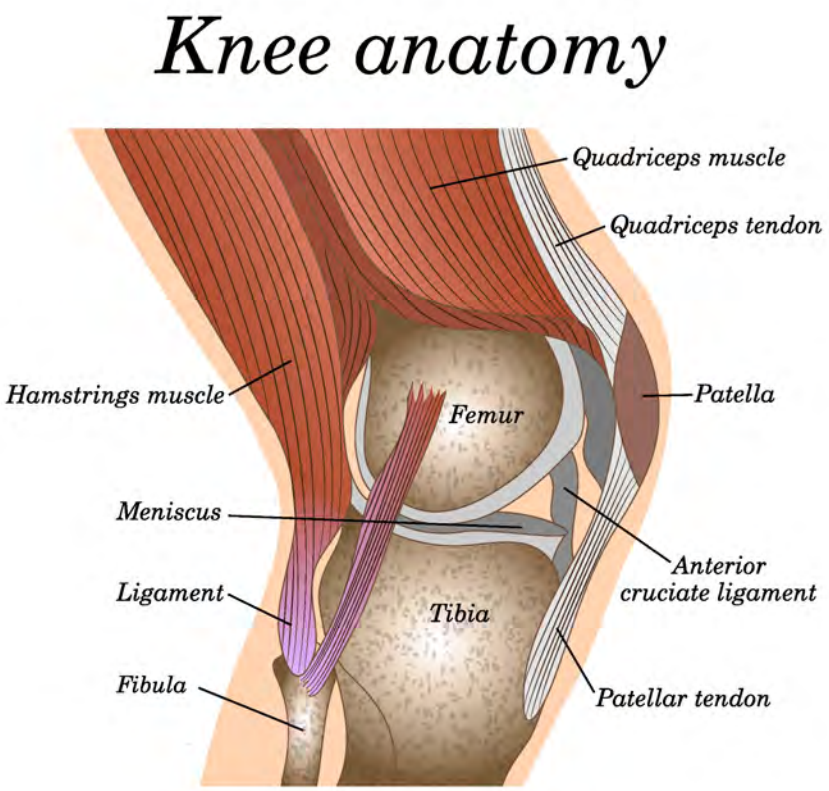

Soft Tissue

The soft tissue framework of the knee involves numerous components. Muscles that move the knee include the *quadriceps femoris*, *biceps femoris*, *semimembranosus*, *semitendinosus*, *sartorius*, *gracilis*, and *popliteus*. The tendons of these muscles (and their extensions) form somewhat of a sheath around the joint—providing it added stability.

The *popliteal fossa* is the posterior region of the knee formed by tendons of the hamstring muscles. The hamstring muscle group (three posterior thigh muscles) includes the *biceps femoris*, *semimembranosus*, and *semitendinosus*. The borders of these muscle tendons form the diamond-shaped space we call the popliteal fossa.

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BL40 (Weizhong)

As acupuncturists, we are familiar with the popliteal fossa in common daily use in the clinic because acupoint BL40 (Weizhong) is located at the back of the knee on the popliteal fossa crease, in a depression midway between the tendons of the biceps femoris and semitendinosus. It is one of the four command points and is the command point of the back. It is also a He-Sea, earth, and Ma Dan-yang Heavenly Star point. One of the major functions of this acupoint is to benefit the knees and lumbar region. It is also used to cool the blood, clear summer heat, and benefit the bladder. We'll take a closer look at acupuncture points later in this course, but we feel that when covering the popliteal fossa, it is important to bring up BL40 because it is an important acupoint point for the treatment of knee disorders.

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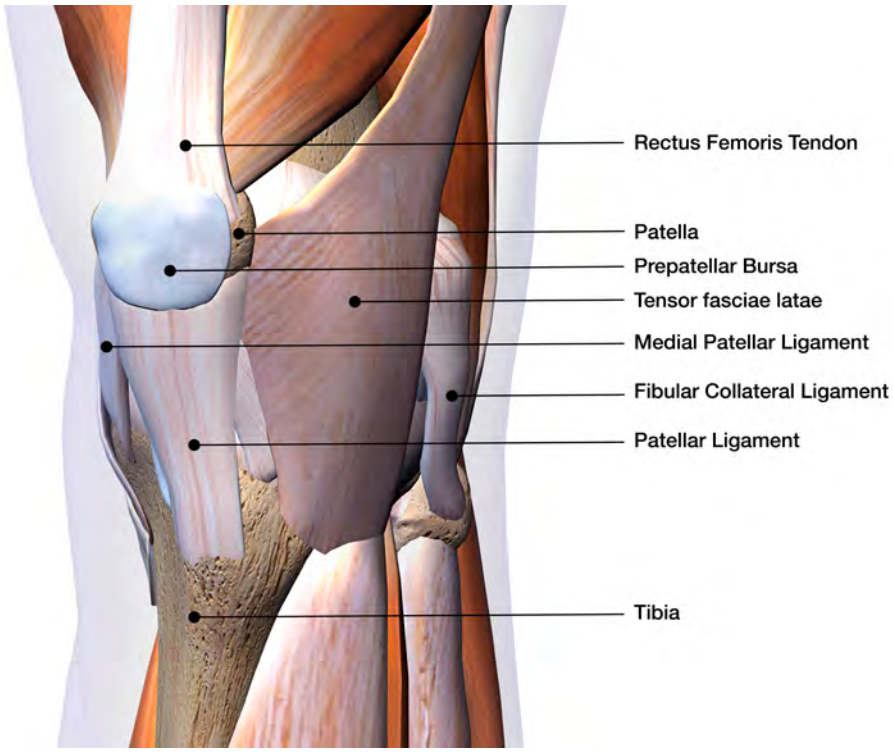
Bursae, Discs, and Ligaments

Bursa

The knee has several bursae (fluid-filled sacs or cavities, especially ones countering friction at a joint). Below is an image showing the prepatellar bursa.



Ligaments

ACL

Anterior cruciate ligament or ACL (an intracapsular ligament)—The ACL prevents the knee from hyperextending and the tibia from sliding anteriorly. This ligament extends posteriorly and laterally from the tibia to the lateral femoral condyle.

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PCL

Posterior cruciate ligament or PCL (intracapsular ligament)— When the knee is flexed, the PCL prevents the tibia from sliding anteriorly and the tibia from sliding posteriorly. This ligament extends anteriorly and medially from the tibia and lateral meniscus to the medial femoral condyle.

Patellar Ligament

This ligament is a continuation of the quadriceps tendon and helps to strengthen the anterior portion the knee joint.

Popliteal Ligaments

This includes the *oblique popliteal ligament* and the *arcuate popliteal ligament*.

Fibular Collateral Ligament

The fibular collateral ligaments are also known as the lateral collateral ligament (LCL).

Tibial Collateral Ligament

The tibial collateral ligaments are also called the medial collateral ligament (MCL).

Discs

There are two major articulating discs:

- *medial meniscus*
- *lateral meniscus*

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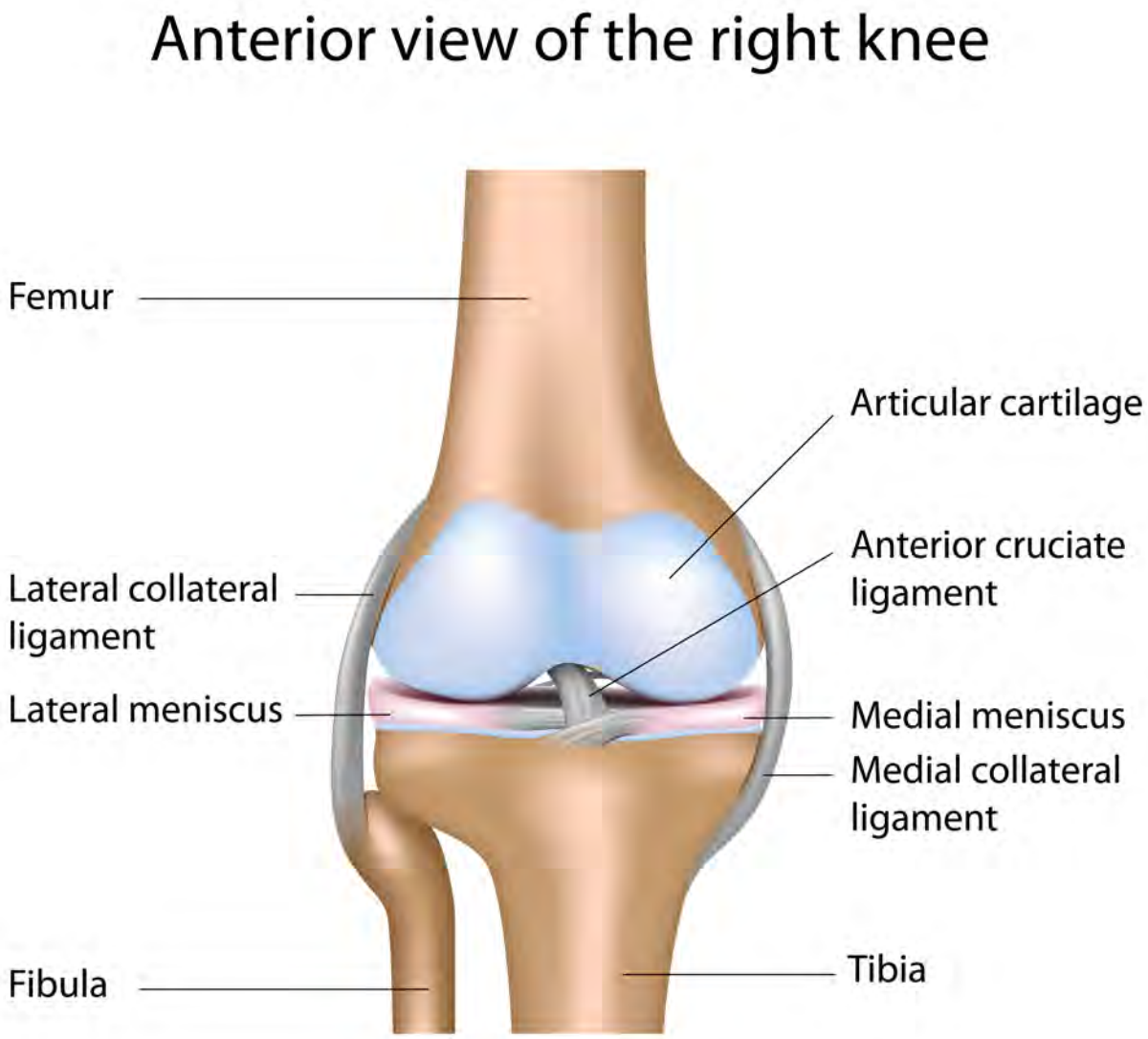
The following images are presented to pictorially review the knee anatomy:



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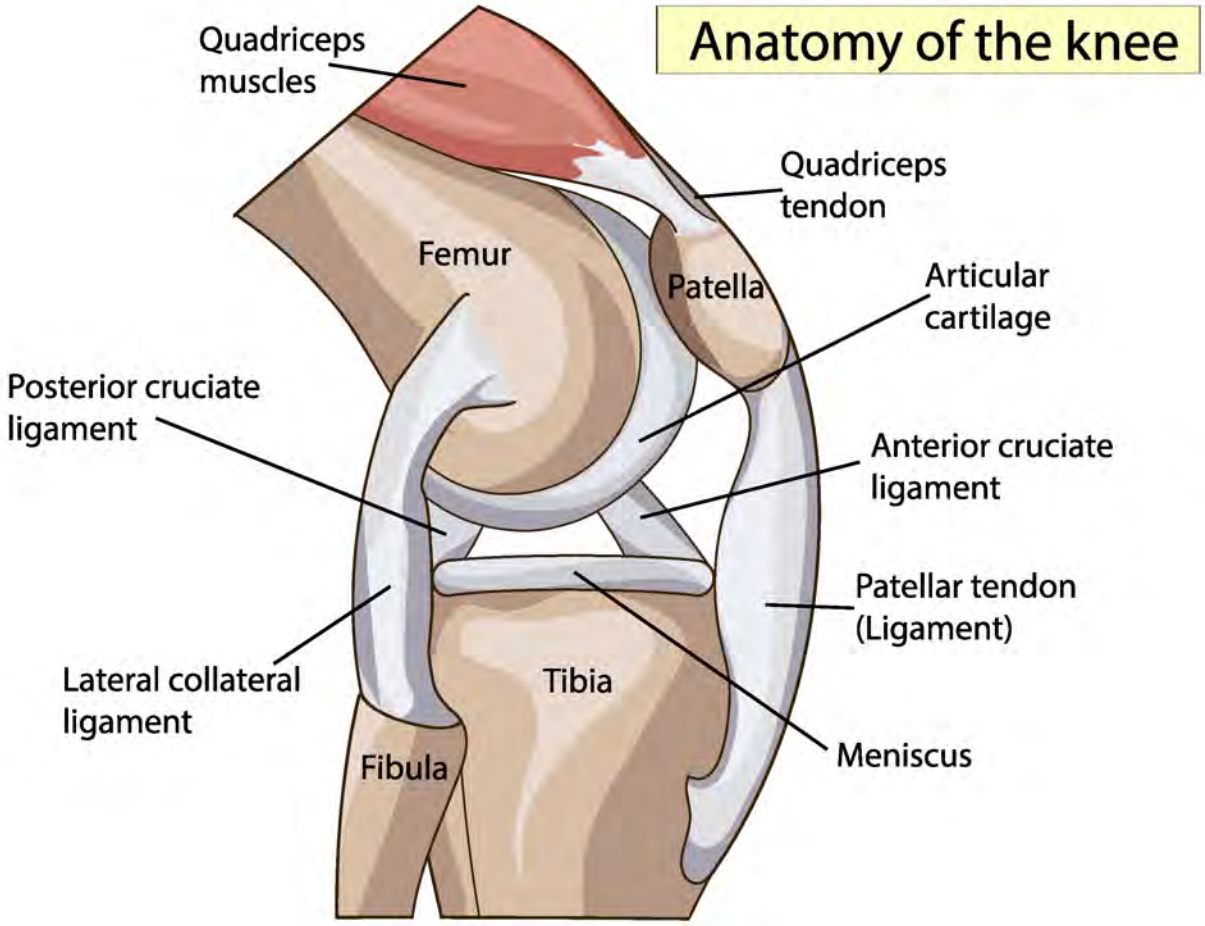
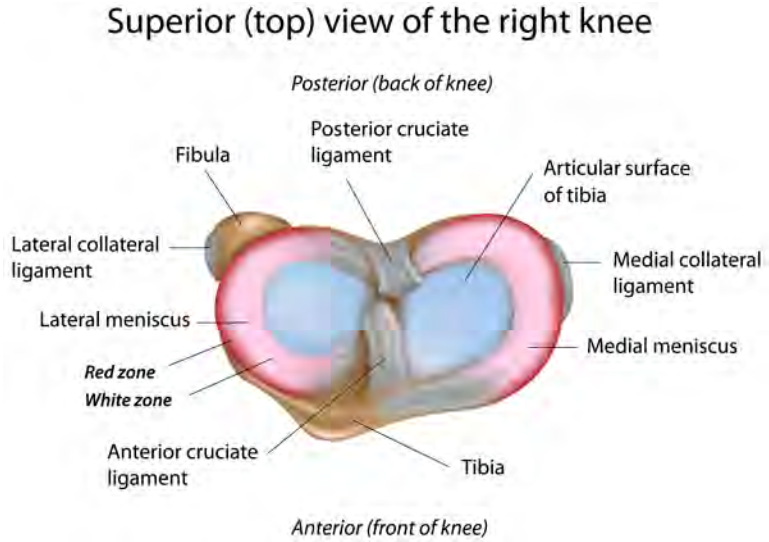


Lateral View



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Common Knee Disorders

Knee pain and dysfunction is often caused by the following:

- Osteoarthritis
- Rheumatoid arthritis
- ACL (anterior cruciate ligament) trauma
- Posterior cruciate ligament injury
- Bursitis
- Medial or lateral collateral ligament injury
- Meniscus injury
- Chondromalacia patella
- Displaced patella
- Sciatica
- Tightness in the hamstrings or quadriceps muscles

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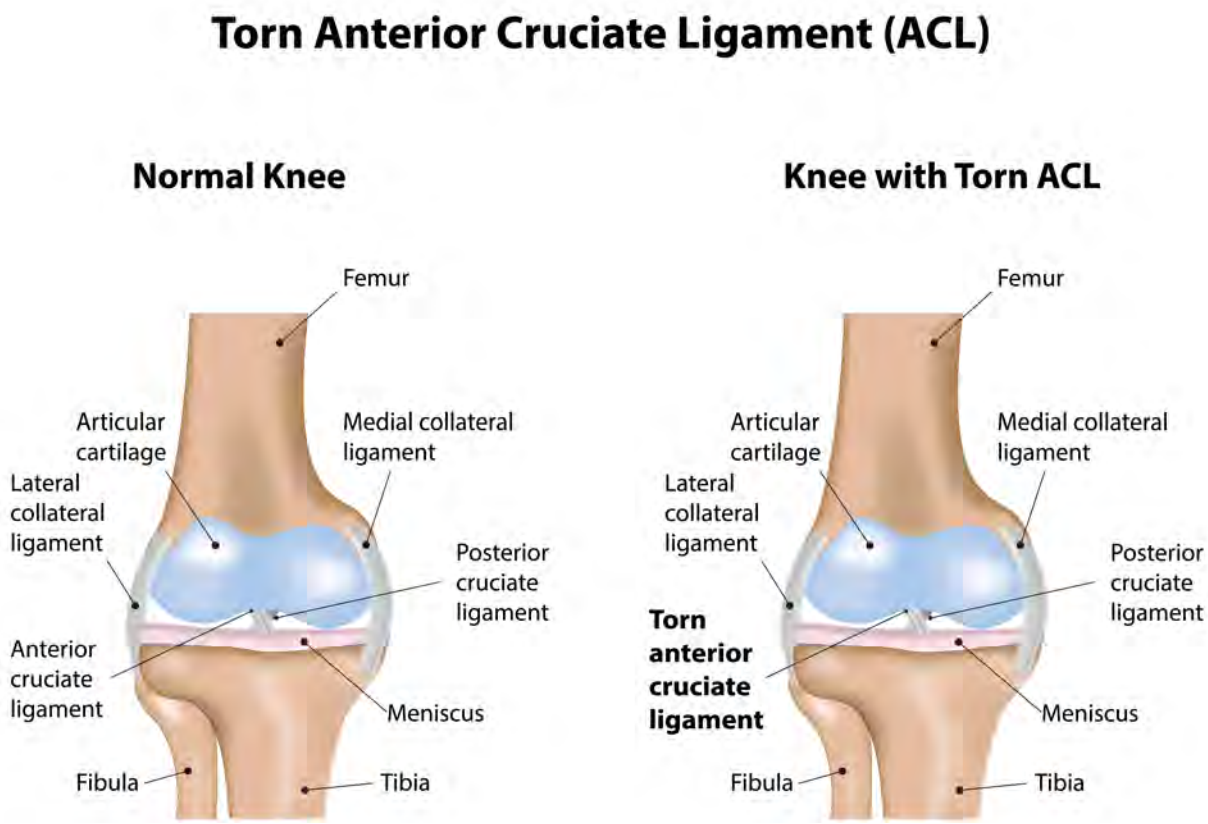
ACL Injuries

ACL injuries often occur during non-contact sporting activities involving rotation of the knee (some experts believe internal rotation may create greater risk). However, injuries can occur from any activity that stretches the ligament beyond its normal capacity, particularly while the leg is in a valgus position (internally rotated tibia). The trauma can result in a partial or complete tear of the ACL.



Many ACL injuries occur when the individual is landing from a jump, stopping abruptly, cutting, or pivoting on a leg. When an athlete places his or her knee in a valgus position with the foot planted and makes an abrupt movement (such as landing in a 'knock-knee' position in which the knees angle medially toward each other), he or she can easily stretch or tear the

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ACL. Many ACL injuries occur during sports or recreational activities, especially while skiing or playing soccer, basketball, football, or volleyball. However, an ACL tear may occur in other situations, such as twisting the knee during normal walking or while breaking a fall. ACL injuries can happen upon impact during a car accident.

ACL tear illustration

With more youth playing highly competitive high-impact sports, ACL related sports injuries are more commonplace among young athletes than in the past. However, other factors indicate higher risks for an ACL injury and knowing these factors may help athletes and non-athletes. For instance, the following factors increase an individual's risk for injuring his or her ACL:

- **A history of a prior knee injury** increases the risk of an ACL injury. Whether the previous injury involved the ACL or not, a person with a previous knee injury is more prone to re-injure or newly injure an ACL.
- **Gender**: Female athletes are six times more likely to injure an ACL than males. Experts do not exactly know why female athletes are more susceptible to ACL tears, but some theories include hormonal, neuromuscular coordination, and biomechanical differences. Some

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studies found women were more likely to tear their ACL before or after their menstrual cycle, which may indicate a hormonal etiology. Also, females have significant biomechanical differences compared to males, such as:

i. **A greater Q angle**: The Q angle measures alignment between the pelvis, leg, and foot by measuring a resultant line of force for the quadriceps formed by connecting a point near the ASIS to the mid-point of the patella. A tendency to knee valgus (knees angle inward) and a larger pelvis greatly affect knee alignment. Women tend to have a greater Q angle than men. The Q angle for women typical ranges 15 – 20 degrees, whereas men generally have a Q angle of 10 – 15 degrees.

ii. **Bend flexion**: One study published in the *American Journal of Sports Medicine* reported men as having three times more bend flexion than women when decelerating during plyometric landing (jump landing). The deeper flexion may protect males against trauma.

iii. **Femoral anteversion** (a femur that is twisted inward): Women tend to have femoral anteversion more than men. Femoral anteversion is what allows individuals to sit with their legs bent backwards and calves close to the thighs like a W shape. This biomechanical difference may be another reason females are more likely to injure an ACL. Researchers in Japan studied 16 “healthy female college students” to understand the relationship between femoral anteversion, hip and knee mechanics, and risk factors for ACL injury in single-leg landing. The results of the study in Japan indicate increased femoral anteversion causes a lower hip flexion angle, increased knee valgus alignment, and more activation of the rectus femoris muscle, which may increase risks for an ACL injury.

iv. **Joint hyperlaxity** (hyperelasticity): This condition is what we typically call ‘loose jointedness’ and is also more common in females.

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v. **Smaller intercondylar notch** and **smaller muscle fibers**: Women also have a smaller intercondylar notch and smaller muscle fibers than men, which again affects knee alignment and stability of the joint. The intercondylar fossa of the femur (intercondylar notch) is a notch between the rear surfaces of the medial and lateral epicondyles of the femur characterized by two protrusions on the distal end of the femur that joins the knee. In a study entitled *The Importance of the Intercondylar Notch in Anterior Cruciate Ligament Tears*, researchers note, "Some studies have shown that patients with a narrow intercondylar notch have a predisposition for ACL tears."

- **Adolescents** tend to tear ACLs more frequently than older individuals—with adolescent girls having a higher rate of ACL injuries than adolescent boys. One reason for the recent increase of ACL injuries with youth may also be due to the larger numbers of U.S. adolescents participating in high-impact sports than in the past.

Symptoms

Symptoms of an ACL tear include pain, swelling, and limited range of motion (ROM) in the affected knee. Often, patients will report hearing a pop or feeling a tearing sensation in the knee at the time of injury. The severity of pain and swelling can vary, and in some cases, patients may be unable to tolerate any weight on the affected knee. There may be a feeling of instability and 'giving way' related to the inability to bear weight on the knee. Onset of symptoms is generally within a 0 – 2 hours.

Imaging

Often patients will seek medical attention within the first few days or weeks after injuring the knee, but some may wait even longer to have an injured knee checked. Diagnosis of the injury may involve the clinician palpating

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the knee, performing physical tests, or ordering X-rays or an MRI. Patients may appear to only have a soft tissue injury when in fact the pain may be due to a fractured bone or displaced joint. With imaging, the clinician can determine if the patient also has fractures, a ruptured meniscus, loose cartilage, or other ligamentous tears.

Orthopedic Testing

Numerous orthopedic assessments are available to help diagnose knee injuries. However, **Lachman's test** is the most commonly used ACL assessment. The following tests are presented to briefly familiarize readers about common exams.

Lachman's Test

This is a passive accessory movement test to identify ACL integrity. The patient is supine on a table. The leg should be slightly externally rotated. The clinician places one hand behind the tibia and the other on the thigh. The clinician's thumb must be on the tibial tuberosity. Pulling the tibia anteriorly, an intact ACL prevents forward translational movement of the tibia on the femur. Anterior translation of the tibia indicates a positive test.

For clarity, the following is a description from research entitled *Accuracy of Lachman and Anterior Drawer Tests for Anterior Cruciate Ligament Injuries,* published in The Archives of Bone and Joint Surgery:

> The Lachman test is carried out in relax supine position, the examiner bends the knee to about 15 degrees and slightly external rotation. Then, by stabilizing the femur with one hand and putting the other hand behind the proximal tibia at the level of joint line, and then the tibia is pulled forward. In normal response there should be a steady restraint to anterior movement. Anterior displacement of proximal tibia being felt by examiner thumb in a soft or mushy end point was associated with positive Lachman test. Grade of laxity was defined by the amount of anterior tibial movement.

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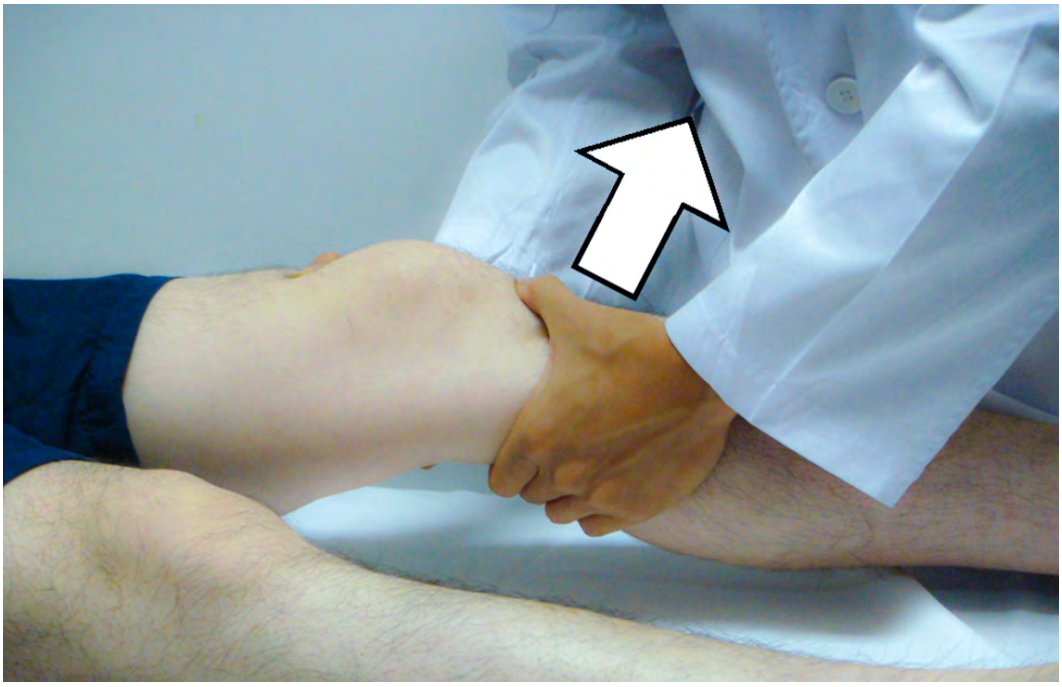

Lachman's Test (Photo by Lam et al.)

In the study, the researchers conclude:

> The diagnosis of the ACL injury and the decision to reconstruct ACL could be reliably made with regards to the anterior drawer and Lachman tests result. The tests did not have privilege to each other. The test accuracy increased considerably under anesthesia especially in women.

Anterior Drawer Test

The anterior drawer test is described in *Accuracy of Lachman and Anterior Drawer Tests for Anterior Cruciate Ligament Injuries*:

> With the patient in supine position, the hip and knee were flexed to 45 and 90 degrees respectively. While the foot was stabilized on the examination table and the hamstrings were relax, frequent manual gentle antro-posterior forces were applied to the proximal tibia, and tibia antero-posterior displacement in flexed knee was measured. The degree of displacement was compared with normal side.

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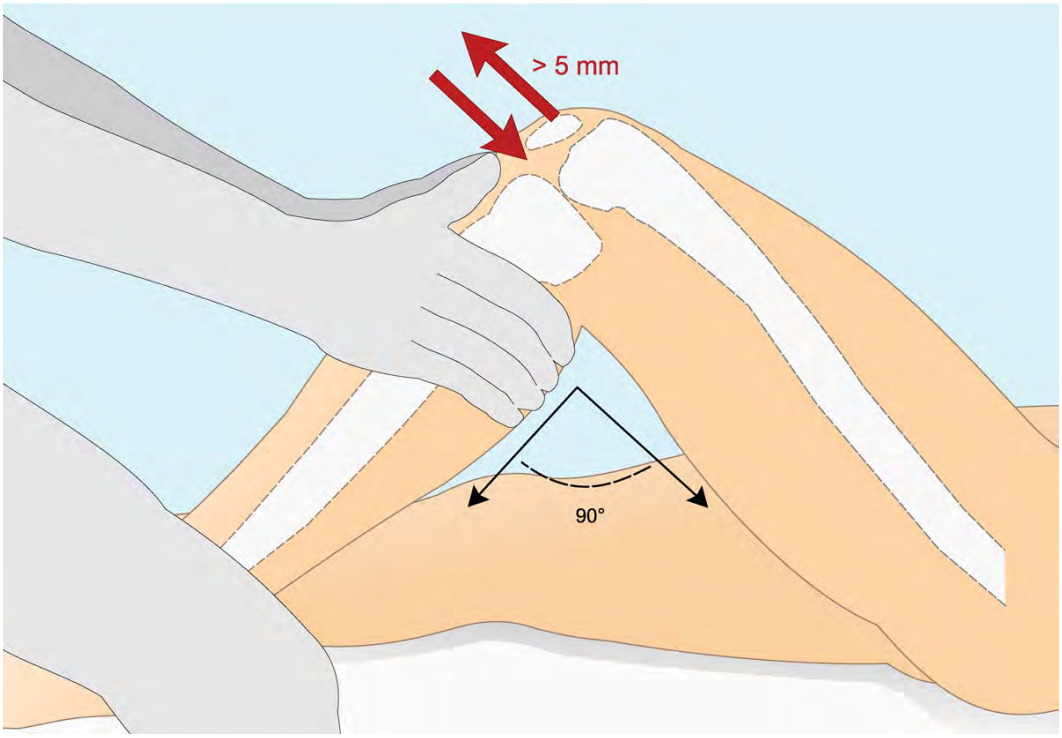
Displacement of more than 6mm comparing the opposite side with a soft end point was proposed as torn ACL.



Anterior and Posterior Drawer Test

Usual Care

Physical therapy is often used to manage ACL injuries. Patient may also receive pain medications, cryotherapy (RICE protocol) for the swelling, or surgery. Reconstruction of the ACL usually requires a surgical graft. The surgeon perform an autograft (using the patient's own tissue) or an allograft (using tissue from a cadaver). The graft often involves using a thin slice of patellar tendon or hamstring tendon tissue to reconstruct the ACL. After surgery, physical therapy is again a standard treatment.

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In research published in *The American Journal of Sports Medicine*, doctors from the Department of Orthopedics at Kaiser Permanente Medical Center, (San Diego, California) document risks associated with abnormal shortening of muscle tissue (contracture) after ACL reconstruction surgery:

> Between 1982 and 1986, 126 patients who had under gone ACL reconstruction were followed in a prospective manner. One year follow-up statistics were re viewed for the presence of 13 different complications. The most prevalent complications were quadriceps weakness, flexion contracture, and patellofemoral pain. Quadriceps weakness (strength less than 80% of the normal side) was present in 65% of patients and correlated positively with flexion contracture, patellar irritability, and ACL reconstructions using patellar tendon grafts. Flexion contracture of 5° or more was present in 24% of patients and correlated positively with in creased age and patellar irritability. Patellofemoral pain was present in 19% of patients and correlated positively with flexion contracture.
>
> Clinical relevance: The three most common complications of knee ligament surgery are shown to be strongly interrelated. It is likely that a causal relationship is present in which flexion contracture causes patellofemoral irritability, and that both of these factors, alone or in combination, result in quadriceps weakness. If this theory is correct, then it is crucial that postoperative rehabilitation programs place a major emphasis on the avoidance of flexion contracture.[1]

1. Sachs, Raymond A., Dale M. Daniel, Mary Lou Stone, and Richard F. Garfein. "Patellofemoral problems after anterior cruciate ligament reconstruction." The American journal of sports medicine 17, no. 6 (1989): 760-765.

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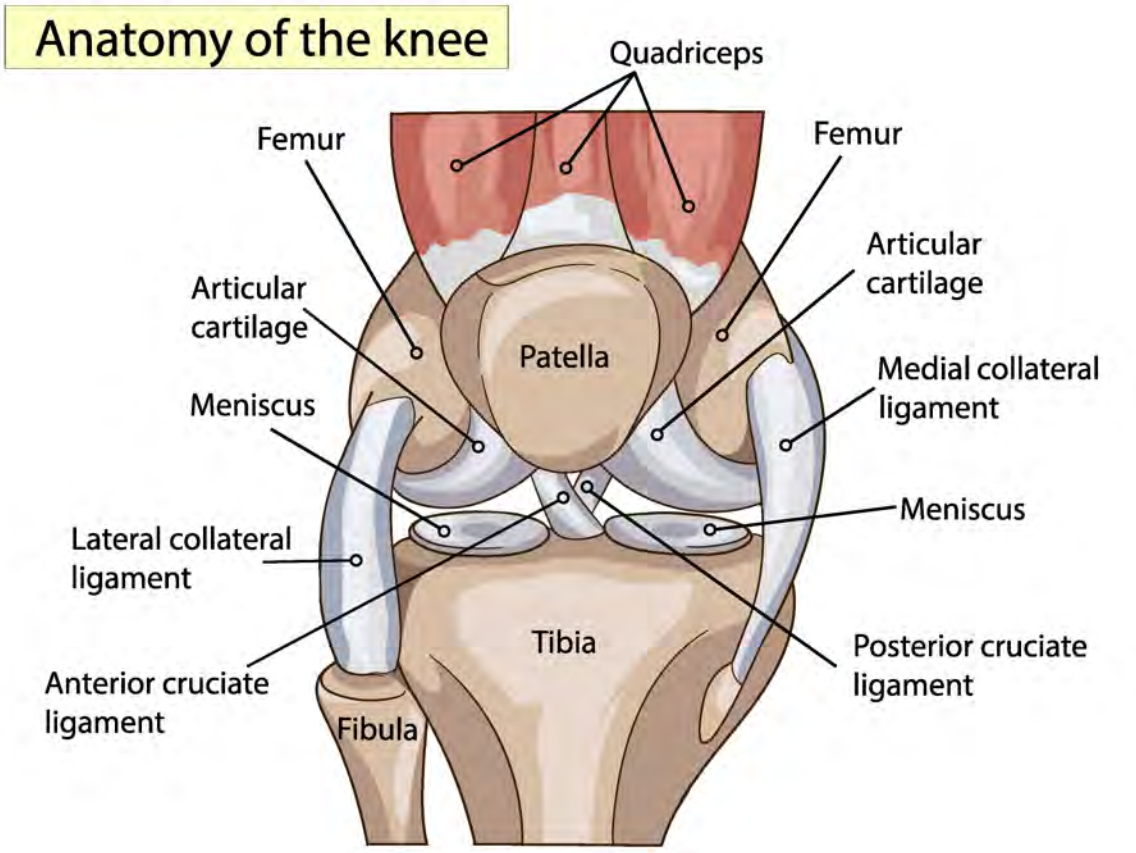
Torn Meniscus

A torn meniscus often accompanies an injured ACL. Each knee has two menisci, which are C-shaped pieces of cartilage that act as cushions between the tibia and femur. The menisci can be damaged when activities place pressure on the knee or rotate the knee. Even something as simple as rising from a squatting position may cause a meniscal tear.

Forced twists, rotations, pivots, deep squatting, and heavy lifting are risk factors for a torn meniscus. Activities requiring abrupt turns and stops are known risk factors. As a result, tennis, soccer, basketball, and football players are at risk.



Anterior View

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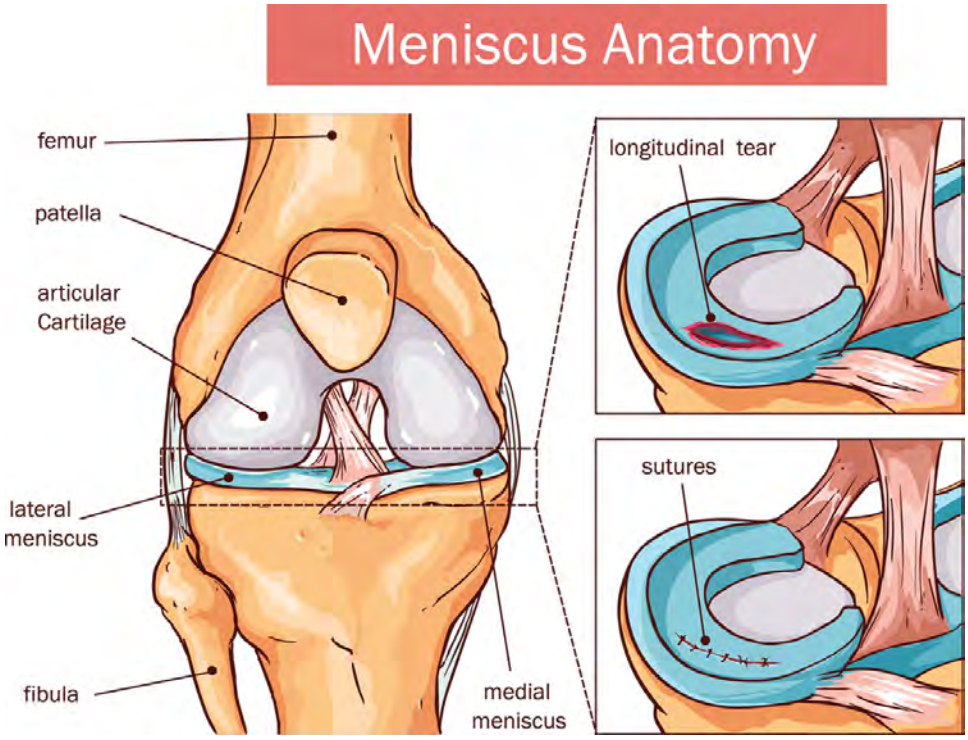

A physical exam and MRI helps to determine meniscus involvement. Doctors note of meniscal tear diagnostic accuracy in *The American Journal of Sports Medicine*:

> The accuracy in clinical diagnosis of meniscal tears was assessed in 100 knees. Arthroscopy was performed in each case to establish the diagnosis. The clinical diagnosis was correct in 87 cases, correct but incomplete in 4, and incorrect in 9. In those with mensical tears repeated popping occurred in 43%, swelling in 51%, and pain localized to the joint line in 63%. Tenderness over the joint line, the most accurate clinical sign, was positive in 77% and false positive in 11 % of meniscal tears. McMurray's test was positive in 58% and false positive in 5%, while the medial-lateral grind test was positive in 68% and false positive in 1%. At least one of these manipulative tests was positive in 79% of meniscal tears. Repeated examination and addition of the medial-lateral grind test to the clinical evaluation of meniscal tears significantly improves diagnostic accuracy.[2]

2. Anderson, Allen F., and A. Brant Lipscomb. "Clinical diagnosis of meniscal tears: description of a new manipulative test." *The American journal of sports medicine* 14, no. 4 (1986): 291-293.

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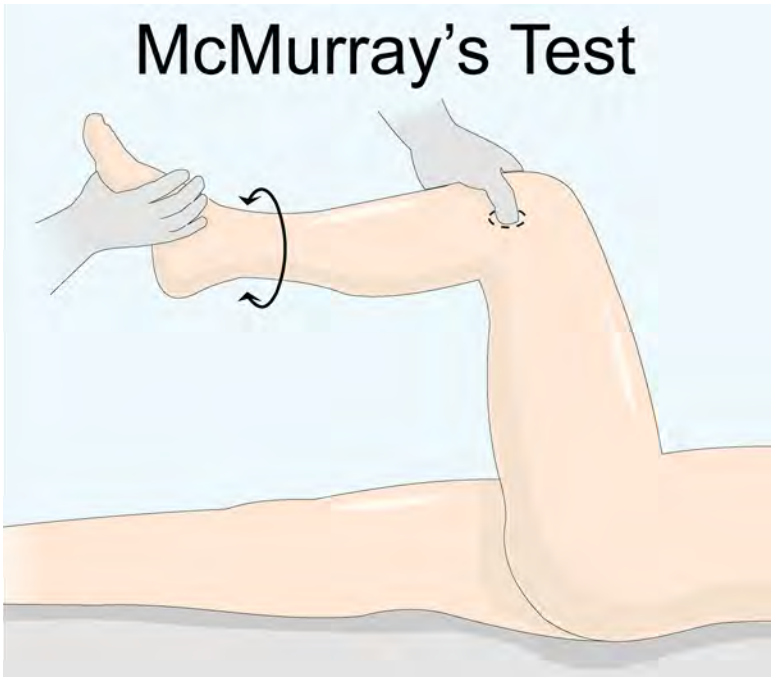

McMurray's Test

Mastering orthopedic testing is not the goal of this course, but familiarization with different procedures is helpful when communicating with physicians and patients. Note that this procedure is 58% positive for a torn meniscus and 5% false positive. The following is a very overview of this procedure.

McMurray's test is performed with the patient in the supine position. The clinician holds the knee and palpates the joint line. The other hand holds the sole of the foot and support the limb to provide movement. The clinician applies a valgus stress to the knee and the opposite hand rotates the leg externally and extends the knee. Audible clicks and pain during the test may indicate a torn medical meniscus. Performing this test with a varus stress is used to determine whether or not a lateral meniscus tear is present.

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Osteoarthritis

Definition

Researchers from Florida International University and Adaptive Neural System Laboratory define osteoarthritis (OA):

> OA can be seen as a two-part degenerative, chronic, and often progressive joint disease. It is the most common musculoskeletal complaint worldwide and is associated with significant health and welfare costs. Within a joint such as the knee, there is a smooth fibrous connective tissue known as articular cartilage. This cartilage surrounds the bone where it comes into contact with another bone. In a normal joint, the cartilage acts as a shock absorber as well as it allows for even movement of the joint without pain. When cartilage degrades, it becomes thinner and may even disappear altogether leading to joint pain and difficulty in movement such as in knee OA. OA is characterized by a repetitive inflammatory response of the articular cartilage due to focal loss or erosion of the articular cartilage and a hypertrophy of osteoblastic activity or a reparative bone response known as osteophytosis. Both of these defining characteristics result in a joint space narrowing or subchondral sclerosis, leading to pain, immobility, and often disability. The symptoms of OA, such as pain and stiffness of the joints and muscle weakness, are serious risk factors for mobility limitation and lead to impaired quality of life for the affected population.
>
> Osteoarthritis (OA) a common disease of aged population and one of the leading causes of disability. Incidence of knee OA is rising by increasing average age of general population. Age, weight, trauma to joint due to repetitive movements in particular squatting and kneeling are common risk factors of knee OA. Several factors including cytokines, leptin, and mechanical forces are pathogenic factors of knee OA.
>
> More than 20 million people in the US suffer from knee osteoarthritis (OA). By 2030, 20% of Americans (about 70 million people) >65 years of age are at risk for OA. Global statistics reveal over 100 million people worldwide suffer from OA, which is one of the most common causes of disability. In addition, younger individuals may be susceptible to injury-induced OA. More than 50% of the population around the world (>65 years) show X-ray evidence of OA

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> in one of the joints, thus demonstrating the high incidence of this disease. [3]

Steroid Injections

Dr. Kirstie Saltsman, Ph.D. published findings on the National Institute of Arthritis and Musculoskeletal and Skin Diseases website:

> Among people with osteoarthritic knees, repeated steroid injections over two years brought no long-term improvement in reducing pain, according to a study funded in part by the NIH's National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS). Rather than showing any benefit, the results revealed that the injections sped the loss of the cartilage that cushions the knee joint. The study appeared in the Journal of the American Medical Association (JAMA).
>
> "Use of corticosteroid injections to treat knee OA is based on the medicine's capacity to reduce inflammation, but corticosteroids have also been reported to have destructive effects on cartilage," said Dr. McAlindon. "We now know that these injections bring no long-term benefit, and may, in fact, do more harm than good by accelerating damage to the cartilage." [4]

The aforementioned study referenced by Dr. Saltsman that cautions against the long-term use of corticosteroid injections concludes the following:

> Among patients with symptomatic knee osteoarthritis, 2 years of intra-articular triamcinolone [intermediate-acting synthetic glucocorticoid], compared with intra-articular saline, resulted in significantly greater cartilage volume loss and no significant difference in knee pain. These findings do not support this treatment for patients with symptomatic knee osteoarthritis. [5]

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3. Bhatia, Dinesh, Tatiana Bejarano, and Mario Novo. "Current interventions in the management of knee osteoarthritis." Journal of pharmacy & bioallied sciences 5, no. 1 (2013): 30.

4. niams.nih.gov/newsroom/spotlight-on-research/long-term-benefit-steroid-injections-knee-osteoarthritis-challenged

5. McAlindon, Timothy E., Michael P. LaValley, William F. Harvey, Lori Lyn Price, Jeffrey B. Driban, Ming Zhang, and Robert J. Ward. "Effect of intra-articular triamcinolone vs saline on knee cartilage volume and pain in patients with knee osteoarthritis: a randomized clinical trial." Jama 317, no. 19 (2017): 1967-1975.

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NIH and Acupuncture

A division of the National Institutes of Health, the National Center for Complementary and Integrative Health, notes the following:

> A landmark study has shown that acupuncture provides pain relief and improves function for people with osteoarthritis of the knee and serves as an effective complement to standard care. The study, the largest Phase III clinical trial of acupuncture for knee osteoarthritis, was funded by NCCAM and the National Institute of Arthritis and Musculoskeletal and Skin Diseases, both components of the National Institutes of Health. [6]

Surgery

A study conducted at the University of Copenhagen tested the efficacy of acupuncture on patients with severe knee osteoarthritis to see if it is an effective means to control pain while waiting to have knee surgery. Not only did acupuncture work, many patients chose to cancel the surgery:

> Purpose: Acupuncture treatment of patients waiting for arthroplasty surgery. Methods: 29 patients with a total of 42 osteoarthritic knees were randomized to two groups. Group A was treated while Group B served as a no-treatment control group. After 9 weeks Group B was treated too. Analgesic consumption, pain and objective measurements were registered. All objective measures were done by investigators who were “blinded” as to Group A & B. In the second part of the study 17 patients (26 knees) continued with treatments once a month. Registration of analgesic consumption, pain and objective measurements continued. Total study period 49 weeks. Results: Comparing Group A to B there was a significant reduction in pain, analgesic consumption and in most objective measures. In Group A + B combined there was an 80% subjective improvement, and a significantly increased knee range movement – an increase mainly in the worst knees. Results were significantly better in those who had not been ill for a long time. In the second part of the study, it was shown that it was possible to maintain the improvements. Conclusions: Acupuncture can ease the discomfort while waiting for an operation and perhaps even serve as an

6. nccih.nih.gov/research/results/acu-osteo.htm

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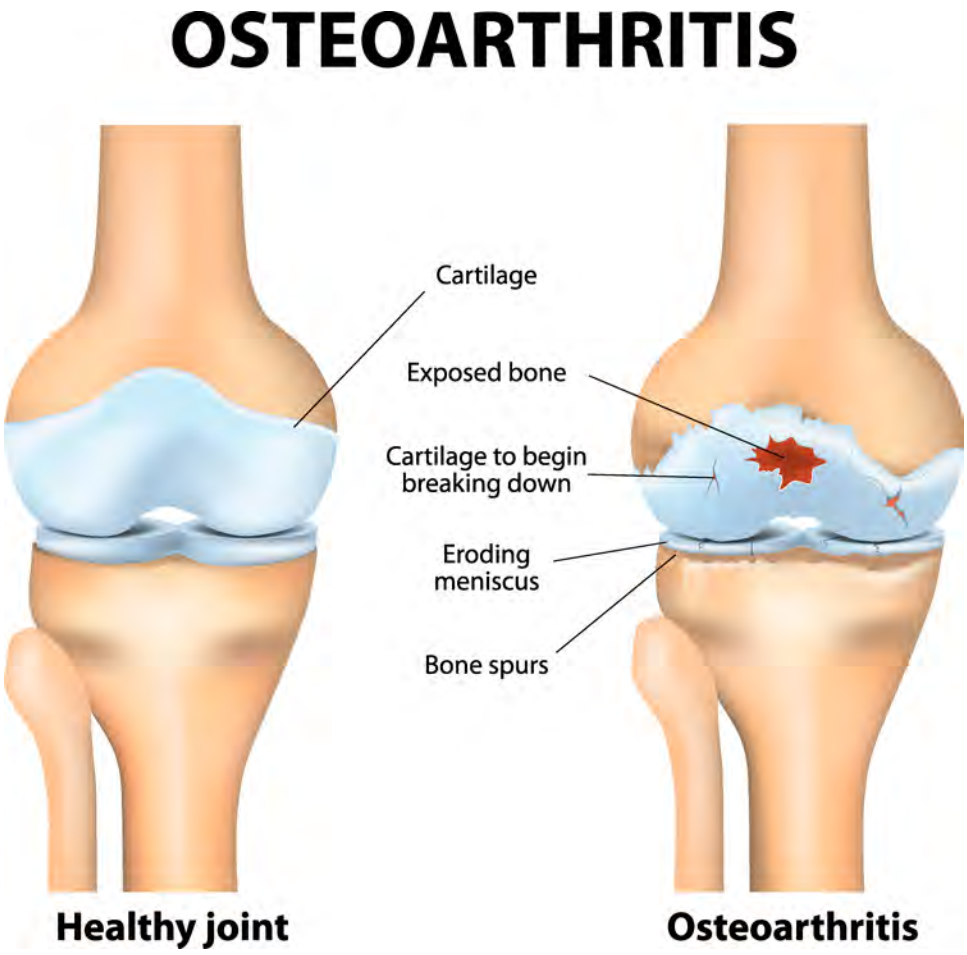
alternative to surgery. Seven patients have responded so well that at present they do not want an operation. (USD 9000 saved per operation). [7]



7. Christensen, B. V., I. U. Iuhl, H. Vilbek, H-H. Bülow, N. C. Dreijer, and H. F. Rasmussen. "Acupuncture treatment of severe knee osteoarthrosis. A long-term study." Acta Anaesthesiologica Scandinavica 36, no. 6 (1992): 519-525.

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Chinese Medicine

Knee pain may be due to excess or deficient etiologies. Rheumatoid arthritis, osteoarthritis, and trauma are common causes. Invasion of external pathogenic factors is a risk factor for knee pain.

Cold and Damp

Environmental risks include dampness and cold. Patients exposed to these conditions may experience wind, cold, and damp attacking the joints, especially when the wei qi (defensive qi) is deficient. Cold and damp exogenous pernicious influences lead to qi and blood stasis, thereby causing knee inflammation and pain. For cold and dampness, patients present with knee pain, coldness of the limbs, and the pain is alleviate by warmth. The pulse is deep, tight, or slow. The tongue is pale or purple.

Heat

Cold and dampness may also transform into heat, thereby creating damp-heat in the knee, which blocks qi and blood circulation. This too causes pain and inflammation. The swelling and pain of the knee is often bilateral and there is a sensation of heat or redness in the knee region. The tongue is red and the pulse is slippery and rapid.

Qi and Blood Deficiency

Qi and blood deficiency may result in knee pain.Patients often present with bilateral knee pain that worsens throughout the day, weakness of the knees, pallor, dizziness, and palpitations. Risk factors include aging and chronic illness. Deficiency precipitates invasion of external pernicious influences (including wind, cold, and dampness) and subsequent qi and blood stasis. The tongue is pale with a thin white coating and the pulse is deep and thready.

Liver and Kidney Deficiency

If the liver and kidneys become deficient, there is often weakness of the knees, inflammation and edema, pain, and deformities of the knees. The knee pain is usually bilateral and patients present with lower back pain,

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fatigue, and weakness of the knees, and poor muscle tone. The pulse is deep, thready, and weak. The tongue is pale with a thin white coating.

Treatment Principles

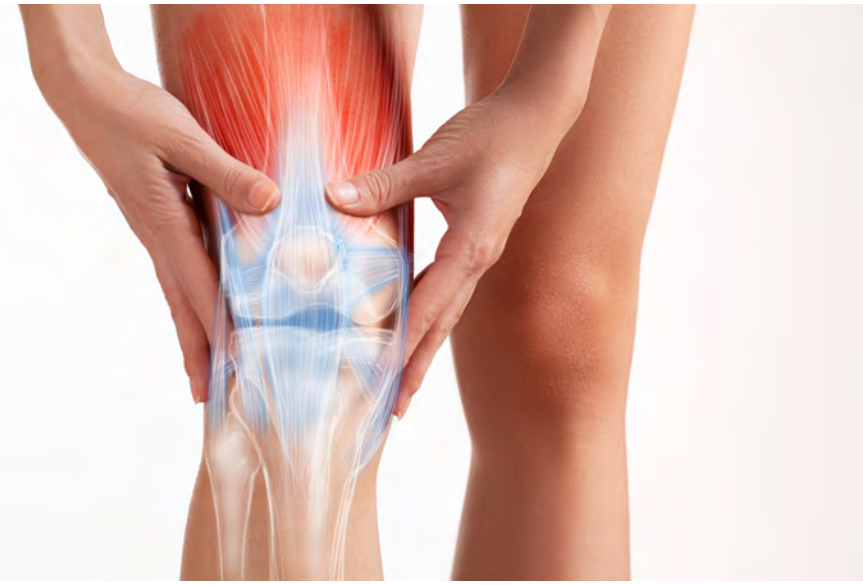
For patients with cold and damp obstruction of the channels of the knees, the treatment principle is to dispel the cold, warm the channels, invigoration blood, and stop pain. For damp-heat, clear the heat, drain the dampness, and reduce inflammation. For qi and blood deficiency, tonify qi and blood and dispel wind-dampness. For liver and kidney deficiency, tonify the liver and kidneys and also nourish the tendons and bones.

Qi and Blood Stasis

In cases of acute trauma, qi and blood stasis results. For injuries to the soft tissues (including the tendons, ligaments, and cartilage), the treatment principle is to invigorate qi and blood, relax the muscles, and alleviate swelling.

Local Points and Ashi

As a general rule, local acupuncture points and ashi points of tenderness are indicated in most instances of knee pain. Distal acupuncture points may be used to supplement the therapeutic value.



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Acupuncture Points

The following are common acupuncture points used for the treatment of knee disorders.

Xiyan (MN-LE-16, Eyes of the Knee)

Xiyan is a pair of acupuncture points located below the patella. The lateral acupoint is ST35 (Dubi) and the medial acupoint is MN-LE-16 (Nei Xiyan). ST35 is located with the knee flexed. The point is at the lower border of the patella, in the hollow below the patella and lateral to the patellar ligament. Nei Xiyan is located in the hollow medial to the patellar ligament.

Medial and lateral Xiyan dispel wind-dampness, alleviate swelling, stop pain, and invigorate the circulation of qi and blood. These acupoints are essential to the treatment of many knee disorders, including knee pain, ACL and meniscus injuries, or weakness of the lower extremities.

Seated

Needling is applied with the knee flexed. When seated, the legs are bent at a 90 degree angle to the floor. Care must be used when patients are seated to ensure that they do not lose consciousness. Application of Xiyan strongly invigorates and disperses qi. Combined with the qi required to remain upright in the seated position, the patient may not have enough qi to remain conscious. Patients with constitutional deficiencies, nervousness, who have not eaten or slept, or that have overworked their bodies may not be appropriate for the seated position.

Anytime a patient is needle in the seated or standing position, take precautions to ensure that the patient does not faint. Ask the patient during the procedure, “Are you faint, dizzy, weak, or feeling sweaty?” Make sure the patient does not experience lightheadedness and does not turn pale. Look for signs of closed pores or sweating. If any signs faintness appear, remove the needles immediately.

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Supine

Patients may rest on the treatment table in a supine position with a pillow below the knees. This flexes the knees and relaxes the back. In this way, the risks associated with the seated position are avoided. Alternately, patients may also rest in a lateral (side) position.

Guidelines

Needling is often applied perpendicularly toward BL40 (Weizhong), such that medial and lateral Xiyan needles point towards the center of the knee after insertion. Depth of insertion is approximately 0.5–2 cun, dependent on the size of the patient and the condition.

Electroacupuncture, Moxa, TDP

For patients with cold and dampness, moxibustion or the TDP heat lamp is applicable. ***Connection of medial and lateral Xiyan with electroacupuncture is an effective treatment option for invigorating qi and blood.*** Electroacupuncture at Xiyan is easily applied with patients in a supine position.

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Xixia (M-LE-15, Below Knee, Hsi Hsia)

This point is at the patellar ligament at the lower border of the patella. The point is below the center of the inferior margin of the patella. Needle insertion is approximately 1–1.5 cun, perpendicularly. Pressing on the point prior to needling often helps to prevent patient discomfort.

This acupoint is very effective for the treatment of many knees disorders, including disorders of the soft tissues of the knee region.

- Xixia is indicated for the treatment of knee arthralgia (joint pain), patellar ligament strains, and arthritis.
- This acupoint pairs with medial and lateral Xiyan (MN-LE-16) for the treatment of knee pain, arthritis, ACL and meniscus injuries, and many soft tissue injuries.
- For arthritis of the knee, Xixia may be combined with Xiyan (MN-LE-16), Heding (M-LE-27), ST36 (Zusanli), GB34 (Yanglingquan), and SP9 (Yinlingquan).

Heding (M-LE-27, Crane's Summit)

Heding is located at the middle of the superior margin of the patella. It is indicated for diseases of the knee and surrounding tissues, weakness of the foot and leg, and paralysis. Needle insertion is approximately 0.3–1 cun.

Classic Three Point Combination

The three point combination of medial and lateral Xiyan with Xixia is a powerful and effective treatment for knee disorders. Xiyan is also commonly used with Heding.

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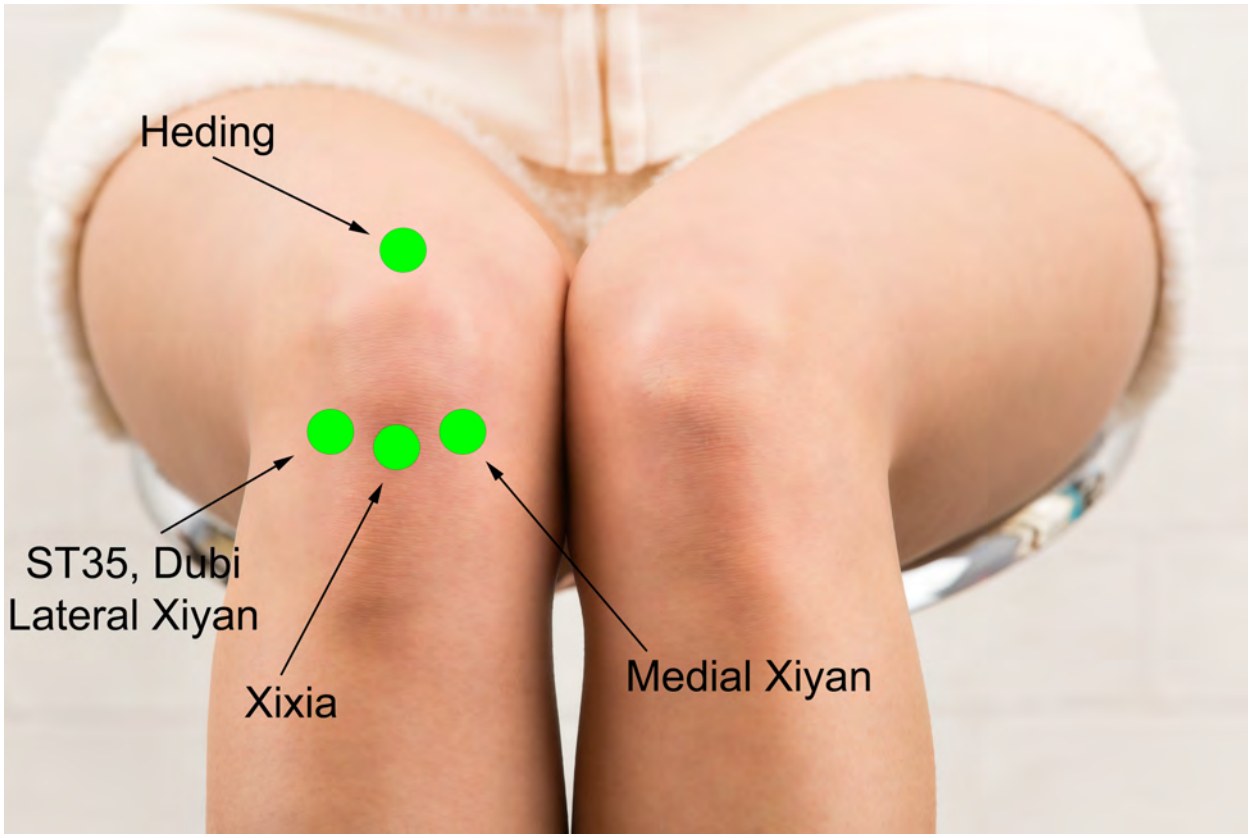

In the depiction above, the patient is in a seated position with legs bent at a 90 degree angle to the floor.

- For sensitive patients, shallower needling of bilateral Xiyan may be applied, Electroacupuncture may be added to enhance efficacy.

- For patients with sufficient qi, needles may be inserted to a greater depth at Xiyan with manual lifting, thrusting, or rotating manipulation applied. Treatment principles include invigorating qi and blood to resolve stasis and nourishing the tendons and ligaments to promote healing.

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BL40 (Weizhong, Middle of the Crook)

This acupoint is located at the midpoint of the transverse crease of the popliteal fossa, between the tendons biceps femoris and semitendinosus. The point is most easily located with the knee slightly flexed. Needle insertion is perpendicular, approximately 1–1.4 cun. Caution must be used with this acupoint, the tibial nerve and popliteal artery and vein are located deeply below the surface of this acupoint.This point is especially useful for patients with both knee and lower back disorders.

- BL40's location at the back of the knee makes this an important local point for the treatment of knee disorders.

- BL40 is one of the four command points, giving it a special indication for the treatment for the treatment of lumbar region pain. BL40 is the command point of the upper and lower back. BL40 is a Ma Dan-yang Heavenly Star point, which indicates this acupoint for the treatment of lumbar pain and dysfunction.

- This acupoint is also the lower he-sea point of the bladder channel. It is used for the treatment of difficulty with urination, enuresis, and other bladder related disorders.

- BL40 is also renown for its effectiveness in the treatment of skin disorders, especially skin disorders due to heat in the blood. Another name used for this acupoint is Xuexi (Blood Xi-Cleft). The name reflects the ability of needling this point to invigorate blood circulation and to cool the blood.

- BL40 is indicated for patients with a fever due to summer heat that may be accompanied with lower abdominal discomfort, diarrhea, or vomiting.

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BL40 is often applied with patients in a supine, prone, or lateral resting position. The above picture shows a patient with BL40 needled in a prone position and a pillow is supporting the lower legs.

Bolster or Pillow

The following picture shows a patient with a bolster under the knees.

- A pillow or bolster under the knees provides support for the patient's back and provides access to needling acupoints such as Heding, Xiyan, Xixia, etc.
- If the bolster or pillow is placed slightly more superiorly towards the patient's thigh and away from the popliteal fossa, BL40 may be needled with the patient in a supine position.

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LV8 (Ququan, Spring at the Crook)

LV8 is located with the knee flexed, in depression above the medial end of the transverse popliteal crease, posterior to the medial epicondyle of the femur, on the anterior part of the insertion of the tendons of m. semimembranosus and m. semitendinosus. Needling is either performed with a perpendicular or slightly posterior angle, 0.8–1.5 cun.

LV8 is a He-Sea and water point. LV8 benefits the urination bladder, clears and cools damp-heat, and relaxes the muscle channels. Indications include medial knee pain or swelling, lower leg or medial thigh pain, prolapsed uterus (metroptosis), nocturnal emission, genital pain or itching, and difficulty with urination.

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GB33 (Xiyangguan, Knee Yang Gate)

GB33 is located on the lateral side of the knee in a depression above the lateral epicondyle of the femur, between the femur and the biceps femoris. This point is located by finding the hollow proximal to the lateral epicondyle of the femur.

- This acupoint relaxes the sinews, benefits the knee, and dispels wind-dampness.
- GB33 is indicated for the treatment of knee and leg pain and motor impairment.

GB34 (Yanglingquan, Yang Mound Spring)

GB34 is the depression anterior and inferior to the head of the fibula. The common peroneal nerve bifurcates into the superficial and deep peroneal nerves at this point. Standard needling is a perpendicular insertion of 0.8–1.5 cun. GB34 is also needled slightly obliquely or through to SP9.

GB34 is a He-Sea and earth point of the gallbladder channel. GB34 is the Lower He-Sea point of the gallbladder. GB34 is a Hui-meeting point of the sinews and is referred to as the influential point of the tendons (one of the eight influential points). This point is also a Ma Dan-yang Heavenly Star acupoint. GB34 benefits the liver and gallbladder, clears and cools damp-heat, and benefits the sinews, tendons, and bones.

- GB34 is indicated for the treatment of lower limb and knee pain, weakness, and motor impairment.
- GB34 is also applicable for the treatment of sciatica, chest and lateral costal region pain, bitter taste in the mouth, inflammation of the gallbladder, jaundice, and hepatitis.

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ST36 (Zusanli, Leg Three Miles)

This acupoint is 3 cun below ST35, one finger-breadth from the anterior crest of the tibia, in tibialis anterior. *This point is lateral to a notch that is palpable on the tibia.* Zusanli (leg three measures) is a He Sea, earth, Lower He Sea of the Stomach, and Sea of Nourishment point. ST36 is a Gao Wu command point and a Ma Dan-Yang heavenly star point. Needling is inserted perpendicularly, 0.5–1.2 cun.

ST36 is effective for benefitting the muscles and lower limbs. ST36 activates the stomach foot-yangming channel and alleviates pain. Jin Dynasty physician Ma Dan-yang notes that ST36 benefits patients with cold stomach disorders, diarrhea, parasites, knee pain, leg swelling, or cold-damp painful obstruction.

ST36 orders the spleen and stomach, regulates qi and blood, and tonifies qi. Common indications for usage include gastric pain, vomiting, abdominal distention, diarrhea, constipation, mastitis, breast accesses, enteritis, gastritis, edema, asthma, general weakness, emaciation, anemia, indigestion, hemiplegia, neurasthenia, and mental disorders.

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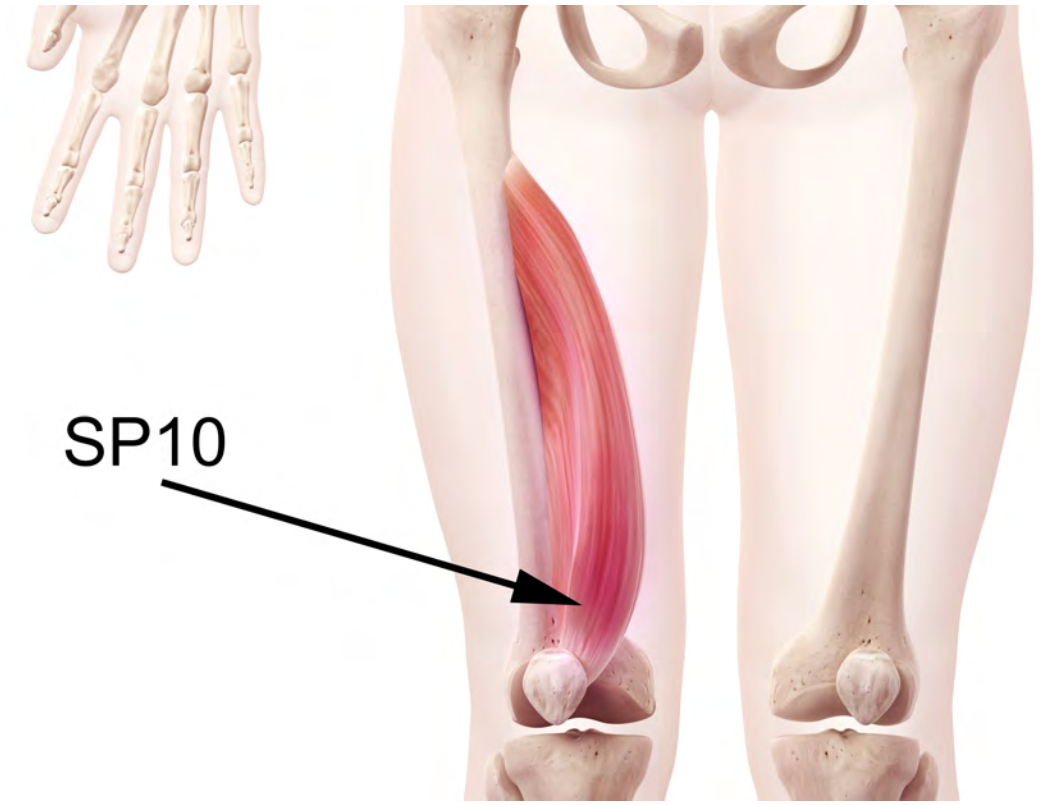
SP10 (Xuehai, Sea of Blood)

SP10 is two cun above the mediosuperior border of the patella, when the knee is flexed, in the depression on the bulge of the medial portion of the vastus medialis muscle. SP10 is directly superior to SP9. Needling is inserted perpendicularly, 0.5–1.5 cun.

SP10 harmonizes and nourishes qi, cools heat in the blood, invigorates the blood, benefits the skin, and harmonizes menstruation. As a Sea of Blood point, SP10 invigorates the blood, dispels blood stasis, and cools the blood. As a result, SP10 is effective for the treatment of injuries due to trauma.

Common indications for usage include pain on the medial aspect of the thigh, irregular menstruation, metrorrhagia (abnormal uterine bleeding), amenorrhea, leukorrhea, skin disorders (e.g., urticaria, eczema, neurodermatitis, pruritus), and dysuria.



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KD10 (Yingu, Yin Valley)

This point is located with the knee flexed. KD10 is level with BL40, between the tendons of m. semimembranosis and semitendinosus. KD10 is at the medial end of the popliteal crease. Perpendicular insertion is from 0.8–1.5 cun.

KD10 is a He-Sea and water point. KD10 clears damp-heat from the genitals and urination bladder. Indications include knee pain or range of motion impairment, medial thigh pain, impotence, dysuria, abnormal uterine bleeding, hernia, and lower abdominal swelling and pain.

SP9 (Yinlingquan, Yin Mound Spring)

SP9 is located at the lower border of the medial condyle of the tibia, in the depression posterior and inferior to the medial condyle of the tibia. Located on the medial side of the body, this acupoint is level with GB34 (Yanglingquan), which is located on the lateral aspect of the lower leg. Perpendicular insertion between 0.5–1.5 cun is applied.

SP9 is a He-Sea and water point. SP9 transforms damp stagnation and benefits the lower jiao (burner). Indications include abdominal pain and distention, diarrhea, dysentery, edema, enuresis, urinary incontinence or retention, genital pain, dysmenorrhea, irregular menstruation, and knee pain. For swelling of the knee, this acupoint may be combined with GB34.

LV7

LV7 (Xiguan) is one cun posterior to SP9 and is effective for the treatment of knee disorders. Preference may be given to needling LV7 if palpable tenderness is present.

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KD3 (Taixi, Supreme Stream)

KD3 is a Shu-stream, earth, and source point. It benefits the kidneys, cools the heat, and strengthens the lower back and knees.

- For the treatment of kidney qi deficient lower back pain, manual acupuncture may be applied to elicit deqi radiating to the lower back or electroacupuncture may be applied bilaterally.
- This point is indicated for the treatment of knee disorders related to kidney qi, yin, and yang deficiency or kidney and liver disharmonies, wherein water fails to nourish wood.

ST34 (Liangqiu, Ridge Mound)

When the knee is flexed, ST34 is 2 cun above the laterosuperior border of the patella. ST34 is on a line between the ASIS (anterior superior iliac spine) and the lateral border of the patella. The patella is 2 cun in length and ST34 may be measured as a patella-length superior to the lateral border of the patella.

- ST34 is a Xi-Cleft point. ST34 clears the channels and pacifies the stomach.
- Indications include knee disorders, including pain, swelling, and difficulty with flexion or extension.
- ST34 is indicated for gastric pain, mastitis, and lower limb pain or motor impairment.

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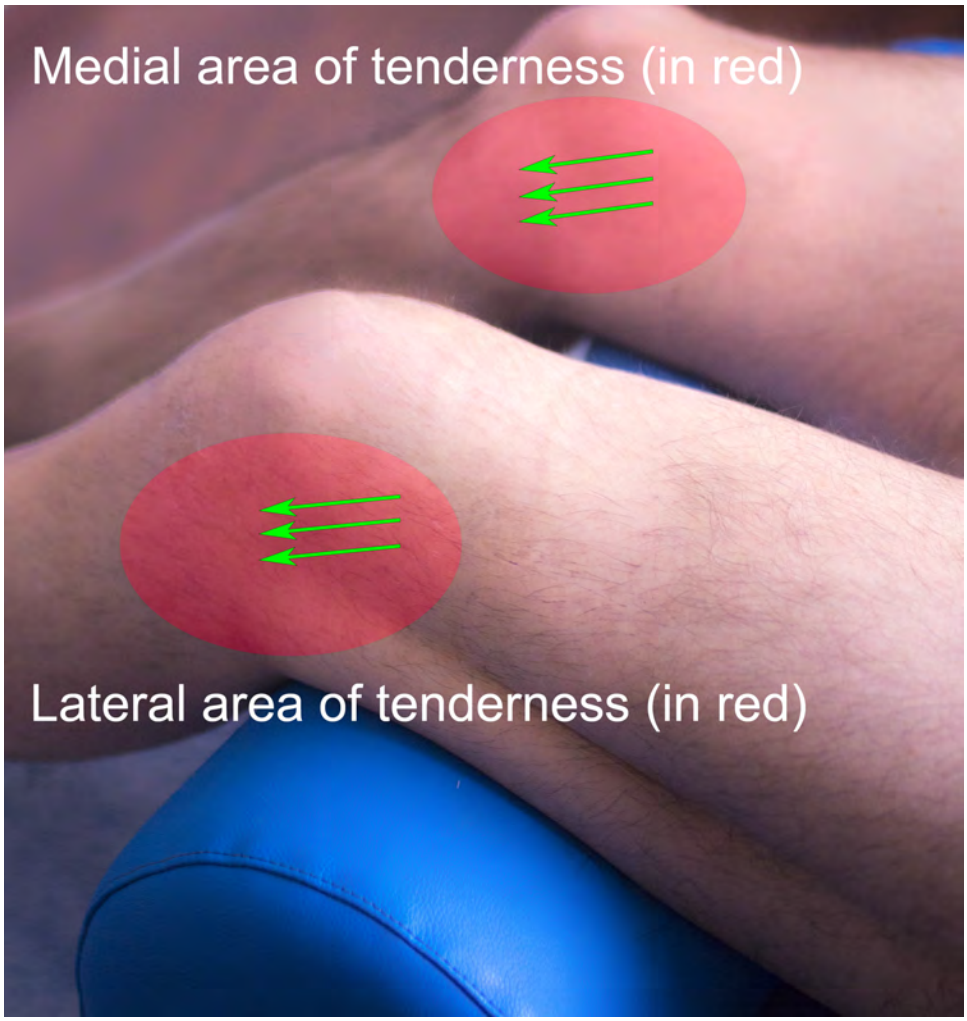
Ashi

Points of local tenderness and pain are indicated for the treatment of knee disorders. The red areas in the illustration below are examples of two possible areas of palpable tenderness that commonly occur.



The illustration above shows possible areas of palpable tenderness for a given clinical scenario (highlighted in red) that may indicate collateral ligament, meniscus, or other local soft tissue involvement. Tenderness at the highlighted lateral area of may indicate lateral collateral ligament (LCL) involvement. Tenderness at the medial highlighted zone may indicate

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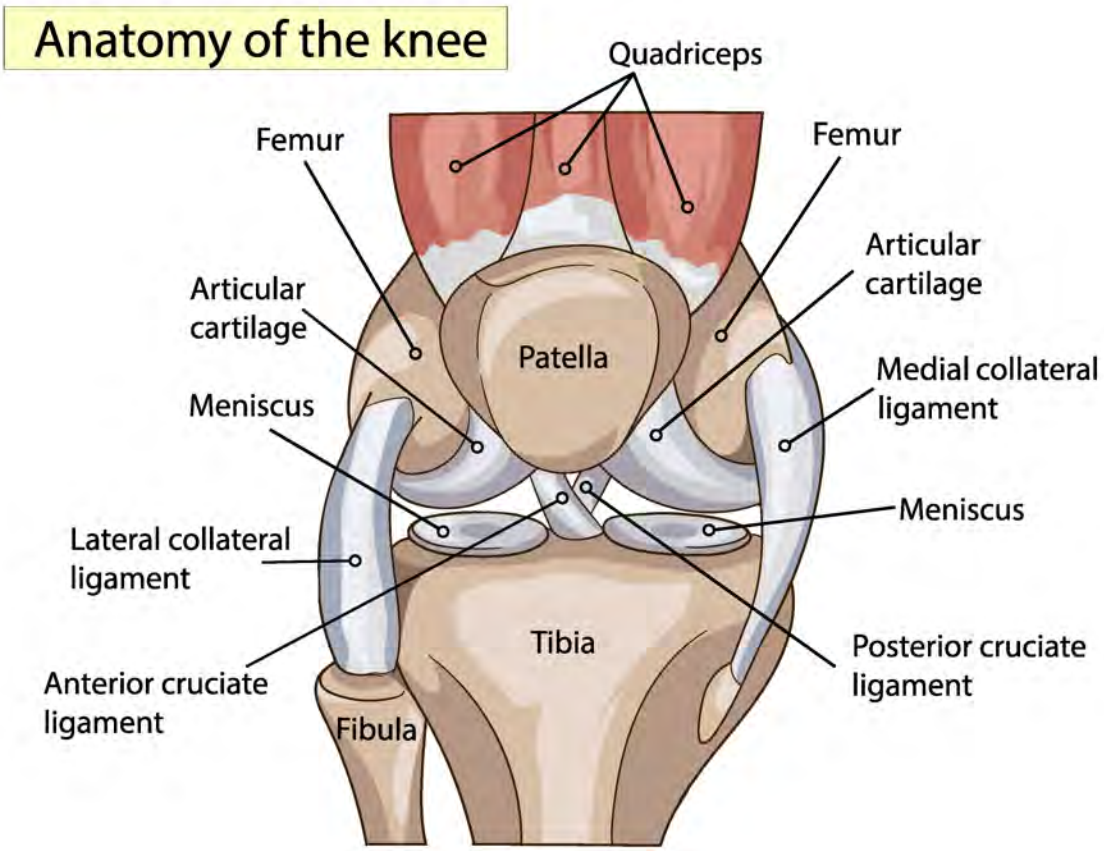
medial collateral ligament (MCL) involvement. Both ligaments regulate motion of the knees and brace the knees against deleterious movements.



MCL

"The medial collateral ligament (MCL) is one of the most commonly injured ligamentous structures of the knee joint. The popularity of sports, particularly those involving valgus knee loading such as ice hockey, skiing, and football, has contributed to the frequent occurrence of MCL injuries. The role of prophylactic bracing has been biomechanically and clinically studied, and in the majority of studies was of limited benefit…. The structures that are considered static stabilizers of the medial knee are the superficial MCL, the deep MCL, and the posterior oblique ligament."[8]

8. Phisitkul, Phinit, Stan L. James, Brian R. Wolf, and Annunziato Amendola. "MCL injuries of the knee: current concepts review." *The Iowa orthopaedic journal* 26 (2006): 77.

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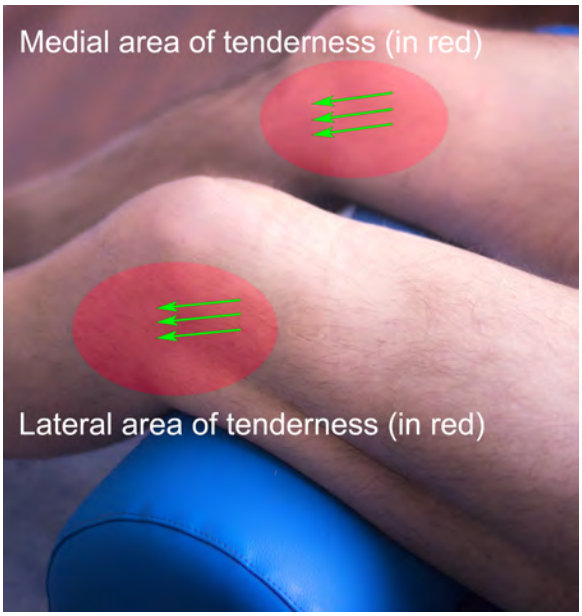
LCL

"The most commonly injured structures include the anterior cruciate ligament (ACL), medial collateral ligament (MCL), and menisci. Lateral ligament injuries of the knee are far less common overall, representing 1.1% of knee injuries. Moreover, the lateral collateral ligament (LCL) is rarely injured in isolation; rather, concomitant cruciate, meniscal, and potentially peroneal nerve involvement are commonly seen…. The LCL is a major passive stabilizer to the lateral aspect of the knee. Considered a component of the posterolateral corner (PLC), the LCL is a primary static restraint to varus stress at the knee."[9]

Ashi Acupuncture

For this patient's clinical scenario in the illustration, the green arrows indicate areas of highest palpable sensitivity. The arrows indicate that three parallel acupuncture points may be needled transverse-obliquely (20 degree angle). Approaches other than this threading technique include perpendicular needling, electroacupuncture through the region, moxibustion, and other methods for benefitting qi and blood circulation.



9. Haddad, M. Alex, Justin M. Budich, and Brian J. Eckenrode. "Conservative management of an isolated grade III lateral collateral ligament injury in an adolescent multi-sport athlete: a case report." International journal of sports physical therapy 11, no. 4 (2016): 596.

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Acupuncture Knee Research

At HealthCMi, the news department focuses on translating acupuncture research. To visit the news department, go to HealthCMi and click on the NEWS link.

The following are based on articles published in the acupuncture news department. These have been hand selected from the many research articles on the treatment of knee disorders with acupuncture at HealthCMi. The focus of this section is to present clinical scenarios for the treatment of knee pain and to highlight common approaches to patient care.

Osteoarthritis and Cartilage Repair

Acupuncture stimulates cartilage repair for patients with knee osteoarthritis.[10] Using MRIs, researchers have quantified the therapeutic effects of acupuncture. Within four weeks, acupuncture successfully improves the condition of cartilage in the anterior medial and lateral tibial regions of the knee. In addition, Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores document that acupuncture reduces pain and stiffness levels while simultaneously improving physical function.

In a controlled trial (Zhang et al.), acupuncture was compared with the therapeutic benefits of physical therapy. The MRIs demonstrate that acupuncture improves cartilage in the knee region. Physical therapy did not stimulate cartilage repair. Pain, stiffness, and physical functioning improved with both therapies. However, acupuncture significantly outperformed physical therapy across all three WOMAC indices (pain, stiffness, and physical functioning).

MRI Results

10. Zhang, Yan, Fei Bao, Yan Wang, and Zhihong Wu. "Influence of acupuncture in treatment of knee osteoarthritis and cartilage repairing." American journal of translational research 8, no. 9 (2016): 3995.

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The researchers used T2 MRIs (magnetic resonance imaging) to measure changes in knee cartilage integrity. The researchers selected T2 (transverse relaxation time) imaging because T2 pulses enhance visibility of fat, water content, and other anatomical structures in the body. The researchers note, “In the earliest stage of OA [osteoarthritis], collagen matrix of cartilage breaks down and cannot immobilize water protons, resulting in an elevation in T2 relaxation time.” The researchers confirmed the findings with “Sagittal T2 Mapping images for the medial and lateral tibiofemoral joints.” The T2 MRIs produced quality resolution documentation that acupuncture “improves medial tibial sub-region (MTa) and anterior lateral tibial sub-region (LTa)” cartilage.[11]

Acupuncture

One group received physical therapy and another study group received acupuncture. For the acupuncture group, electroacupuncture was administered by licensed acupuncturists with a practice experience in excess of twenty years. Acupuncture was applied once, every other day, for a total of four weeks. Needle retention time per acupuncture session was 20 minutes.

The needles used in the study were Hanyi brand disposable stainless steel filiform needles, size 0.30 × 40 mm. The depth of insertion ranged from 0.8–3.5 cm. Manual needle stimulation was applied to elicit a deqi response for each needle. Additionally, medial and lateral Xiyan received 20 Hz electroacupuncture stimulation to patient tolerance levels. The acupoints used in the study were the following:

- **MN-LE16 Neixiyan (medial Xiyan)**
- **ST35 Dubi (lateral Xiyan, Waixiyan)**
- **EX-LE2 Heding**
- **SP10 Xuehai**
- **SP11 Jimen**
- **ST34 Liangqiu**

11. Zhang, Yan, Fei Bao, Yan Wang, and Zhihong Wu. "Influence of acupuncture in treatment of knee osteoarthritis and cartilage repairing." American journal of translational research 8, no. 9 (2016): 3995.

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- **ST36 Zusanli**

Medial and lateral Xiyan and Heding were chosen as the primary acupoints for all participants. Supplementary points were added to benefit local tissues. A total of 126 patient were screened for inclusion and 47 patients participants with 94 treated knees completed the clinical trials.

The researchers note that Traditional Chinese Medicine (TCM) principles were used to make the acupoint selection for the study. Local points were used to benefit local tissues and ST36 located on the stomach foot-yangming channel was selected because this channel "is full of energy and nutrition." The focus of ST36 stimulation was to invigorate qi through the channel.

The researchers note that acupuncture and physical therapy produced positive patient outcomes, especially for pain, stiffness in the morning, and joint dysfunction. The researchers note, "acupuncture treatment showed better curative effect than physiotherapy, suggesting that acupuncture may be a superior non-operative treatment for KOA [knee osteoarthritis] compared with physiotherapy."

Integrative Medicine
Tuina massage, qigong, and taiji are traditional approaches to aspects of physical and movement therapy and have long been important modalities within TCM. Given that both acupuncture and physiotherapy produced positive patient outcomes in the study and that TCM includes physiotherapy within its scope of practice, integration of physiotherapy with acupuncture may produce greater positive patient outcomes than either treatment modality as a standalone therapy. This combination is consistent with TCM historical approaches to patient care.

Morphology and Detection
The researchers note that osteoarthritis is a degenerative disease involving articular cartilage degradation. They add, "With the influence of age, wearing, biochemical and genetic factors, natural extracellular

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environment no longer exist because of damaged collagen scaffold and degraded proteoglycans in the chondrocyte matrix, leading to decreased cell counts and abnormal distribution. Attenuated cartilaginous layers, bony cleft and even bone defect will then appear along with biomechanics changes."

Based on these morphological conditions, the researchers note, "As the quantitative MRI method, increased T2 values, to some extent, could represent damages of the cartilage collagen scaffold. T2 image could thus be used for the discrimination of the OA severities, which has been considered to be a sensitive method for detecting articular cartilage changes and curative effect evaluation in OA patients."

The researchers note that high stress regions are important factors relating to articular cartilage degeneration in knee osteoarthritis. Two naturally occurring regions of high stress due to weight bearing loads are the medial tibial sub-region (MTa) and anterior lateral tibial sub-region (LTa). The researchers add that medial and lateral Xiyan reach both of these sub-regions and were therefore chosen as primary acupoints for the study. MRIs reveal that acupuncture improved the conditions of the MTa and LTa, "This study revealed significant differences in T2 values before and after acupuncture in MTa and LTa, while no significant difference in T2 value was detected in the physiotherapy group."

The MRIs demonstrate that acupuncture "improves medial tibial sub-region (MTa) and anterior lateral tibial sub-region (LTa)" cartilage. The research team commented that prior research may give us clues as to the biochemical mechanisms responsible for acupuncture's therapeutic and curative actions. "Previous studies have proved anti-inflammatory action of acupuncture by influencing expression of interleukin-1β, tumor necrosis factor-α, matrix metalloproteinase and tissue inhibitor. Additionally, acupuncture may play roles in improving cartilage repairing by influencing expression of transforming growth factor-β1 and basic fibroblast growth factor."

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The research confirms that acupuncture reduces pain and inflammation due to osteoarthritis of the knee. The MRI documentation demonstrates that acupuncture initiates cartilage repair.

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Meniscus Post-Operative Recuperation

Researchers conclude that acupuncture increases the effectiveness of rehabilitation exercises after knee meniscus repair surgery.[12] Patients receiving acupuncture in a controlled clinical trial had less quadriceps atrophy, limping, locking, pain, and swelling than patients receiving only rehabilitation exercises. Patients receiving acupuncture also had significantly better range of motion, stability, and the ability to walk, jump, and climb stairs.

Researchers from the Third Affiliated Hospital of Nantong University combined acupuncture with functional training exercises. Patients receiving both functional training exercises and acupuncture in a combined treatment protocol had superior patient outcomes compared with patients receiving only functional training exercises. The researchers conclude that the addition of acupuncture to a functional training regimen improves VAS scores, reduces the degree of quadriceps atrophy, increases range of motion (ROM) scores, and improves the Lysholm Knee Scoring Scale scores for patients after arthroscopic meniscus repair surgery.

Each knee has a pair of menisci, which are fibrocartilaginous pads located between the femur and tibia. Each meniscus plays a vital role in absorbing shock, relieving stress, and lubricating and stabilizing the knees. Meniscus tears are often caused either by an acute injury—such as a sudden twist or quick turn during sporting activities, or by chronic strains—such as cartilage degeneration in primary knee osteoarthritis. An individual with a torn meniscus may take a long time to recover, because the blood supply to the region is generally poor. In addition, a lack of proper management of meniscus tears leads to joint pain and instability, quadriceps atrophy, and secondary knee osteoarthritis, causing a negative impact on health and quality of life.

12. Sun XX, Gao SN, Chen WY, Wang H, Gu YL. Effect of the Function Training Combined with Acupuncture Moxibustion in Rehabilitation Treatment of Meniscus Injury of Knee Joint [J]. Journal of Liaoning University of TCM, 2015(12):165-168.

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Arthroscopic meniscus surgery requires postoperative protection to allow healing.[13] While often effective, complications caused by this surgery include injuries to skin and nerves, blood clot formation, knee stiffness, and infections.[14] In Traditional Chinese Medicine, meniscus tears are often precipitated by deficiency of qi and blood, as well as poor qi and blood circulation. Acupuncture and moxibustion activate local blood circulation, transform stasis, drain dirty water buildup, and eliminate swelling. Importantly, postoperative application of acupuncture allows for faster recovery times with fewer complications.

Design

Researchers (Sun et al.) used the following study design. A total of 70 patients that received an arthroscopic meniscus repair surgery were treated and evaluated in this study. They were randomly divided into an acupuncture treatment group and a control group, with 37 and 33 patients in each group respectively. Both groups received arthroscopic meniscus repair surgery, followed by identical functional training exercises for the knee. The treatment group also received acupuncture and moxibustion.

The statistical breakdown for each randomized group was as follows. The control group was comprised of 17 males and 16 females. The average age in the control group was 52.17 (±9.84) years. The average weight in the treatment group was 72.72 (±12.05) kilograms. The treatment group was comprised of 17 males and 20 females. The average age in the treatment group was 54.67 (±10.94) years. The average weight in the treatment group was 73.56 (±11.95) kilograms. There were no significant statistical differences in gender, age, and weight relevant to patient outcome measures for patients initially admitted to the study. The patients fulfilling the criteria as stated below were selected for the study:

- Age＞18
- A history of knee injuries

13. orthop.washington.edu

14. Ardali G. A daily adjustable progressive resistance exercise protocol and functional training to increase quadriceps muscle strength and functional performance in an elderly homebound patient following a total knee arthroplasty[J]. Physiotherapy theory and practice, 2014, 30(4): 287-297.

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- Swelling, pain, clicking, locking, and tenderness of knee joints, with positive findings on McMurray, Apley, and Gravity tests
- Diagnosed with meniscus tears under MRI and arthroscopic findings

Surgical Procedure
Under anesthesia, patients underwent an arthroscopic procedure to remove inflamed synovial tissue, repair the torn portion of the meniscus, and remove the damaged meniscal tissue. Within 24 hours after surgery, the surgical area was compressed with an elastic wrap. Within 48 hours after surgery, ice packs were used to relieve pain and inflammation.

Functional Training Exercises
Patients from both groups received functional training exercises. They involved the following sets of exercises:

- The first set was conducted for 6 hours, 1 day after surgery. Patients performed isometric quadriceps, ankle flexion/extension, and toe flexion/extension exercises. The exercises were performed in sets of 10 repetitions, 20 – 30 sets per day.
- The second set was conducted 1 – 2 days after surgery. First, patients performed straight leg raising (SLR). They were instructed to lift the leg up to the desired angle (30 degrees) above the plinth and hold the contraction during the lifting phase for 10 seconds. This exercise was performed in sets of 10 repetitions, 20 – 30 sets per day. Next, patients received passive knee flexion/extension exercises for 30 minutes on a continuous passive motion (CPM) machine. The exercises were performed twice per day.
- The third set was conducted for 2 days, 1 month after surgery. Patients performed muscle strength training with a rolling walker.
- The fourth set was conducted 1 – 2 months after surgery. Patients were trained with full weight bearing walking.

Acupuncture Procedure
Patients from the treatment group received acupuncture and moxibustion for 7 days, approximately 2 weeks after the surgery. A total of 4 – 8

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acupuncture points were selected from a pre-selected set of acupuncture points:

- **SP9 (Yinlingquan)**
- **SP10 (Xuehai)**
- **ST34 (Liangqiu)**
- **ST35 (Dubi)**
- **EX-LE4 (Neixiyan)**
- **EX-LE5 (Xiyan)**
- **ST36 (Zusanli)**
- **ST40 (Fenglong)**

Upon disinfection, 0.35 mm × 40 mm or 0.35 mm × 50 mm acupuncture needles were inserted into the acupuncture points to a standard depth. After obtaining a deqi sensation, the needles were retained and moxibustion was applied to the same acupoints. Moxa cigar cuttings, each 2 cm long, were attached to each needle handle and ignited. Moxa was left in place to self-extinguish. A total of 3 moxa cigar cuttings were applied on each acupuncture point. One treatment session was administered daily.

Evaluations

Multiple subjective and objective instruments were used to measure patient outcomes at several data points: prior to the surgery (T1), and then 1 day (T2), 1 week (T3), 2 weeks (T4), and 4 weeks (T5) after completion of the surgery. First, the improvement of pain intensity was scored using the visual analog scale (VAS). Second, the muscle size was measured via MRI scans to assess the degree of quadriceps muscle atrophy. Third, knee joint range of motion (ROM) was recorded using a goniometer. Fourth, the general outcome of knee surgery was evaluated using the Lysholm Knee Scoring Scale, which measures the following:

- limp
- support, instability, locking
- stair climbing, squatting
- walking, running, jumping
- pain and swelling

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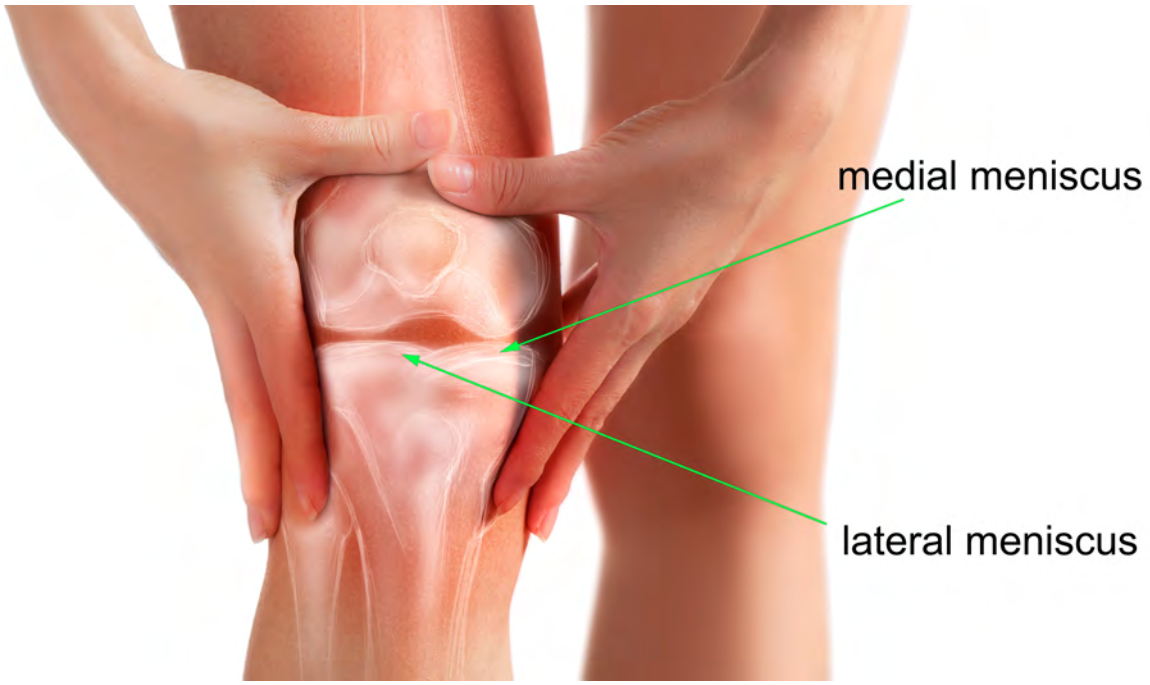
At T1, T2, and T3, there was no significant difference between the two groups in improving healing parameters. At T4 and T5, the acupuncture treatment group showed significantly greater improvement than the control group. VAS scores at T4 and T5 in the patients of the acupuncture treatment group were all lower than those in the control group ($P<0.05$). The degree of quadriceps atrophy at T4 and T5 in the treatment group were decreased significantly as compared with those in the control group ($P<0.05$). ROM scores were increased significantly compared with those in the control group ($P<0.05$) and the Lysholm Knee Scoring Scale scores at T4 and T5 in the treatment group increased significantly as compared with those in the control group ($P<0.05$).

Results

The results indicate that acupuncture combined with functional training into an integrated treatment protocol is more effective than functional training as a standalone therapy. Sun et al. conclude that acupuncture is safe and effective for speeding up knee joint recovery after arthroscopic meniscus repair surgery.



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Osteoarthritis and Ibuprofen

Yueyang Hospital

Researchers find acupuncture combined with tuina massage more effective for the treatment of knee osteoarthritis than ibuprofen.[15] Across two independent studies, researchers made several important findings. One important discovery is that acupuncture plus tuina produces superior treatment outcomes compared with oral intake of ibuprofen (a nonsteroidal anti-inflammatory drug). Keep reading, you may find some shocking information about ibuprofen therapy that may make you reconsider long-term exposure to the drug.

Yueyang Hospital of Integrated Traditional Chinese Medicine and Western Medicine researchers (Fan et al.) conclude that acupuncture plus tuina has a 90.0% total treatment effective rate. Ibuprofen achieved an 87.5% total treatment effective rate. Acupuncture plus tuina slightly outperformed ibuprofen. Let's take a look at the study and what acupoints delivered the clinical results.

Fan et al. had a sample size of 80 patients and conducted a clinical trial at the Yueyang Hospital of Integrated Traditional Chinese Medicine and Western Medicine (Affiliated Hospital of Shanghai University of Traditional Chinese Medicine). Patients were randomly divided into an acupuncture group and a medication group, with 40 patients in each group. The acupuncture group received a combination of acupuncture and tuina therapy and the medication group received ibuprofen. The primary acupoints selected for all patients were the following:

- **EX-LE5 (Neixiyan, medial Xiyan)**
- **ST35 (Dubi, lateral Xiyan)**
- **EX-LE2 (Heding)**
- **SP10 (Xuehai)**
- **ST34 (Liangqiu)**

15. Qiao Lei. Observation on Clinical Effect of Acupuncture and Massage Combined with the Treatment of Knee Osteoarthritis [J]. Journal of Practical Traditional Chinese Internal Medicine, 2017, 31(9):68-70.

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- **ST36 (Zusanli)**
- **GB34 (Yanglingquan)**
- **SP6 (Sanyinjiao)**

Treatment commenced with patients in a supine position. After disinfection of the acupoint sites, a 0.30 mm x 40 mm disposable filiform needle was inserted into each acupoint with a high needle entry speed. Upon elicitation of a deqi sensation, the reinforcing-reducing technique was applied by twisting and twirling the needle. The manual acupuncture manipulation technique was applied for one minute at each point. A 20-minute total needle retention time was observed. One acupuncture session was conducted daily, for a total of 20 days.

Patients in the acupuncture group also received tuina massage therapy for 20 minutes, once daily, for a total of 20 days. The specific protocol used is as follows:

First, patients were instructed to rest in a supine position. Rolling manipulation was performed on the anterior, lateral, and interior side of the thigh. Next, kneading and pressing manipulations were used around the knee joint, especially at Futu (ST32), Liangqiu (ST34), Dubi (ST35), Xuehai (SP10), Yanglingquan (GB34), Zusanli (ST36) and Ashi points. Afterwards, the patients switched to a prone position. The rolling manipulation was used on the popliteal fossa region, while the kneading and pressing manipulations were applied on the leg, especially at Weizhong (BL40), Weiyang (BL39), Heyang (BL55), and Chengshan (BL57) acupoints.

After that, rotating manipulation was performed on the knee joint, and passive or resistance movements of the knee joints were made, such as flexion and extension. The rubbing manipulation was used on the patella with wintergreen oil as the final tuina procedure.

For the medication group, patients received ibuprofen tablets (Fenbid, 0.3 g/tablet, GlaxoSmithKline Investment Co., Ltd., UK), one tablet each time, twice per day, for a total of 20 days. The results tabulated, acupuncture

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plus tuina slightly outperformed ibuprofen for the treatment of knee osteoarthritis.

Zhengzhou Orthopedic Hospital

Let's look at another investigation yielding important results. In a randomized controlled clinical trial, Qiao et al. (Zhengzhou Orthopedic Hospital) investigated the treatment efficacy of two Traditional Chinese Medicine (TCM) protocols. The researchers determined that acupuncture combined with tuina yields better treatment results than tuina as a standalone therapy.[16]

Tuina, as a standalone therapy, produces an 80.95% total effective rate for the treatment of knee osteoarthritis. However, adding acupuncture increases the total effective rate to 92.00%. The acupuncture plus tuina group outperformed the tuina group by 11.05%. The total effective rate includes all patients that completely recovered or those that had significant relief of symptoms and improvements in daily life activity functioning.

A total of 92 patients were treated and evaluated in the study. They were randomly divided into a treatment group (n=50) and a control group (n=42). The treatment group underwent both acupuncture and tuina therapy while the control group received only tuina therapy. The specific protocol used for the tuina treatment was the following:

- Relaxing the muscles: Treatment commenced with patients in a supine position. Rolling and kneading manipulations were used on the muscles surrounding the knee joints.
- Plucking and pressing the points: The following points were plucked and pressed: Zusanli (ST36), Yanglingquan (GB34), Weizhong (BL40), Neidubi (M-LE16), Waidubi (ST35), and Ashi points. Each point was plucked and pressed for one minute.
- Adjusting the joints: The patella was pushed and kneaded repeatedly from downward to upward and from the interior to the exterior. The force was generally increased until a sore, heavy, and distended

16. Jin Hui. Clinical observation on treatment of knee osteoarthritis by acupuncture and tuina therapy [J]. Clinical Journal of Traditional Chinese Medicine, 2011, 23(5):419-420.

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feeling was observed or to patient tolerance levels. Next, the patella was pushed in alternatively clockwise and counter-clockwise directions. This manipulation was conducted at a rate of 120 times per minute.

- Relaxing the muscles: Rolling and kneading manipulations were used again on the muscles surrounding the knee joints.

Patients from the treatment group also received acupuncture at the following primary acupoints:

- **SP9 (Yinlingquan)**
- **GB34 (Yanglingquan)**
- **ST34 (Liangqiu)**
- **SP10 (Xuehai)**
- **EX-LE4 (Neixiyan)**
- **EX-LE5 (Waixiyan)**

Additional secondary acupoints were added based on symptom presentation:

- **Wind-cold assailing the meridians: GB31 (Fengshi)**
- **Liver and Kidney deficiency: BL18 (Ganshu), BL23 (Shenshu)**
- **Static blood obstructing the meridians: BL17 (Geshu), SP6 (Sanyinjiao)**

After disinfection of the acupoint sites, a 0.30 mm x 40 mm disposable filiform needle was inserted into each acupoint, reaching up to a maximum depth of 1–1.5 cun. The insertion angle was perpendicular. Upon achieving a deqi sensation, the mild reinforcement and attenuation (Ping Bu Ping Xie) manipulation technique was applied to each needle. A 20-minute needle retention time was observed.

While the needles were retained, moxibustion was applied to the same acupoints. An approximately 2 cm length moxa roll was attached to the end of each needle and ignited. The moxa rolls were retained for 8–12 minutes. One acupuncture session was conducted daily for a total of 30 days.

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The researchers provide some insight into TCM principles relative to the treatment of knee osteoarthritis. For the tuina treatment, plucking and pressing the points promotes local qi and blood circulation and regulates the meridians. Adjusting the joints reduces tissue adhesion, expands the narrow joint spaces, and lubricates the joints. For the acupuncture treatment, needling the points promotes blood circulation, removes stasis, and reduces pain by activating the qi flow in related meridians.

Root and Symptom

The distinction between TCM therapeutic modalities (acupuncture, tuina, herbs) and drug therapy is perhaps best elucidated by reference to the Chinese medicine therapeutic principle of root and symptom. Acupuncture and tuina therapeutically work to resolve the root cause of a condition and exacerbating factors that lead to long-term joint degeneration. Drug therapy primarily reduces pain and inflammation to control symptoms. Long-term drug use may provide some protection against joint degradation but also presents the risk of adverse effects.

Ibuprofen and Hypogonadism

Ibuprofen may disturb the gastrointestinal tract and lead to disruption of hormone secretions. Kristensen et al. note, “Our data demonstrate that ibuprofen alters the endocrine system via selective transcriptional repression in the human testes, thereby inducing compensated hypogonadism.”[17] This is an example of how ibuprofen intake alters human testicular physiology. The researchers highlight that ibuprofen alters the hormonal balance in men. They add, “Previous studies have shown that long-term fetal exposure to acetaminophen and acetylsalicylic acid in mice and rats targets primordial germ cell proliferation by blocking RNA synthesis and thus leads to reduced follicle reservoir and subsequent decreased fertility in adulthood.”

An advantage of acupuncture and tuina therapy is that they do not cause adverse effects to the endocrine system and gastrointestinal tract. The

17. Kristensen, David Møbjerg, Christèle Desdoits-Lethimonier, Abigail L. Mackey, Marlene Danner Dalgaard, Federico De Masi, Cecilie Hurup Munkbøl, Bjarne Styrishave et al. "Ibuprofen alters human testicular physiology to produce a state of compensated hypogonadism." Proceedings of the National Academy of Sciences (2018): 201715035.

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advantage of drug therapy is that it is readily accessible and portable. Based on the data, access to acupuncture and tuina care is a vital issue for the treatment of knee osteoarthritis for two important reasons. Acupuncture and tuina alleviate pain and inflammation but also prevent dependence on the long-term use of medications that may cause deleterious effects. Patients are advised to consult with local licensed acupuncturists to learn more.

Knee Arthritis Treatment Confirmed

Researchers find acupuncture effective for the treatment of knee osteoarthritis pain and joint dysfunction. Three independent studies confirm the benefits of acupuncture. One study finds acupuncture effective for increasing the efficacy of celecoxib treatment. Another finds acupuncture effective for increasing the positive patient outcome rates for patients taking Traditional Chinese Medicine (TCM) herbs. A third study compared two different types of acupuncture and determined that centro-square needling is exceptionally beneficial for the treatment of knee osteoarthritis. Let's start with a brief overview of knee osteoarthritis and acupuncture before reviewing the independent investigations.

Knee osteoarthritis (KOA) is a common degenerative joint disease. It often develops from knee joint cartilage degeneration and bone hyperplasia, causing pain and limited joint movement. Long-term use of anti-inflammatory and analgesic oral medications, or intra-articular sodium hyaluronate, may lead to liver and kidney toxicity, as well as gastrointestinal damage. [1–2] It is therefore worthwhile to explore treatment methods to prevent these adverse effects.

The pathogenesis of KOA in TCM is often categorized as a combination of wind, cold, and dampness, together with heat-dampness and phlegm stagnation, all of which culminate in obstructed meridians and poor circulation of qi and blood. [3–4] The disease was first recorded in the "Huangdi Neijing (Yellow Emperor's Inner Canon)," where systematic

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documentation of its cause, pathogenesis, symptoms and other related conditions were recorded. According to TCM principles, KOA stems from internal Zheng-qi deficiency, which allows external pathogens or injuries to damage meridians, leading to stagnant blood and consequent pathological responses. [5] The overall pathogenesis of KOA is often attributed to kidney and liver blood deficiency, external injuries, or external invasion of wind, cold, and dampness. [6]

Renowned Chinese TCM physician, Professor Jin Rui, uses a protocolized group of acupoints for treating KOA, named Xisanzhen (three on the knee): Xuehai (SP10), Liangqiu (ST34), Xiyan. Xisanzhen's main clinical indications are knee pain, swelling, or weakness. Xuehai and Liangqiu regulate blood and qi flow, while Neixiyan and Waixiyan are special acupoints that reduce redness and swelling of the knee. [7]

In important type of acupuncture for KOA is warm needle acupuncture. Warm acupuncture is especially helpful for the treatment of KOA with cold-dampness origin. This type of acupuncture warms the meridians, dispels cold, removes wind and dampness, circulates blood and qi for the purposes of relieving swelling and pain. Fire acupuncture has a similar therapeutic effect.

Centro-square needling, a method of acupuncture wherein extra needles are inserted surrounding the main acupoint, is useful for treating cold-type arthritis. The increased stimulation from the extra needles strengthens the clearing, warming and qi stimulating properties of acupuncture. Centro-square needling is commonly utilized for the treatment of musculoskeletal diseases. [8–10] Centro-square needling to appropriate depths stimulates blood and lymph circulation, promotes the absorption of inflammatory exudates, and calms muscle spasms, thereby aiding tissue regeneration and pain relief. [11]

Zhengzhou Orthopedic Hospital of Traditional Chinese Medicine
A study by Li Jian (Zhengzhou Orthopedic Hospital of Traditional Chinese Medicine) determined that acupuncture enhances patient outcomes for patients taking celecoxib, a non-steroidal anti-inflammatory medication. [12]

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The study compared KOA patients receiving both acupuncture and celecoxib with KOA patients receiving only celecoxib. Acupuncture provided more significant and longer-lasting pain relief.

To evaluate treatment efficacy, patients were scored based on a KOA grading system and a Visual Analog Scale (VAS). The KOA grading system allocated a total score based on the severity of KOA symptoms. The VAS measures pain intensity levels. KOA and VAS scores were taken thrice throughout the course of the study, once before treatment, once immediately after treatment, and once 8 weeks after treatment. The differences in KOA and VAS scores before and after treatment were recorded.

Results

The improvement in KOA scores for the acupuncture plus drug group was 13.9 ± 2.86 immediately after treatment, while that of the drug group was significantly less ($P<0.05$) at 12.1 ± 3.51. Eight weeks after treatment, the acupuncture plus drug group maintained a significant improvement of 12.7 ± 2.99, while the drug only group declined ($P<0.05$) and only achieved a final improvement of 6.51 ± 2.66.

The VAS scores showed a similar trend. Immediately after treatment, the acupuncture plus drug group recorded a VAS improvement of 5.78 ± 0.98, significantly higher than that of the drug group, which was 4.59 ± 1.45 ($P<0.05$). Eight weeks after treatment, the final VAS improvement of the acupuncture plus drug group was 5.09 ± 0.95, while that of the drug only group fell to 2.40 ± 1.01 ($P<0.05$). The researchers conclude that acupuncture significantly boost treatment efficacy for patients taking the NSAID celecoxib.

Design

The study was set up as a two-arm experiment. A total of 70 liver and kidney deficient KOA patients from Zhengzhou Orthopedic Hospital of Traditional Chinese Medicine participated in the study. They were diagnosed between March 2014 and October 2016. KOA diagnoses were made based on both TCM and biomedical diagnostic criteria. TCM

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differential diagnostics were used to diagnose liver and kidney deficiencies and biomedical diagnostic criteria were used to diagnose KOA. TCM diagnostic criteria for liver and kidney deficiency and joint-meridian obstruction were in accordance with the 2002 edition of "Guiding Principles for Clinical Study of New Chinese Medicines." [13] The TCM guidelines included the following:

- *Primary symptoms: Joint pain, soreness/weakness in lower limbs.*
- *Secondary symptoms: Restricted movement, reddish tongue, thin or white tongue coating, slippery or taut pulse.*
- *Biomedical diagnostic criteria for KOA were in accordance with "Guidebook for Diagnosis and Treatment of Osteoarthritis" stipulated by the Chinese Orthopedic Association in 2007. [14] The criteria were the following:*
- *Recurring knee joint pain for ≥1 month.*
- *Osteophyte (bone spur) formation, subchondral sclerosis and/or cyst formation, joint space narrowing detected via standing/weight-bearing imaging.*
- *≥2 synovial fluid analyses performed, synovial fluid clear and sticky with white blood cell count of <2000 cells/ml.*
- *Morning stiffness ≤30 minutes.*
- *Crepitus upon movement.*

The following selection criteria were also applied:

- *Fulfilled both aforementioned TCM and biomedical diagnostic criteria.*
- *Duration of illness between 4 months and 15 years.*
- *Discontinued usage of non-steroidal anti-inflammatory drugs, steroids, and other relevant drugs ≥90 days before start of study.*
- *Complied fully with prescribed treatment during study.*

The following exclusion criteria were applied:

- *Major orthopedic diseases such as torn meniscus, ligament rupture, vascular/nerve damage, bone tuberculosis and bone tumors.*
- *Severe psychological or cardiac diseases.*
- *Pregnant or lactating.*

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Participating patients were randomly divided into the treatment group and the control group. Both groups were comparable demographically. The treatment group had 35 patients, 10 males, 25 females, aged 46–69 years, mean age 53.7 ± 3.9 year, duration of illness 0.6–14 years, mean duration of illness 5.03 ± 2.23 years. The control group had 35 patients, 9 males, 26 females, aged 45–72 years, mean age 54.2 ± 3.8 years, duration of illness 0.7–16 years, mean duration of illness 4.96 ± 1.3 years.

Both groups were treated with celecoxib. In addition, the treatment group received Xisanzhen acupuncture. Treatment lasted for 6 weeks. During the entire course of treatment, patients discontinued any non-prescribed medications other than those for heart, high blood pressure, diabetes, or infectious diseases.

Acupuncture Treatment
The following acupoints were selected for the treatment group (on the afflicted side):

- Xuehai (SP10)
- Liangqiu (ST34)
- Neixiyan
- Waixiyan

Forty millimeter acupuncture needles were used. Acupoints were located with the knees bent. Xuehai and Liangqiu were vertically pierced 25–30 mm deep, until deqi was achieved. Neixiyan and Waixiyan were pierced inwards, to a 25–30 mm depth, avoiding the joint cavity. One acupuncture session was conducted every other day, thrice per week. Celecoxib capsules (Pfizer Inc., 0.2 g x 6 capsules/box) were orally administered to all patients. The prescribed dosage was 0.2 g each time, once per day, every other day. The results indicate that the addition of acupuncture to a protocol of celecoxib significantly enhances treatment outcomes. Acupuncture provides great pain relief and lasting results.

Nujiang Hospital of Traditional Chinese Medicine

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Wang Qirun (Nujiang Hospital of Traditional Chinese Medicine) finds that adding warm needle acupuncture to herbal treatment produces superior positive patient outcomes to using only herbal medicine. [15] The study compared two groups of KOA patients, one receiving only TCM herbs and the other receiving both herbs and warm needle acupuncture. The addition of warm needle acupuncture produces greater pain relief, knee mobility, and knee function.

Three parameters were used to evaluate treatment efficacy: knee pain, knee function, and knee mobility. [16] The Numeric Pain Rating Scale (NRS) was used to provide a quantifiable measure of the intensity of knee pain. From a scale of 0–10 (10 represents the most intense pain), patients selected an integer representing their perceived pain. Knee function was measured using the Hospital for Special Surgery (HSS) score. Finally, knee mobility was recorded as the greatest angle that patients could bend their knee (0°–130°). In addition to the above parameters, each treatment was also given an overall treatment effective rate. Based on clinical symptoms, the treatment efficacy for each patient was classified into 1 of 3 tiers:

- *Significantly effective: No knee pain and swelling. Significant improvement in knee mobility.*
- *Effective: Knee pain and swelling subsided. Improvement in knee mobility.*
- *Ineffective: No improvement in knee pain, swelling or mobility.*

Results

The treatment effective rate for each patient group was derived with the following formula: [Significantly effective + Effective] / [Total number of patients in group] * 100%. The treatment effective rate for the acupuncture plus herbs group was 95.45%, significantly higher than that for the herbs only group ($P<0.05$), which was 80.95%. The outcome rates show that acupuncture generally strengthens the efficacy of TCM herbal treatment for KOA.

Before treatment, the three parameters of quantification did not differ meaningfully between both groups ($P>0.05$). The mean NRS scores were

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6.73 ± 0.85 and 6.63 ± 0.54 for herbs only and acupuncture plus herbs respectively. The respective mean HSS scores were 45.33 ± 6.74 and 45.42 ± 6.83. The respective mean knee mobility angles were 105.33 ± 6.74 and 105.42 ± 6.83. Both groups started out at a statistically comparable level.

After treatment, both groups showed a marked difference across all 3 parameters. The mean NRS score was reduced to 2.47 ± 0.18 after acupuncture with herbs, while standalone herbal therapy also produced pain reduction ($P<0.05$), with a final mean NRS score of 3.52 ± 0.64. To the same effect, acupuncture with herbs led to a greater improvement in knee function over the use of herbs as a standalone therapy ($P<0.05$). The mean HSS scores were 78.52 ± 9.33 and 61.85 ± 7.44 for acupuncture plus herbs and herbs only respectively. Patients had greater knee mobility with acupuncture plus herbs therapy compared with herbs only ($P<0.05$). The mean knee mobility angles were 128.52° ± 9.33° and 111.85° ± 7.44° for acupuncture plus herbs and herbs respectively.

Design

The study was designed as a double-arm experiment. A total of 43 KOA patients from Nujiang Hospital of Traditional Chinese Medicine participated in the study. Patients were randomly divided into two groups: herbs and acupuncture plus herbs. For an unbiased comparison, the study ensured that both groups were equivalent in demographics at the outset of the investigation ($P>0.05$). The herbs group had 21 patients, 13 males, 8 females, between 34–76 years, mean age 48.14 ± 2.24 years, duration of illness 1–15 years, mean duration of illness 6.29 ± 0.21 years. The acupuncture plus herbs group had 22 patients, 14 males, 8 females, between 34–74 years, mean age 48.34 ± 2.63 years, duration of illness 1–15 years, mean duration of illness 6.24 ± 0.12 years.

Both groups were given a modified Yi Shen Tong Luo Fang decoction. In addition, the acupuncture plus herbs group received warm acupuncture. The following acupoints were applied with warm needle acupuncture:

- Neixiyan

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- Waixiyan
- Zusanli (ST36)
- Heding (MLE27)
- Liangqiu (ST34)
- Xuehai (SP10)
- Yinlingquan (SP9)
- Yanglingquan (GB34)
- Sanyinjiao (SP6)

Size 0.3 mm x 40 mm Hwato brand disposable acupuncture needles were used. Acupuncture was administered with patients in a seated position, knees bent at 90°. Needles were perpendicularly inserted then moderately manipulated by rotation, applying reinforcement-attenuation techniques, until deqi was achieved. For Neixiyan, Waixiyan, and Zusanli, a 2 cm moxa cigar cutting was attached to the end of each inserted needle, then lit. A new moxa cigar cutting was affixed once the previous cigar extinguished. A total of 2 moxa cigars were used for each acupoint per session. During warm needle acupuncture, the acupuncturist ensured that the distance between the skin and moxa cigar cutting was 2–3 cm. To avoid burns, the area surrounding the acupoint was covered with cardboard. All needles were retained for 30 minutes. One acupuncture session was administered per day. One treatment cycle comprised 10 consecutive days of acupuncture, with a 3-day break before the next cycle. [17] Treatment was administered for 2 treatment cycles. The Yi Shen Tong Luo Fang decoction consisted of the following ingredients: (note: herbal medicine information is for your personal information but not required on the quiz)

- Tusizi (20g)
- Niuxi (20g)
- Nuzhenzi (15g)
- Gouqizi (15g)
- Buguzhi (15g)
- Chuanxiong (15g)
- Danggui (15g)
- Roucongrong (10g)
- Yinyanghuo (10g)

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- Taoren (10g)
- Honghua (10g)
- Zelan (10g)
- Lujiaojiao (10g)
- Paoshanjia (6g)
- Xixin (3g)
- Shenggancao (6g)

Secondary ingredients were added based on TCM differential diagnostics on an individual basis. For phlegm stagnation, the following herbs were added:

- Cangzhu
- Banxia
- Chenpi

For qi-blood deficiency, the following herbs were added:

- Huangqi
- Fuling

For liver-kidney deficiency, the following herbs were added:

- Duzhong
- Xuduan
- Guiban

For wind-cold-dampness obstruction, the following herbs were added:

- Jianghuang
- Rougui
- Fuzi

For wind-damp-heat stagnation, the following herbs were added:

- Huangbai

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- Rendongteng
- Xuanshen

One brewing of the decoction was ingested per day. Each brew was divided into two equal portions, one taken in the morning and the other at night. One treatment cycle comprised 10 consecutive days of consumption, with a 3 day break before the next treatment cycle.

Acupuncture plus herbs produced an NRS score of 2.47 ± 0.18 and standalone herbal therapy produced a final NRS score of 3.52 ± 0.64. This demonstrates that adding acupuncture to the herbal medicine protocol enhances the analgesic effects of treatment. Knee function also improved, with a mean HSS score of 78.52 ± 9.33 and 61.85 ± 7.44 for acupuncture plus herbs and herbs only respectively. Mean knee mobility angle improvements were 128.52° ± 9.33° and 111.85° ± 7.44° for acupuncture plus herbs and herbs only respectively. The results indicate that acupuncture plus herbs produces significant positive patient outcomes for patients with knee osteoarthritis.

China Academy of Chinese Medical Sciences

Wang et al. (China Academy of Chinese Medical Sciences) compared the efficacy of two types of acupuncture. [18] Fire acupuncture with centro-square needling and standard acupuncture both produced significant results for patients with KOA, with centro-square needling producing slightly better outcomes.

Pain intensity and osteoarthritis severity were assessed to evaluate clinical efficacy. A VAS was used to measure pain intensity. The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) were used to provide a quantifiable measure of KOA severity. [19] Patients were scored on five aspects: pain, joint stiffness, joint physiological function, socialization, and mood. The higher the score, the greater the KOA severity. Based on the WOMAC scores, the improvement rate for each patient was calculated using the following formula: [Score before treatment–Score after treatment] / [Score before treatment] * 100%. The

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WOMAC improvement rates were then used to categorize the treatment efficacy for each patient into 1 of 4 tiers:

- *Clinical recovery: Symptoms completely absent. Normal mobility. WOMAC improvement rate ≥ 95%.*
- *Significantly effective: Symptoms largely absent. Joint mobility not restricted. WOMAC improvement rate ≥70% but <95%.*
- *Effective: Symptoms mostly absent, albeit occasional recurrence. Joint mobility slightly restricted. WOMAC improvement rate ≥30% but <70%.*
- *Ineffective: No noticeable improvement in symptoms and mobility. WOMAC improvement rate <30%.*

Based on the number of patients in each tier, the treatment total effective rate for each patient group was calculated using the following formula: [Clinical recovery + Significantly effective + Effective] / [Total number of patients in group] * 100%. The treatment significantly effective rate was calculated using the following formula: [Clinical recovery + Significantly effective] / [Total number of patients in group] * 100%. Patient evaluations were conducted four times: before treatment, 2 weeks into treatment, 4 weeks into treatment, and 1 month after treatment.

Results

The VAS scores showed significant improvement in both groups after treatment. For the fire centro-square acupuncture group, the VAS score was 6.94 ± 1.64 before treatment, with a steady reduction throughout treatment. The VAS scores were 3.88 ± 1.25 two weeks into treatment, 2.29 ± 1.13 four weeks into treatment, and 1.73 ± 1.11 one month after treatment. Similarly, for the filiform acupuncture group, the VAS score was 6.89 ± 1.83 before treatment, 4.83 ± 1.91 two weeks into treatment, 3.09 ± 1.82 four weeks into treatment, and 2.55 ± 1.55 one month after treatment.

Both groups saw consistent improvement throughout the course of treatment for all datapoints. The VAS scores one month after treatment also illustrate that the therapeutic effect of acupuncture for KOA lasts beyond the treatment time-frame, showing that patients experience pain relief even

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after they discontinue treatment. At the same time, the fire centro-square acupuncture group achieved greater improvements than the filiform acupuncture group at all three datapoints after treatment.

The WOMAC scores display a similar trend. For the fire centro-square acupuncture group, the WOMAC scores were 89.97 ± 23.04 before treatment, 52.83 ± 20.85 two weeks into treatment, 29.44 ± 16.81 four weeks into treatment, and 22.03 ± 17.21 one month after treatment. This demonstrates that KOA symptoms were consistently lessening throughout the treatment period and continued to improve even after treatment ended ($P < 0.01$). The filiform acupuncture group also showed a stable decline in WOMAC scores ($P < 0.01$). The scores were 88.53 ± 26.77 before treatment, 59.92 ± 23.80 two weeks into treatment, 39.83 ± 23.46 four weeks into treatment, and 31.83 ± 21.16 one month after treatment. From 4 weeks into treatment onwards, the fire centro-square acupuncture group achieved lower WOMAC scores than the filiform acupuncture group ($P<0.05$). Both groups achieved significant positive patient outcomes.

The treatment effective rates are reflective of the VAS and WOMAC results. Two weeks into treatment, the fire centro-square acupuncture group had a 2.8% significantly effective rate, and an 88.9% total effective rate. The filiform acupuncture group had a slower initial improvement ($P<0.01$), having a 0% significantly effective rate and a 61.1% total effective rate. Further along into the treatment at 4 weeks, the significantly effective rate of the fire centro-square acupuncture group increased to 66.7%, bringing the total effective rate to 97.2%, while the filiform acupuncture group had a 41.7% significantly effective rate and a 91.7% total effective rate. At 4 weeks into treatment, more patients saw significant efficacy with fire centro-square acupuncture than conventional filiform acupuncture ($P<0.05$). One month after treatment ended, the data reflects that patient symptoms continue to improve. The significantly effective rate of the fire centro-square acupuncture group was 83.3%, and the total effective rate remained at 97.2%. This was greater than the conventional filiform acupuncture group ($P<0.01$), which had a significantly effective rate of 44.4% and total effective rate of 94.4%.

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Design

The study was designed as a double-arm experiment. A total of 72 KOA patients from the Acupuncture and Moxibustion Hospital (Institute of Acupuncture and Moxibustion of China Academy of Chinese Medical Sciences) participated in the study. Patients were divided into either the fire centro-square group or the conventional filiform acupuncture group, with 36 patients in each group. Both groups were equivalent ($P>0.05$) in gender, age, and duration of illness prior to the investigation to ensure a fair comparison.

The fire centro-square group had 16 males, 20 females, aged between 40–75 years, mean age 59 ± 9 years, duration of illness between 0.8–240 months, mean duration of illness 39.8 ± 53.1 months. The filiform group had 9 males, 27 females, aged between 40–75 years, mean age 56 ± 11 years, duration of illness between 1.0–240 months, mean duration of illness 42.8 ± 53.4 months. All 72 patients were included in the final results and no subjects were disqualified for non-compliance with treatment or severe side effects during the study.

The diagnostic criteria for KOA were in accordance with those published by the American College of Rheumatology, which were recommended in the "Osteoarthritis Diagnosis and Treatment Guide" drafted by the Rheumatology Committee of the Chinese Medical Association. [20] These criteria were the following:

1. *Frequent knee joint pain (most of the time) within the recent month.*
2. *Presence of crepitus.*
3. *Knee joint morning stiffness lasting ≤30 minutes.*
4. *≥40 years old.*
5. *Swelling around knee joint.*
6. *Bone spurs around the bone edges of the knee, detected by X-ray.*

The diagnosis was confirmed if the patient fulfilled both conditions 1 and 6, or conditions 1 through 5. The following selection criteria were applied to choose trial participants:

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- *Fulfilled the diagnostic criteria.*
- *Did not receive any KOA treatment, or other treatments that may affect the study results, within the recent month.*
- *VAS score of ≥3.*
- *Signed informed consent.*

The following exclusion criteria were applied:

- *Knee synovitis, meniscus injury or cruciate ligament injury.*
- *Rheumatoid arthritis, metabolic arthritis or other non-osteoarthritic diseases that may cause knee pain.*
- *History of knee surgery or severe knee injury.*
- *Other diseases with complications affecting the joints, such as psoriasis, syphilitic neuropathy, ochronosis, metabolic bone diseases, acute trauma etc.*
- *Severe cardiac, neurological, hepatic, renal, respiratory, hematopoietic or mental diseases.*
- *Prone to spontaneous bleeding.*
- *Pregnant or lactating.*

Acupoint selection was identical for both groups. Three acupuncture sessions were administered per week. Sessions were administered one day apart from another, with Sunday being a break day. One treatment cycle was comprised of six acupuncture sessions, and a total of two treatment cycles were administered. The following primary acupoints were selected and applied to the afflicted side):

- Xuehai (SP10)
- Liangqiu (ST34)
- Neixiyan
- Dubi (ST35)
- Zusanli (ST36)
- Yanglingquan (GB34)
- Yinlingquan (SP9)
- Ashi

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The patients rested in a supine position during acupuncture. Size 40 mm length needles were used on most acupoints. The following protocol was observed for the fire centro-square group. Needles were heated using an ethanol lamp untill the tip and body were red-hot, then perpendicularly inserted into each acupoint in a swift motion, to 20–30 mm depth, and retained for 3–5 minutes. For Neixiyan and Dubi, 25 mm length needles were used instead, inserted swiftly 5 mm deep and not retained. Centro-square needling was carried out on the Ashi acupoints. Additional needles were inserted around each Ashi acupoint, at 4 centro-square points, each deviating 1–1.5 inches away from the Ashi acupoint: above, below, left and right.

At each centro-square point, a heated needle was inserted at a 30–40° angle toward the Ashi acupoint, to 20–30 mm depth, then retained for 3–5 minutes. If an Ashi acupoint was located near the edge of the kneecap or either end of the knee joint where the flesh was thin, a 25 mm long needle was used, and the depth of insertion was adjusted to 10–20 mm. Apart from the Ashi acupoints, two of the other selected acupoints (barring Neixiyan and Dubi) were targeted for centro-square needling in one acupuncture session, and a different pair was targeted in every session. After needle removal, the pierced acupoints were immediately cupped, retaining the cups for 3–5 minutes. The following measures were observed during treatment:

- *After fire acupuncture, the treated areas were disinfected with iodine.*
- *Patients were advised to avoid showering on the day of acupuncture, and to keep the treated areas dry.*
- *Patients were instructed to refrain from scratching the treated areas after acupuncture, as slight reddening, itching, or swelling are normal reactions.*

The following protocol was observed for the filiform group. Conventional filiform needle acupuncture was administered after disinfection. Upon achieving deqi, the needles were manipulated with reinforcement and attenuation (Ping Bu Ping Xie), then retained for 30 minutes. Ashi

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acupoints, as well as two of the other treated acupoints, were immediately cupped after needle removal. A different pair of acupoints were cupped in each session. Both types of acupuncture achieved significant positive patient outcomes.

Summary

Knee osteoarthritis is often a painful and disabling disorder. Research confirms that acupuncture is an effective treatment modality for short and long-term relief.

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Stanford Knee Replacement Surgery

Stanford University researchers conclude that acupuncture reduces and delays the need for opioids after total knee replacement surgery. Over 4.7 million people in the United States have had knee replacement surgery. Conventional post-surgical treatment often includes prescription opioids. [1] The drugs often provide pain relief for patients but are ineffective for some.

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Further, there is a growing concern that the extended use of prescription opioids leads to addiction, further exacerbating epidemic levels of opiate abuse. As a result, finding drug-free interventions that effectively relieve pain and decrease opiate use has become a public health imperative.

Acupuncture, the insertion of fine filiform needles at specific points on the body, has been used for millennia in China to treat disease, and recently the treatment modality is finding its footing in the schema of conventional medicine in the occident. As formal studies satisfy the burden of proof, acupuncture is increasingly recommended as an alternative to, or adjunct for, pharmaceutical patient care. In the meta-analysis conducted at Stanford University, researchers analyzed the results of 2,391 patients over 39 randomized clinical trials comparing the efficacy of five of the most common drug-free interventions for decreasing pain and opiate use after knee replacement surgery: acupuncture, electrotherapy, cryotherapy, preoperative exercise, and continuous passive motion. Among them, only acupuncture and electrotherapy were associated with reduced and delayed opioid consumption. [2]

Osteoarthritis is a major cause of knee pain and, if severe, it can damage the overall quality of life; chronic pain can diminish functional independence, which may lead to psychological afflictions. [3] Thus, total knee arthroplasty (TKA) is one of the most common elective surgical procedures worldwide. [4] Although the goal of surgery is to decrease pain and restore mobility, TKA is associated with intense postoperative pain, and “there is a high prevalence of patients who report persistent chronic pain and some patients who report chronic pain development subsequent to the procedure.” [5, 6] Since acute postoperative pain slows recovery and may lead to chronic pain, adequate pain control is a major concern for patients undergoing joint replacement surgery. [7]

Opioid Pain Management and Rehabilitation

Patients with total joint arthroplasty rely, in part, on physical therapy for postsurgical rehabilitation. Opioid analgesics to manage acute postoperative pain are less than optimal for these patients because their

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side effects, especially sedation, can interfere with rehabilitation. [8] “As opioids are recommended for the treatment of osteoarthritis and surgical recovery, patients... are likely to be exposed to opioids for long periods of time, increasing their chance of developing tolerance, hyperalgesia, and other dangerous and potentially costly opioid-related side effects.” [9] Opioids are more effective for patients at rest, but prolonged immobility can inhibit patient mobilization and prolong the length of hospital stays. [10, 11] Additionally, “inadequate postoperative pain management has profound acute effects, including immune system suppression, decreased mobility that increases deep vein thrombosis and pulmonary embolism rates, myocardial infarction, and pneumonia. Long-term influences of poor pain management include transition to chronic pain and prolonged narcotic consumption, which can result in opioid dependence, an epidemic in the United States.” [12]

Functional Improvement

Many patients are concerned about using prescription opioid analgesics. [13] There is a complicated relationship between pain relief and functional improvement that makes it difficult to determine the best course of treatment; “whereas strong opioids in general provided better pain relief than weak opioids or non-opioids, function was improved by weak opioids and nonopioids, but not strong opioids,” forcing patients —or their doctors— to weigh the benefits of pain control against functional mobility. [14] For those who place preference on pain control, a high daily dose (over a 120mg morphine equivalent) is a direct predictor of long-term opiate use, especially because there is no natural endpoint to this pharmaceutical therapy. [15, 16] Indeed, workers treated with opioids were less likely to return to work than those who did not receive opioids. [17]

While side effects, lack of efficacy, or heightened concern causes most patients to discontinue opioid therapy early in their course of treatment, two-thirds of patients that continue using opioids for the first 90 days will remain on the medication years later. [18] “Compared to those whose chronic pain episode was not treated with opioids, those treated with acute high-dose use had 3 times the risk of opioid abuse, while those with chronic

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high-dose use has 107 times the risk." [19] Among patients that receive opioids for chronic pain in a primary care setting, the rate of lifetime aberrant drug behavior may be as high as 80%. [20] "The pharmacology of opioids has been extensively studied and the search for non-addictive opioids has been long and fruitless," so we should not be surprised with such high rates of addiction amongst those with access to prescription pharmaceuticals. [21]

It is not only prescribed opioids that potentially pose iatrogenic harm from long-term use. [22] In 2010, 5% of the general population admitted to using prescription opioids for "non-medical" purposes, and "the majority of these non-medical users obtained their opioids from friends or family, not from drug dealers or the internet." [23] The mismanagement of long-term pain relief facilitates easy access to these drugs among the general population, and for those who need to satiate an addiction, some individuals turn to heroin when it becomes harder to obtain than prescription opioids. [24] "In Seattle, 40% of patients using heroin report first "getting hooked on" prescription opioids." [25] The addiction crisis is well-known in hospitals; according to the US Centers for Disease Control and Prevention, 40% of emergency department visits are related to opioid misuse. [26] Thus, identifying suitable non-pharmaceutical alternatives for pain relief is a matter of public health.

University of Minnesota

Acupuncture research is promising. Acupuncture is known for its impact on pain relief: in a study conducted at the University of Minnesota School of Public Health on 2,500 patients with total hip or knee replacements, "forty-one percent of patients reported moderate/severe pain prior to receiving acupuncture, while only 15% indicated moderate/severe pain after acupuncture." [27] Additionally, acupuncture moderates pharmaceutical use: "acupuncture has been shown to reduce the use of opioid analgesics as well as to aid in alleviating post-operative medication side effects including sedation, nausea, vomiting, and dizziness. Of note... was the

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clinically meaningful finding that acupuncture contributed to lowering pain below the threshold at which patients would receive intravenous narcotics beyond the initial postoperative standard dose." [28] Since the long-term side effects of opiate use are dose dependent, even a moderate change in acute pain can have a huge impact on long-term care if it tempers early stage opioid use.

The risks of pain mismanagement are extraordinarily high for joint replacement patients. Acupuncture and electrotherapy reduce opioid consumption and improve postoperative pain management outcomes. [29] The results of this study distinguishes acupuncture from a panoply of treatment options. Hopefully, this encourages doctors to include acupuncture in their postsurgical treatment regimens to reduce the incidence of lifelong dependence on opioids.

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Acupuncture Outperforms Drugs

Researchers confirm that acupuncture is more effective than two drugs (ibuprofen and diclofenac) for long-term relief of knee osteoarthritis pain, inflammation, and motor impairment. In one investigation, acupuncture plus herbal medicine outperformed acupuncture plus ibuprofen for pain relief. In another independent investigation, acupuncture outperformed diclofenac for relief of pain, inflammation, and motor impairment due to knee osteoarthritis. Let's take a look at both investigations.

Acupuncture plus herbs outperforms ibuprofen for the alleviation of knee pain, inflammation, and dysfunction. Guangxi Lingshan County Hospital of Traditional Chinese Medicine researchers investigated the benefits of drugs, electroacupuncture, and herbal medicine for the treatment of knee osteoarthritis. The results of the randomized-controlled clinical trial finds acupuncture plus herbs more effective than the ibuprofen (a nonsteroidal anti-inflammatory drug) plus acupuncture protocol.

All patients in the study suffered from pain and dysfunction due to knee osteoarthritis. Patients receiving a special herbal formula for knee dysfunction plus an acupuncture point prescription administered with electroacupuncture stimulation had an 86.7% total effective rate. Another group of patients received ibuprofen drug therapy plus electroacupuncture, but without any herbal medicine. That group had a 63.3% total effective rate. Both groups had effective relief, but the group receiving electroacupuncture plus herbs outperformed the group receiving electroacupuncture plus ibuprofen by 23.4%.

The researchers protocolized their acupuncture and herbal medicine investigation directly from Traditional Chinese Medicine (TCM) classic prescriptions for knee osteoarthritis. The herbal formula chosen for the study, Du Huo Ji Sheng Tang, has been in use since the Tang Dynasty according to multiple acupuncture continuing education sources. Its uses and composition were first published by Sun Si-Miao in the Bei Ji Qian Jin Yao Fang (Thousands of Golden Prescriptions for Emergencies). The formula has since been an important part of Traditional Chinese Medicine

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for the treatment of chronic pain. Now, modern research confirms that Du Huo Ji Sheng Tang combined with acupuncture is highly effective for the treatment of knee osteoarthritis.

The acupuncture point prescription was straightforward TCM. Local acupoints combined with body style acupuncture and Ashi acupoints comprised the point formula. **The combination of Dubi (ST35) and Neixiyan (MNLE16, medial Xiyan) were applied.** Together, this acupoint combination is termed Xiyan (Eyes of the Knee). The point combination is given its name based on its location in the hollows below the patella on the medial and lateral sides of the patellar ligament. Although the TCM classic work Song of the Jade Dragon indicates that acupoint LV7 (Xiguan) combines well with Xiyan for the treatment of pain and inflammation of the knees with the inability to walk properly, a different set of TCM classic acupoints were chosen for this investigation to supplement administration of **Xiyan**:

- **Liangqiu (ST34)**
- **Xuehai (SP10)**
- **Yanglingquan (GB34)**
- **Heding (MLE27)**
- **Ashi**

A total of 60 patients were treated and evaluated in the study. They were randomly divided into the acupuncture plus herbs treatment group and the acupuncture plus ibuprofen control group, with 30 patients in each group. Both groups received identical electroacupuncture therapy; the treatment group was treated with Du Huo Ji Sheng Tang, while the control group was treated with ibuprofen sustained release capsules.

Manual acupuncture was applied prior to the administration of electroacupuncture. After elicitation of a deqi sensation, the acupuncture needles were connected to an electroacupuncture device with a continuous wave. The needles were retained for 30 minutes once electroacupuncture began. One 30 minute electroacupuncture session was conducted daily, for a total of 20 consecutive days. The slightly modified version of Du Huo Ji

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Sheng decoction for the treatment group was comprised of the following herbs: *(herbal medicine information is not required on the quiz, it is there for your personal information)*

- Dang Gui (9 g)
- Bai Shao (12 g)
- Chuan Xiong (6 g)
- Shu Di Huang (10 g)
- Dang Shen (18 g)
- Fu Ling (12 g)
- Du Zhong （12 g)
- Niu Xi (15 g)
- Qin Jiu (10 g)
- Fang Feng (10 g)
- Du Huo (10 g)
- Sang Ji Sheng (30 g)
- Xi Xin (3 g)
- Gan Cao (6 g)
- Gui Zhi (9 g)

Additional herbs were prescribed according to individual symptoms, for arthralgia the following herbs were added:

- Yin Yang Huo (10 g)
- Yan Hu Suo (12 g)

For knee pain and swelling, the following herbs were added:

- Yi Yi Ren (30 g)
- Huang Bai (10 g)

For qi deficiency, the following herb was added:

- Huang Qi (30 g)

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One batch of the above herbs was boiled in water and simmered to yield a 200 ml decoction. Two decoctions were given to the patient daily, one in the morning and one at night, for a total of 20 consecutive days. For the drug control group patients, two 0.3 g ibuprofen sustained release capsules were given to the patient daily, one after breakfast and one after dinner, for a total of 20 consecutive days. Patients were evaluated before and after the treatment course. Joint function and severity of knee osteoarthritis were evaluated based on the Lysholm Knee Score Standard (LKSS). The total treatment effective rate for each patient group (treatment and control) was derived as the percentage of patients who achieved at least an effective treatment tier of improvement. The treatment efficacy for each patient was categorized into 1 of 3 tiers:

- *Significantly effective: Complete or significant absence of symptoms. ≥70% improvement in LKSS score.*
- *Effective: Symptoms showed improvement. ≥30% but <70% improvement in LKSS score.*
- *Not effective: Symptoms showed no visible improvement. <30% improvement in LKSS score.*

The study confirms that herbs and acupuncture outperform drugs and acupuncture. This is a clinically significant finding for important reasons. First, the herbal medicine with acupuncture protocol does not cause the gastrointestinal distress common with ibuprofen intake. Second, this is a proven treatment option for the effective relief of disability and pain due to knee osteoarthritis.

Sun et al. had similar results in their independent investigation published in the Anhui Medical and Pharmaceutical Journal. The researchers determined that acupuncture plus moxibustion is more effective than diclofenac (an NSAID) for relief of knee osteoarthritis pain and motor impairment. The NSAID (nonsteroidal anti-inflammatory drug) had a faster onset of effective action but acupuncture produced significantly greater positive patient outcomes for long-term relief. **The primary acupoints used in the study were Xiyan (M-NLE-16) and Heding (M-LE-27), two local acupoints commonly used for the treatment of knee disorders.**

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Additional acupoints were added for specific diagnostic considerations. For stomach yangming channel related knee osteoarthritis issues, the following acupuncture points were added:

- **ST34 (Liangqiu)**
- **ST36 (Zusanli)**
- **ST32 (Futu)**

For gallbladder shaoyang channel related disorders, the following acupuncture points were added:

- **GB34 (Yanglinquan)**
- **GB33 (Xiyangguan)**
- **GB36 (Waiqiu)**
- **GB39 (Juegu)**

For bladder taiyang channel related disorders, the following acupoints were added:

- **BL40 (Weizhong)**
- **BL39 (Weiyang)**
- **BL57 (Chengshan)**
- **BL60 (Kunlun)**

For spleen taiyin related disorders, the following acupoints were added:

- **SP10 (Xuehai)**
- **SP9 (Yinlingquan)**
- **SP3 (Taibai)**

For liver jueyin related issues, the following acupuncture points were included:

- **LV7 (Xiguan)**
- **LV3 (Taichong)**
- **LV9 (Yinbao)**

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For wind-cold channel concerns, the following acupuncture points were added:

- **LI11 (Quchi)**
- **DU14 (Dazhui)**
- **GB20 (Fengchi)**

For blood stasis, the following acupoints were added:

- **LV3 (Taichong)**
- **BL17 (Geshu)**
- **SP10 (Xuehai)**

For liver and kidney related conditions, the following acupuncture points were added:

- **BL18 (Ganshu)**
- **BL23 (Shenshu)**
- **CV6 (Qihai)**

Acupuncture combined with moxibustion produced a positive patient outcome rate of 63.33%. The NSAID produced a 33.33% positive patient outcome rate for the treatment of knee osteoarthritis. Both studies reviewed in this article demonstrate that acupuncture is an effective therapy for relief from knee osteoarthritis inflammation, pain, and motor dysfunction. Given the data, acupuncture and other TCM modalities are recommended as viable treatment options by the researchers.

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Acupuncture Knee Arthritis Relief

Acupuncture relieves knee pain. Maternal and Child Health Hospital of Zhoushan City researchers investigated the effectiveness of electroacupuncture and moxibustion for the treatment of knee osteoarthritis. Patients receiving electroacupuncture had a 60% total effective rate and patients receiving manual acupuncture with moxibustion had a 48.89% total effective rate.

A closer look at the results demonstrates important clinical differences between electroacupuncture and moxibustion. Electroacupuncture had a higher rate of positive patient outcomes for relief of pain. Electroacupuncture also excelled at relief of knee stiffness in the morning. Electroacupuncture had a shorter duration of time between onset of treatment and relief of pain. Electroacupuncture outperformed moxibustion in the ability to restore daily living activities.

Manual acupuncture with moxibustion outperformed electroacupuncture in the time between onset of treatment and relief from knee stiffness with swelling. The results indicate that electroacupuncture and moxibustion have different clinical advantages. Moxibustion reduced swelling more readily while electroacupuncture provided a more significant analgesic effect.

The study involved randomization of ninety osteoarthritis patients into two groups, electroacupuncture and moxibustion. Acupuncture was applied with patients in a supine position. Acupuncture needles were 0.3 x 40 mm.

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Perpendicular insertion at local points was applied. Primary acupuncture points included:

- **Xuehai, SP10**
- **Xiyan (medial and lateral)**
- **Zusanli, ST36**
- **Yinlingquan, SP9**
- **Shenshu, BL23**

Supplementary points were added to the protocolized acupuncture point prescription based on differential diagnostics. **Sanyinjiao (SP6) was added for patients with continuous pain. Weizhong (BL40) was added for patients with severe pain intensity.**

Electroacupuncture was applied at 5 Hz and the intensity level was set to patient tolerance levels. Warm needle acupuncture involved the attachment of moxa to the acupuncture needles. Both treatment regimens involved the same approach to the acupuncture point prescriptions and were administered three days per week for four consecutive weeks. The researchers note that each approach to acupuncture, both moxibustion and electroacupuncture, have their own strengths and limitations.

Xiong et al. took a slightly different approach to examining the effectiveness of acupuncture for the treatment of knee osteoarthritis. The researchers concluded that acupuncture combined with Tui-Na is effective for the resolution of knee pain and stiffness. In addition, the combined therapy is effective in the restoration of knee functionality.

Liu et al. found acupuncture highly effective for the treatment of knee osteoarthritis pain. Electroacupuncture at Xiyan was applied. The results indicated that deep needling of Xiyan produced significantly greater clinical results than shallow or moderate needle insertion. Supplementary points were also used in the investigation and included: Heding, GB34 (Yanglingquan), ST36 (Zusanli). **Deep needling of Xiyan produced greater pain relief and reversal of leg flaccidity than shallow or moderate needle insertion.**

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Several biochemical mechanisms responsive to acupuncture needle stimulation may be responsible for the beneficial patient outcomes. The work of Morgana et al., published in *Molecular Neurobiology*, reveals that manual acupuncture stimulation downregulates M1 macrophage pro-inflammatory cells and upregulates M2 macrophage anti-inflammatory cells. This results in reductions of both pain and swelling. One reason for this response is that M2 macrophages are an important source of IL-10, interleukin-10. IL-10 is an anti-inflammatory cytokine, which in turn regulates actions between cells. Morgana et al. note, “These findings provide new evidence that MA (manual acupuncture) produces a phenotypic switch in macrophages and increases IL-10 concentrations in muscle to reduce pain and inflammation.” This important discovery measures one of many biological responses to acupuncture that yields positive patient outcomes.

Zhang et al., whose work was published in *Anesthesiology - The Journal of the American Society of Anesthesiologists*, measured biological responses to electroacupuncture. **Their research finds 2 to 10 Hz electroacupuncture more effective than 100 Hz electroacupuncture for pain relief and the reduction of inflammation.** The researchers document that electroacupuncture “blocks pain by activating a variety of bioactive chemicals through peripheral, spinal, and supraspinal mechanisms.” Specifically, they measured acupuncture’s ability to activate endogenous opioids and other biochemicals that desensitize pain sensory receptors, nociceptors. They note that electroacupuncture desensitizes “peripheral nociceptors and reduce(s) proinflammatory cytokines peripherally and in the spinal cord, and serotonin and norepinephrine, which decrease(s) spinal N-methyl-D-aspartate receptor subunit GluN1 phosphorylation.”

The research teams of Zheng et al. and Morgana et al. demonstrate that acupuncture’s ability to regulate cytokines is integral to its ability to reduce pain and inflammation. Cytokines are immunoregulatory proteins secreted by cells. As research emerges, the bioactive properties of acupuncture are revealed and measured by scientists. The question of whether or not

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acupuncture works has fallen by the wayside. Now the question remains, what are the most significant biological mechanisms by which acupuncture exerts its effective action? Already, we know many of the answers.

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Acupuncture Knee Arthritis Cartilage Repair Discovery

Acupuncture stimulates knee osteoarthritis cartilage repair by regulating proteins TGF-β1 and IGF-1. Beijing University of Traditional Chinese medicine researchers determined that acupuncture accelerates articular cartilage repair in the osteoarthritic knee by inhibiting the overexpression of TGF-β1 and IGF-1. With multiple objective laboratory instruments measuring outcomes, the investigation also reveal that acupuncture smooths the surface of knee cartilage while regulating cell proliferation and differentiation. [1] Under the results section of this article, you will be able to read more about this groundbreaking discovery.

Knee osteoarthritis (KOA) often presents with pain, limited mobility, and a reduction in quality of life. Pathologically, it is characterized by changes in the articular cartilage, the subchondral bone, the intra-articular space, ligaments, and the articular capsule region. The researchers designed a laboratory experiment to determine the biochemical mechanisms by which acupuncture exerts its therapeutic actions. The randomized study of 30 experimental rabbits was divided into three arms: a control group (n=10), a knee osteoarthritis model group (n=10), and an acupuncture treatment group (n=10). For the KOA model group and treatment group, a KOA model was made by immobilization of the rabbit knee. Only the treatment group received warm needle acupuncture treatments. The control group did not receive any medical procedures or treatment for the duration of the study.

Results

The hospital researchers conclude, “In comparison with the control group, the expression levels of both TGF-beta1 [transforming growth factor beta 1] and IGF1 [insulin-like growth factor 1] were up-regulated in the KOA model group and then down-regulated after the warm-needling treatment.” They add that both microscopic and macroscopic improvements in the knee joint were observed. After the treatment, “the surface of knee cartilage became smoother.” Additionally, “less abnormal cell proliferations and clusters were found in the warm-needling group compared to those of the model group.” The research team determined that “acupuncture can inhibit the overexpression of TGF-beta1 and IGF-1 in the knee cartilage of rabbits

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with KOA, having a solid effect in improving pathological changes of knee cartilage."

Acupuncture
Acupuncture treatment commenced one week after the KOA model was established. Acupuncture was applied once per day, for a total of four weeks. Needle retention time per acupuncture session was 20 minutes. Manual needle stimulation was applied to elicit a deqi response for each needle. Additionally, moxa cuttings were attached to each needle handle and ignited for 20 minutes to warm the needles. The acupoints used in the study were the following:

- **EX-LE4 (Neixiyan, medial Xiyan)**
- **EX-LE5 (Waixiyan, lateral Xiyan)**
- **SP10 (Xuehai)**
- **GB34 (Yanglingquan)**

The researchers note that Traditional Chinese Medicine (TCM) principles were used to make the acupoint selection for the study. This acupoint prescription is widely used on human patients. In Traditional Chinese Medicine, KOA is in the scope of Gu Bi (translated as bone impediment) and Xi Tong (translated as knee pain). The stagnation of external pernicious influences (e.g., wind, cold, damp, heat, phlegm) in the local meridians (acupuncture channels and collaterals) is a primary cause of KOA.

The TCM treatment principle is to invigorate local blood circulation and disperse stagnation. Neixiyan, Waixiyan, Xuehai, and Yanglingquan are located at the knee region. Needling these acupoints accelerates local blood circulation. According to the Huangdi Neijing (The Yellow Emperor's Classic of Medicine), "the knee is the house of the tendons." Yanglingquan (GB34) is the gathering point of the tendons. Needling this acupoint treats tendon issues, including those related to the knee joint. In this study, moxibustion was also applied as a part of warm needling therapy. Moxibustion warms the local area and supplements acupuncture to promote blood circulation and disperse stagnation.

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Laboratory Detection

The researchers note, “KOA is caused by an imbalance between knee cartilage degradation and repair, the process of which is closely related to TGF-beta1 and IGF-1.” [1] This is supported by another research investigation, in which Stephen et al. concluded that “TGF-beta1 and IGF-1 plays an important role in cartilage homeostasis.” [2]

TGF-beta1 is a secreted protein involved in osteoblast formation and bone remodeling. There is a positive correlation between the concentration of TGF-beta1 and the degree of cartilage damage. Fahlgren et al. note that “high concentrations of TGF-beta1 in synovial lavage fluid seemed indicative for the later development of more severe OA changes in contrast to lower concentrations.” [3] Couchourel et al. document that “Elevated TGFβ1 levels in OA osteoblasts are responsible, in part, for the abnormal ratio of COL1A1 to COL1A2 and for the abnormal production of mature type I collagen. This abnormal COL1A1-to-COL1A2 ratio generates a matrix that blunts mineralization in OA osteoblasts.” [4] Homeostasis is the key. Tsai et al. find that “at proper levels, TGF-β1 could prevent OA from progression.” [5]

IGF-1 is a mitogen (substance that stimulates mitosis) that plays a role in regulating the proliferation, differentiation and apoptosis of chondrocytes. Lan et al. note that at the early stages of knee OA, normal increase in concentrations of IGF-1 activates bone growth and repair. [6] However, they also document that overexpression of IGF-1 leads to osteophyte formation and disease deterioration. In a related research, Wei et al. conclude, “TGF-1 regulates development and homeostasis of articular cartilage, and only TGF-1 at proper levels can accelerate cartilage repair and prevent OA’s progression.” [7]

Based on the findings, the Beijing University of Traditional Chinese Medicine research team concludes that “the relation between TGF-beta1 and IGF-1 levels and articular cartilage repair is a normal distribution.” They add, “the key of knee OA treatment is to reduce the overexpression of the

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two regulatory factors." Their findings demonstrate that acupuncture stimulates a homeostatic response on expression of these factors.

Summary

Laboratory data indicates that acupuncture is effective for the treatment of KOA. According to the research covered in this article, common protocols involve the application of acupoints EX-LE4 (Neixiyan), EX-LE5 (Waixiyan), SP10 (Xuehai), and GB34 (Yanglingquan). Patients interested in learning more about treatment are recommended to contact local licensed acupuncturists.

Primary Research

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