# ARTICULAR CARTILAGE AND KNEE JOINT FUNCTION pdf

## 1: What is Articular Cartilage? (with pictures)

*Joint motion and load are important to maintain normal articular cartilage structure and function. Inactivity of the joint has also been shown to lead to the degradation of cartilage. 10 Regular joint movement and dynamic load is important for the maintenance of healthy articular cartilage metabolism.*

Adorable animal families that will make you "aww" Articular cartilage is a white, smooth tissue which covers the ends of bones in joints. It enables bones of a joint to easily glide over one another with very little friction. This establishes easy movement. Many areas of the body can contain this kind of cartilage. Joints between the bones, knee, elbow, and rib cage are some typical locations. Cartilage is a connective tissue that is stiff yet flexible. Some of the main types include fibrous, elastic , and hyaline. Fibrous cartilage may be found in such areas as between vertebral discs of the spinal cord. The outer ear, nose, and larynx are some locations of elastic. Hyaline cartilage, also referred to as articular cartilage, covers joint surfaces and additionally may be found in the shoulder and hips as well. Acting as a cushion between joints, cartilage can help distribute the load of pressure and weight over the surface of joints. It also can serve as a shock absorber. Composed mainly of water and collagen , shock absorbency can be possible by the hydration in the tissue. Proper function is enabled by the arrangement of internal components and composition. Ad One articular cartilage function is to provide smooth and low-friction interaction between the bones of a joint. This may allow the withstanding of pressure and weight-bearing brought about by the motions of daily and athletic activities. By keeping the bones from gliding against each other, it can provide a measure of protection and a surface that is wear resistant. Tension and joint compression also may be better tolerated by this type of cartilage. Normal wear and tear of everyday activities may cause articular cartilage damage. When cartilage wears away, the attached joints may become stiff, painful and face limited ranges of motion. Overuse, excessive weight and activity and improper alignment are some ways damage may occur. Additionally, articular cartilage injury may be caused by exercising, by playing sports, or be in conjunction with knee injuries. The fluidity of movement in the joints may be impaired by damages and injury. Extreme stress on the bones of a joint may lead to the loss of cartilage. As a result, the bones may begin to rub together which can cause a great deal of pain and discomfort. A condition known as osteoarthritis may be a result of this process. Osteoarthritis may cause a degenerating articular surface which could be debilitating. Symptoms of damage may include pain, swelling, stiffness, and a reduced range of joint movement. There also can be tenderness. Knee pain may be particularly common if the injured cartilage is in the knee. The sensation of joints catching or locking also may be a problem. If symptoms are too severe, it may be necessary to eliminate or adjust the activities which cause the most pain. Damages may be diagnosed in a variety of ways. Plain X-rays generally are not very useful. Magnetic resonance imaging MRI scans often are used to make a diagnosis. A procedure known as arthroscopy also may be used. This involves making a keyhole to look directly inside the joint with a small camera. Generally, there is no direct blood supply to the cartilage. If it is damaged or injured, an articular cartilage repair may be done with surgery. This may depend on the location of the injury as well as the extent of damage. Early detection and treatment can prevent further damage and the onset of other problems such as osteoarthritis. A doctor may make a proper diagnosis and help to decide the best treatment options for damages and injuries.

# ARTICULAR CARTILAGE AND KNEE JOINT FUNCTION pdf

## 2: Skeletal System | Skeleton Bones, Joints, Cartilage, Ligaments, Bursae

*Articular cartilage is the layer covering the joint surfaces. Its main function is to produce smooth articulations among the joint surfaces. In most joints, adult human articular cartilage is of the hyaline type.*

Patient Survey Cartilage and the Knee Joint The knee is the largest weight-bearing joint in the body. It is the junction between the femur thigh bone and the tibia shin bone. The knee joint is technically a hinge joint, but there is also a great deal of twisting, turning, and rotating that occurs at the knee. All this movement and weight bearing can cause a great deal of wear and tear on the knee as you go through your normal daily activities. Increasing your activities, as you do with sports and exercise, can add to these forces. To help absorb the excessive forces that occur at the joint, your body has two different kinds of cartilage. The first is called articular cartilage. This is cartilage that lines the ends of all your bones. Any place that two bones come together to form a joint, you will find articular cartilage. The purpose of this cartilage is to allow smooth, pain free gliding of one bone on the other. The ends of your bones are very rough and uneven. Bones are very rich in both blood and nerve supply. Therefore, if you were to rub one bone on the other, the motion would not be smooth, and you would get a lot of pain and bleeding. The articular cartilage helps prevent this. It covers the end of your bones to give you a nice smooth surface to move one bone on the other. It has no direct nerve or blood supply, so when it comes in contact with another cartilage coated bone, there is no pain or bleeding. However, this comes with a price. Because there is no direct nerve or blood supply, articular cartilage cannot regenerate. If the articular cartilage begins to wear away, or if it completely wear down to bone, there will be a significant increase in pain and swelling at the knee. Because your knee is such a huge weight bearing joint, there is a second type of cartilage present that is called the meniscus. There are two of them, and they sit directly on top of the tibial plateau.. The inside one is called the medial meniscus, and the outside one is the lateral meniscus. The menisci help to absorb shock at the knee joint so all the compressive forces do not go directly on the articular cartilage. If there are no menisci present, the potential for serious joint degeneration is extremely high. Studies show that people who have had their entire meniscus removed to have a very high rate of significant osteoarthritis years following surgery. Luckily, a total meniscectomy complete removal of the meniscus is very rarely performed anymore. Like articular cartilage, menisci will wear down over time. However, they can also tear. Menisci are attached to the tibia along the outside edge, but the inside border is free floating. With increased joint compression and twisting, a tear can occur. If the knee is already loose or unstable from a previous ligament injury, this is even more likely to occur. This would be particularly true if a person with an unstable knee were participating in a sport that involves twisting or pivoting, such as soccer or any court sports. This potential for cartilage damage is why ligament injuries are often surgically repaired to prevent instability. After all, a ligament reconstruction is a much better alternative to a to a total joint replacement in the future! A tear in the meniscus may require surgical intervention, especially if it is causing irritation to the joint. Surgery is performed arthroscopically, and will either involve removing the torn piece of cartilage if it is in the white zone, or repairing it if there is decent blood supply, like there is in the red zone. Meniscal repairs take longer to recover from, but the long-term benefits to preserving the meniscus far outweigh the short-term loss of function with recovery from the repair. Some meniscal tears occur due to repetitive stresses on the knee joint, and are more degenerative in nature. These tears cannot be repaired, and many time do very well without surgical intervention. Small, degenerative type tears will not usually be a major irritant, and are often best left alone as long as there is no restriction to knee motion. These tears usually do well with physical therapy for strengthening and modification of activities. There have been many advances in the treatment of cartilage deficient knees. It is now possible to do meniscal transplants, though it is uncommon and long-term research needs to be done to prove the efficacy. There are techniques in which articular cartilage cells are removed from a non weight-bearing surface of the knee, grown in a lab, and transplanted to an area of cartilage defect. This treatment option is for small set of people who have specific areas that are affected. Osteotomies can be performed where the joint is re-aligned to distribute forces to a different area. These are also knee replacement surgeries in which only part of the joint is replaced. However,

all of these surgeries are very invasive and require long healing times. The bottom line is that the cartilage needs to be preserved as much as possible to avoid significant surgical intervention. There are many things you can do to help decrease the amount of compressive forces to put on the knee joint, and therefore slow the progression of degeneration. Footwear that increases shock absorption, especially for sports or for people who are on their feet a lot is very helpful. Running shoes are best, though any footwear that is designed to increase shock absorption is helpful. Controlling body weight will also significantly help reduce compressive force on the knee joint. Studies have shown that for every pound lost, there is a four-pound decrease in compression at the knee joint. Losing five pounds would translate into a 20 pound decrease in compressive forces at your knee. Very strong muscle forces will also increase compression at the knee joint, especially when the knee is bent. Therefore, care should be taken with lifting very heavy weights, especially with squatting activities. This increased compression can also occur with riding a bike with very heavy resistance. Anyone with a history of meniscus problems or osteoarthritis should avoid these activities. The following chart outlines high to low risk activities:

# ARTICULAR CARTILAGE AND KNEE JOINT FUNCTION pdf

## 3: Articular cartilage damage - Knee Arthroscopy in London

*"The knee is the largest joint in the body, and relies on two knee cartilage types to function effectively: fibrocartilage and articular cartilage. When you understand knee cartilage types and how to care for them, you can help prevent injury and unnecessary wear and tear.*

Superficial or tangential zone This is the smallest zone that constitutes 10 percent of the cartilage. Collagen fibers are thin and are oriented horizontally to subchondral bone. This zone is called the lamina splendens. Collagen fibers are thicker and start to be arranged into radial bundles. It has got High proteoglycan and water content. Calcified zone This zone separates cartilage from the subchondral bone. Collagen fibers penetrate into this zone and anchor the cartilage to the bone. Tidemark is a basophilic line which straddles the boundary between calcified and uncalcified cartilage; Articular cartilage is avascular and lacks nerve structures. Microscopic Composition of Articular Cartilage The tissue is composed of a relatively small number of cells and abundant extracellular matrix. Chondrocyte activity is necessary for the synthesis of the matrix and probably its physiologic degradation and removal. Extracellular Matrix The matrix is responsible for maintaining the homeostasis of the environment and is the main component providing the biomechanical properties of the articular cartilage. The matrix contains a large amount of water, a network of collagen fibers, and a ground substance composed mainly of carbohydrate and noncollagenous protein. Water content decreases with normal aging and increases with osteoarthritis. Collagen provides the framework and tensile strength. Proteoglycans also retain water and aggrecan is the most responsible for hydrophilic behavior. Proteoglycans are produced by chondrocytes and are composed of glycoaminoglycans subunits which are mainly chondroitin sulfate and keratin sulfate. Noncollagenous protein is also present in the matrix The pericellular matrix contains a delicate meshwork of fine filaments. In mature adult articular cartilage, there is a sharply defined boundary between the pericellular and the intercellular matrix. This zone contains a high concentration of protein and glycoprotein. The collagen fibers at this site are arranged circumferentially to form a strong enclosure about the chondrocyte. Cells Cells of the cartilage are chondrocytes which are derived from their precursor cells called chondroblasts. These cells produce collagen, proteoglycans, and enzymes. They respond to mechanical stimuli like load and chemical stimuli like growth factors. Immature articular cartilage also has stem cells but adult articular does not. Chondrocytes are involved with the physiologic turnover of extracellular ground substance, which is responsible for the biomechanical and biologic properties of this tissue. Chondrocytes exhibit different properties in different zones. Lubrication of Articular Surfaces Joint cartilage is lubricated by various mechanisms Synovial joints serve as mechanical bearings with low coefficients of friction. Their three major sources of lubrication are: Hydrodynamic Lubrication Loading of the articular cartilage causes compression that forces water out of the cartilage. This fluid forms an aqueous layer that separates and protects the opposing surfaces. Boundary-Layer Lubrication A small glycoprotein called lubricin, which is produced by synovial lining cells, binds to articular cartilage where it retains a protective layer of water molecules. Hyaluronic Acid It is produced by synovial lining cells and lubricates the contact surface between synovium and cartilage. Nutrition of Articular Cartilage Adult cartilage is avascular, and chondrocytes obtain nutrients through diffusion. The nutrients are derived from the synovial fluid whose diffusion is facilitated during joint loading. With joint loading, some of the water in cartilage is squeezed out into the synovial space. When the joint is unloaded, the hydrophilic properties of the cartilage proteoglycans cause the water to be sucked back into the cartilage. As the water returns to the cartilage, diffusion of nutrients from the synovial fluid is facilitated. In normal articular cartilage, chondrocytes rarely divide. Chondrocytes synthesize and replace the extracellular matrix components. Proteoglycans have a faster turnover rate compared with collagen. Cytokines such as interleukin-1 and tumor necrosis factor can increase or upregulate the degradative process, whereas transforming growth factor and insulin-like growth factor-1 have an opposite effect on chondrocyte metabolism. Articular cartilage breakdown can be detected by assays using monoclonal antibodies to measure type II collagen and proteoglycans in bodily fluids. In osteoarthritis , the patients experience pain due to irritation of the subchondral bone, which gets exposed as the cartilage degenerates.

Additionally, accumulation of synovial fluid can cause pain through distention of the innervated joint capsule and synovium. Accompanying mild synovial inflammation also causes pain. Get more stuff on Musculoskeltal Health Subscribe to our Newsletter and get latest publications on Musculoskeletal Health your email inbox. Thank you for subscribing. We respect your privacy and take protecting it seriously Spread the Knowledge.

# ARTICULAR CARTILAGE AND KNEE JOINT FUNCTION pdf

## 4: How Does a Knee Function? - www.enganchecubano.com

*The knee is the largest weight-bearing joint in the body. It is the junction between the femur (thigh bone) and the tibia (shin bone). The knee joint is technically a hinge joint, but there is also a great deal of twisting, turning, and rotating that occurs at the knee.*

Anatomical terms Anatomical terms allow us to describe the body clearly and precisely using planes, areas and lines. Below are some anatomic terms surgeons use as these terms apply to the knee: Anterior â€" if facing the knee, this is the front of the knee Posterior â€" if facing the knee, this is the back of the knee, also used to describe the back of the kneecap, that is the side of the kneecap that is next to the femur Medial â€" the side of the knee that is closest to the other knee, if you put your knees together, the medial side of each knee would touch Lateral â€" the side of the knee that is farthest from the other knee opposite of the medial side Structures often have their anatomical reference as part of their name, such as the medial meniscus or anterior cruciate ligament. The medial meniscus would refer to the meniscus on the inside of the knee, the anterior crucial ligament would be on the anterior side front of the knee. Structures of the Knee The main parts of the knee joint are bones, ligaments, tendons, cartilages and a joint capsule, all of which are made of collagen. Collagen is a fibrous tissue present throughout our body. As we age, collagen breaks down. The adult skeleton is mainly made of bone and a little cartilage in places. Bone and cartilage are both connective tissues, with specialized cells called chondrocytes embedded in a gel-like matrix of collagen and elastin fibers. Cartilage can be hyaline, fibrocartilage and elastic and differ based on the proportions of collagen and elastin. Cartilage is a stiff but flexible tissue that is good with weight bearing which is why it is found in our joints. Cartilage has almost no blood vessels and is very bad at repairing itself. Bone is full of blood vessels and is very good at self repair. It is the high water content that makes cartilage flexible. Bones of the Knee The bones give strength, stability and flexibility in the knee. Four bones make up the knee see above image: Tibia â€"commonly called the shin bone, runs from the knee to the ankle. The top of the tibia is made of two plateaus and a knuckle-like protuberance called the tibial tubercle. Attached to the top of the tibia on each side of the tibial plateau are two crescent-shaped shock-absorbing cartilages called menisci which help stabilize the knee. Patellaâ€"the kneecap is a flat, triangular bone; the patella moves when the leg moves. The kneecap glides along the bottom front surface of the femur between two protuberances called femoral condyles. These condyles form a groove called the patellofemoral groove. The round knobs at the end of the bone are called condyles. Fibulaâ€"long, thin bone in the lower leg on the lateral side, and runs along side the tibia from the knee to the ankle. Ligaments in the knee The knee works similarly to a rounded surface sitting atop a flat surface. The function of ligaments is to attach bones to bones and give strength and stability to the knee as the knee has very little stability. Ligaments are strong, tough bands that are not particularly flexible. Once stretched, they tend to stay stretched and if stretched too far, they snap. Medial Collateral Ligament tibial collateral ligament â€" attaches the medial side of the femur to the medial side of the tibia and limits sideways motion of your knee. Lateral Collateral Ligament fibular collateral ligament â€" attaches the lateral side of the femur to the lateral side of the fibula and limits sideways motion of your knee. It limits rotation and forward motion of the tibia. It limits the backwards motion of the knee. Patellar ligament â€" attaches the kneecap to the tibia The pair of collateral ligaments keep the knee from moving too far side-to-side. The cruciate ligaments crisscross each other in the center of the knee. Working together, the 4 ligaments are the most important in structures in controlling stability of the knee. There is also a patellar ligament that attaches the kneecap to the tibia and aids in stability. A belt of fascia called the iliotibial band runs along the outside of the leg from the hip down to the knee and helps limit the lateral movement of the knee. Tendons in the Knee Tendons are elastic tissues that technically part of the muscle and connect muscles to bones. Many of the tendons serve to stabilize the knee. There are two major tendons in the kneeâ€"the quadriceps and patellar. The quadriceps tendon connects the quadriceps muscles of the thigh to the kneecap and provides the power for straightening the knee. It also helps hold the patella in the patellofemoral groove in the femur. Cartilage of the knee The ends of bones that touch other bonesâ€"a jointâ€"are covered with articular cartilage. It also allows

the bones to move more freely against each other. The articular cartilages of the knee cover the ends of the femur, the top of the tibia and the back of the patella. In the middle of the knee are menisciâ€"disc shaped cushions that act as shock absorbers. The articular cartilage is kept slippery by synovial fluid which looks like egg white made by the synovial membrane joint lining. Since the cartilage is smooth and slippery, the bones move against each other easily and without pain. In a healthy knee, the rubbery meniscus cartilage absorbs shock and the side forces placed on the knee. Together, the menisci sit on top of the tibia and help spread the weight bearing force over a larger area. Because the menisci are shaped like a shallow socket to accommodate the end of the femur, they help the ligaments in making the knee stable. Because the menisci help spread out the weight bearing across the joint, they keep the articular cartilage from wearing away at friction points. The weight bearing bones in our body are usually protected with articular cartilage, which is a thin, tough, flexible, slippery surface which is lubricated by synovial fluid. The synovial fluid is both viscous and sticky lubricant. Synovial fluid and articular cartilage are a very slippery combinationâ€"3 times more slippery than skating on ice, 4 to 10 times more slippery than a metal on plastic knee replacement. Synovial fluid is what allows us to flex our joints under great pressure without wear. Muscles Around the Knee Muscles Around the Knee anterior view The muscles in the leg keep the knee stable, well aligned and movingâ€"the quadriceps thigh and hamstrings. There are two main muscle groups â€"the quadriceps and hamstrings. The quadriceps are a collection of 4 muscles on the front of the thigh and are responsible for straightening the knee by bringing a bent knee to a straight position. The hamstrings is a group of 3 muscles on the back of the thigh and control the knee moving from a straight position to a bent position. The Joint Capsule The capsule is a thick, fibrous structure that wraps around the knee joint. Inside the capsule is the synovial membrane which is lined by the synovium, a soft tissue that secretes synovial fluid when it gets inflamed and provides lubrication for the knee. Bursae There are up to 13 bursa of various sizes in and around the knee. These fluid filled sacs cushion the joint and reduce friction between muscles, bones, tendons and ligaments. There are bursa located underneath the tendons and ligaments on both the lateral and medial sides of the knee. The prepatellar bursa is one of the most significant bursa and is located on the front of the knee just under the skin. It protects the kneecap. In addition to bursae, there is a infra patellar fat pad that helps cushion the kneecap. Plicae Plicae are folds in the synovium. Plicae rarely cause problems but sometimes they can get caught between the femur and kneecap and cause pain. The knee has limited movement and is designed to move like a hinge. The Quadriceps Mechanism is made up of the patella kneecap , patellar tendon, and the quadriceps muscles thigh on the front of the upper leg. The patella fits into the patellofemoral groove on the front of the femur and acts like a fulcrum to give the leg its power. The patella slides up an down the groove as the knee bends. When the quadriceps muscles contract they cause the knee to straighten. When they relax, the knee bends. In addition the hamstring and calf muscles help flex and support the knee. In addition to wear and tear on the knee, sports injuries are the source of many knee problems. Symptoms Knee symptoms come in many varieties. Pain can be dull, sharp, constant or off-and-on. Pain can also be mild to agonizing. The range of motion in the knee can be too much or too little. You may hear grinding or popping, the muscles may feel weak or the knee can lock. Some knee problems only need rest and ice, others need physical therapy knee rehab exercises or even surgery. Swelling One of the most common symptoms is local swelling. There are two types of swelling. One is caused by the knee producing too much synovial fluid and the other is caused by bleeding into the joint hemarthrosis. Swelling within the first hour of an injury is usually from bleeding. Swelling from hours is more likely to be from the joint producing large amounts of synovial fluid trying to lubricate an abnormality inside the knee. The best home treatment for swelling is R. Chronic swelling can distend the knee, prohibit full range of motion and the muscles can atrophy from non-use. Also, if the cause of the swelling is blood, the blood can be destructive to the joint. Locking or Catching Locking or catching is when something is keeping the knee from fully straightening out. This is usually a loose body in the knee. The loose body can be as small as a grain of sand or as big as a quarter. The best treatment is removal of the loose body by arthroscopy. The best treatment here is rest and maybe some ice; swelling is not usually present. Giving way can also be caused by weak leg muscles or an old ligament injury. Sometimes the noise is caused by loose bodies that just float around and are not causing pain or injury to the knee.

# ARTICULAR CARTILAGE AND KNEE JOINT FUNCTION pdf

## 5: Form and function of articular cartilage - OrthopaedicsOne Articles - OrthopaedicsOne

*Articular cartilage is smooth, white cartilage on bones in joints such as the knee, which enables the bones to move smoothly together and the joint to move easily. This animation shows the role of articular cartilage in the knee joint.*

Medical consultation Meniscus function The upper leg and lower leg bones meet in the knee joint. However, the surfaces which contact each other do not quite fit together. Both surfaces only have contact with each other at a few points. Both menisci create an all-important balance. Medial and Lateral Meniscus Right Knee There is a somewhat larger medial meniscus and a smaller lateral meniscus. The medial meniscus is grown together with the medial ligament and is more prone to injuries for this reason. The blood supply to the meniscus diminishes with age. As a result, once injured, it will no longer heal as quickly or as well. A damaged meniscus should be treated since it provides an important cushion that protects the articular cartilage and helps to prevent knee arthrosis. The meniscus is made of more resilient fibrous cartilage and has more or less the shape of a "C". It is wedge-shaped or triangle-shaped in the cross-section. Simply take two apples to make a picture of the function of the meniscus yourself. Place one of the apples on a table top so that it easily rolls back and forth, and divide the other one into eight bite-size pieces with a knife. Now place two of these pieces under the apple so that it can no longer roll around: The table top corresponds to the joint surface of the tibia, the bottom part of the apple to the upper leg, and both pieces of apples have assumed the task of the medial meniscus and the lateral meniscus. You will easily recognize that the outer edge of the meniscus is thicker than the inside part. The meniscus fullfil two vital functions They transfer the load from the upper leg to the lower leg and stabilize the knee during flexion, extension and during circular movements. The menisci move during the backward flexion and the forward extension of the knee in order to balance the change of the articular surfaces. The medial meniscus moves by up to six millimetres forward and backward during flexion and extension, and it deforms in the process. The lateral meniscus moves even more. It slides up to twelve millimetres forward and back each time when we flex or extend the knee. It also deforms during each flexion and extension movement. The meniscus function can be summarized as follows:

# ARTICULAR CARTILAGE AND KNEE JOINT FUNCTION pdf

## 6: Meniscus function | Ivy Sports Medicine

*Articular cartilage is a white, smooth tissue which covers the ends of bones in joints. It enables bones of a joint to easily glide over one another with very little friction. This establishes easy movement. Many areas of the body can contain this kind of cartilage. Joints between the bones, knee.*

Exercise Cartilage is a connective tissue found in many parts of the body. Although it is a tough and flexible material, it is relatively easy to damage. This fine, rubbery tissue acts as a cushion between the bones of joints. People with cartilage damage commonly experience joint pain, stiffness, and inflammation swelling. In this article, we will describe the function of cartilage, how it can become damaged, and how that damage can be treated. Fast facts on cartilage damage Here are some key points about cartilage damage. More detail and supporting information is in the main article. Cartilage has several functions, including holding bones together and supporting other tissues There are three types of cartilage Diagnosis of cartilage damage will normally require and MRI or arthroscopy Cartilage damage is often treated with non-steroidal anti-inflammatory drugs NSAIDs What is cartilage? Cartilage is tissue that cushions the bones. Cartilage has several functions in the human body: Reduces friction and acts as a cushion between joints and helps support our weight when we run, bend, and stretch. Holds bones together, for instance, the bones of the ribcage. Some body parts are made almost entirely of cartilage, for example, the external parts of our ears. In children, the ends of the long bones are made of cartilage, which eventually turns into bone. Unlike other types of tissue, cartilage does not have a blood supply. Because of this, damaged cartilage takes much longer to heal, compared with other tissues that are supplied by blood. There are three types of cartilage: Elastic cartilage yellow cartilage - the most springy and supple type of cartilage. Elastic cartilage makes up the outside of the ears and some of the nose. Fibrocartilage - the toughest type of cartilage, able to withstand heavy weights. It is found between the discs and vertebrae of the spine and between the bones of the hip and pelvis. Hyaline cartilage - springy, tough, and elastic. It is found between the ribs, around the windpipe, and between the joints articular cartilage. Elastic cartilage, fibrocartilage, and hyaline cartilage can all be damaged. For example, a slipped disk is a type of fibrocartilage damage, while a hard impact on the ear can cause elastic cartilage damage. When cartilage in a joint is damaged, it can cause severe pain, inflammation, and some degree of disability - this is known as articular cartilage. Symptoms Patients with damage to the cartilage in a joint articular cartilage damage will experience: Inflammation - the area swells, becomes warmer than other parts of the body, and is tender, sore, and painful. Range limitation - as the damage progresses, the affected limb will not move so freely and easily. Articular cartilage damage most commonly occurs in the knee, but the elbow, wrist, ankle, shoulder, and hip joint can also be affected. In severe cases, a piece of cartilage can break off, and the joint can become locked. This can lead to hemarthrosis bleeding in the joint ; the area may become blotchy and have a bruised appearance. Causes Direct blow - if a joint receives a heavy impact, perhaps during a bad fall or an automobile accident, the cartilage may be damaged. Sportspeople have a higher risk of suffering from articular damage, especially those involved in high impact sports like American football, rugby, and wrestling. Wear and tear - a joint that experiences a long period of stress can become damaged. Obese individuals are more likely to damage their knee over a year period than a person of normal weight, simply because the body is under a much higher degree of physical stress. Inflammation, breakdown, and eventual loss of cartilage in the joints is known as osteoarthritis. Lack of movement - the joints need to move regularly to remain healthy. Long periods of inactivity or immobility increase the risk of damage to the cartilage.

# ARTICULAR CARTILAGE AND KNEE JOINT FUNCTION pdf

## 7: Knee Anatomy Pictures: Bones, Ligaments, Muscles, Tendons, Function

*Knee anatomy is about the structure of the knee - that is, the parts that makeup the knee. This article also tells you how a normal knee works and provides resources for problems of the knee joint or it's parts including knee injuries.*

Injured areas, called lesions, often show up as tears or pot holes in the surface of the cartilage. If a tear goes all the way through the cartilage, surgeons call it a full-thickness lesion. When this happens, surgery is usually recommended. However, these operations are challenging. Repair and rehabilitation are difficult. This guide will help you understand what your surgeon hopes to achieve what happens during the procedure what to expect after surgery Anatomy Where is the articular cartilage, and what does it do? Articular cartilage covers the ends of bones. It has a smooth, slippery surface, which allows the bones of the knee joint to slide over each other without rubbing. This slick surface is designed to minimize pressure and friction as you move. When the surface of the cartilage is injured, it is usually not painful at first. This is because cartilage tissues are not supplied with nerves. However, any holes or rough spots in the cartilage can throw off the intricate design of the joint. If this happens, the joint can become inflamed and painful. If the injury, or lesion, is large enough, the bone below the cartilage loses protection, and pressure and strain on this unprotected portion of the bone can also become a source of pain. Surgeons classify defects in the knee cartilage using a grading scale from I one to IV four. In a grade I tear, the cartilage has a soft spot. Grade II lesions show minor tears in the surface of the cartilage. Grade III lesions have deep crevices. In grade IV lesions, the tear goes all the way to the underlying bone. A grade IV lesion goes completely through all layers of the cartilage. It is diagnosed as a full-thickness lesion. Sometimes part of the torn cartilage will break off inside the joint. Since it is no longer attached to the bone, it can begin to move around within the joint, causing even more damage to the surface of the cartilage. Some doctors refer to this unattached piece as a loose body. Cartilage lacks a supply of blood or lymph vessels, which normally nourish other parts of the body. Without a direct supply of nourishment, cartilage is not able to heal itself if it gets injured. If the cartilage is torn all the way down to the bone, however, the blood supply from inside the bone is sometimes enough to start some healing inside the lesion. In cases like this, the body will form a scar in the area using a special type of cartilage called fibrocartilage. Fibrocartilage is a tough, dense, fibrous material that helps fill in the torn part of the cartilage. Rationale What does Dr. Articular cartilage lesions do not always cause symptoms. In fact, surgeons many times happen upon lesions in the knee joint cartilage while doing knee surgery for a completely different problem. In general, partially torn lesions do not heal by themselves. And they often get worse over time, not better. Likewise, full-thickness lesions may not cause any symptoms at first. The body may have problems adapting to the altered shape of the joint, which can eventually even change the way the joint works. When the lesion causes pain, surgery will most likely be recommended. If the lesion is not causing symptoms, there is less certainty about what to do. Or could it make the situation worse? In these cases, Dr. Even if patients have pain, they may not have surgery right away. This could be as simple as applying heat or ice and taking prescription medication. Other options include physical therapy and a knee sleeve. Preparation What should I expect before surgery? In addition to your physical exam, you will need more X-rays and possibly other imaging tests, such as magnetic resonance imaging MRI and bone scans. Surgical Procedure What happens during surgery? Many types of surgery have been developed for fixing articular cartilage injuries in the knee. When the decision is made to go ahead with surgery, Dr. Reparative procedures may provide pain relief and improve knee motion and function. This requires restorative surgery, meaning that the end result is a lesion filled to the full depth by tissue identical to the original. Surgeons rely on some fairly new procedures to substitute or replace the original cartilage. One method is to transplant cartilage and underlying bone from a nearby area in the knee joint. Another method is to take some chondrocytes the primary cells of cartilage from your knee cartilage, grow them in a laboratory, and then use the newly grown tissue to fill in the lesion at a later date. The final decision about which surgery to use will be based on your specific injury, age, activity level, and the overall condition of your knee. Cell Stimulation Methods These procedures are used to stimulate the body to begin healing the injury. They are considered reparative surgeries because the lesion mainly fills in with

fibrocartilage. Sometimes this procedure is referred to as chondroplasty. It is only intended to be a short-term solution, but it is often successful in relieving symptoms for a few years. This procedure is usually used when the lesion is too large for a grafting type procedure or the patient is older and an artificial knee is planned for the future. Abrasion Arthroplasty When osteoarthritis affects a joint, the articular cartilage can wear away, leaving an exposed area of bone. The scraping action causes a healing response in the bone. In time, new blood vessels enter the area and fill it with scar tissue fibrocartilage that is like articular cartilage. Fibrocartilage is weaker than normal articular cartilage. Because this is not true articular cartilage, it does not function as well for weight bearing as articular cartilage. The fibrocartilage that forms may not be strong enough to remove all the symptoms of pain in the knee. This usually is a temporary solution. Symptoms may return after this surgery. Like abrasion arthroplasty, this procedure is used to get the layer of bone under the cartilage to produce a healing response. The fresh blood supply starts the healing response and triggers the body to start forming new cartilage mainly fibrocartilage inside the lesion. Substitution and Replacement Methods In these procedures, tissue is placed inside the lesion in hopes of restoring the normal structure and function of the original cartilage. The stimulation methods and these newer procedures are showing improved results in helping people return to normal activity. Periosteal and Perichondral Grafting Autologous Chondrocyte Implantation This is a new way to help restore the structural makeup of the articular cartilage. A short surgery is scheduled to allow the surgeon to take a few chondrocytes from inside the knee cartilage. These cells are grown in a laboratory. At a later date, the patient returns for a second surgery, during which the surgeon implants the newly grown cartilage into the lesion and covers it with a small flap of tissue. The cover holds the cells in place while they attach themselves to the surrounding cartilage and begin to heal. The place where the graft is taken is called the donor site. In this case, Dr. Usually, the donor site for this procedure is on the joint surface of the injured knee. Even then, people sometimes end up with problems around the donor site. The osteochondral autograft procedure has mostly been used to treat osteochondritis dissecans OCD , a condition where a chunk of the cartilage and the layer of bone beneath have died. The fragment often gets dislodged and becomes a loose body in the joint. Surgeons have gotten good results with this surgery, but it is challenging to contour the graft to be just the same shape as the covering of the joint. Kiritsis relies on tissue from another person, much like using donor hearts, kidneys, and other organs. The osteochondral allograft procedure is mostly used for OCD lesions larger than 2cm in diameter. It is not recommended for patients with osteoarthritis. One of the problems with this kind of procedure is the limited supply of donor tissue. Even though there are technical difficulties with this type of surgery, the success rate is generally high. This procedure usually involves placing rather large pieces of cartilage and bone in the joint. Kiritsis has a significant amount of experience with this procedure and is also qualified to perform the BioUni procedure. This procedure allows for a more precise shaping and fit of the graft. Complications What might go wrong? As with all major surgical procedures, complications can occur. Some of the most common complications following articular cartilage surgery are anesthesia complications.

# ARTICULAR CARTILAGE AND KNEE JOINT FUNCTION pdf

## 8: Articular Cartilage Problems of the Knee Richmond VA, Sports Medicine

*Articular cartilage lies at the end of bones at the joint. It is very smooth (its coefficient of friction is less than one-third of ice on ice) highly compressible and resilient. Articular cartilage derives its powers from its very organized and efficiently constructed microanatomy.*

Articular cartilage provides an ultimate low-friction gliding surface, which none of the artificial constructs have been able to replace successfully. Retrospective review of the knee arthroscopies has revealed an underestimated incidence of this complex problem. Cartilage injuries in the knee joint if left untreated lead to pre-mature early arthritis and affect the activities of daily living. Various different treatment methods of cartilage regeneration have shown encouraging results, but unfortunately none has proved to be the ultimate solution. Sources of data This article re-visits the intricate structure of articular cartilage and reviews the different methods of regeneration described in the literature, based on evidence-based effectiveness. The methods described by their originators and their results are considered gold standards for those methods, as being the best available evidence. Areas of agreement Majority of the authors agree that cartilage injuries are complex and difficult to treat. If untreated, cartilage defects lead to early osteoarthritis. Great debate still persists about the best available treatment for symptomatic chondral or osteochondral defect s. Areas of controversy The controversy about the management outplays its aetiological theories. Several authors have reported good results with different techniques; however none has proved to be the solution for the problem. Growing points Up until , marrow stimulation techniques were routine form of management for chondral defects. However, ever since autologous chondrocyte implantation was successfully introduced in humans, it has provided a new dimension for the treatment of chondral defects. Areas timely for developing research The success of any treatment lies in its longevity. The new minimally invasive techniques are being invented. In spite of new advances in the field of tissue engineering, this statement holds true even three centuries later. Cartilage injuries are common in the knee joint, and if untreated can become symptomatic and progressively lead to premature arthritis. This article revisits articular cartilage anatomy and its injuries and reviews prospective comparative studies between different cartilage reconstruction procedures. Anatomy of the cartilage Gross anatomy and types of cartilage Depending on the composition of the matrix, cartilage in human body is classified into elastic, fibro-cartilage, fibro-elastic and hyaline cartilage. Hyaline cartilage provides a low-friction gliding surface, with increased compressive strength and is known to be wear-resistant under normal circumstances. Some mesenchyme cells aggregate to form a blastema, at 5 weeks of gestational age. The cells of blastema begin to secrete cartilage matrix and are then called chondroblasts. With further development, the extracellular matrix that is produced gradually pushes the cells apart. The cells encased in this tough and specialized matrix are called as chondrocytes. The mesenchymal tissue surrounding the blastema gives rise to a membrane called perichondrium. Anatomy of the articular hyaline cartilage Hyaline articular cartilage is aneural, avascular and alymphatic structure. Chondrocytes receive their nutrition by diffusion through the matrix. Matrix pH is 7. Chondrocytes are very specialized cells responsible for synthesizing and maintaining the matrix infrastucture. It allows load-dependent deformation of the cartilage. It provides nutrition and medium for lubrication, creating a low-friction gliding surface. This leads to decreased modulus of elasticity and thus reduction in load bearing capability of the articular cartilage.

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## 9: Knee - Wikipedia

*Articular cartilage problems in the knee joint are common. Injured areas, called lesions, often show up as tears or pot holes in the surface of the cartilage. If a tear goes all the way through the cartilage, surgeons call it a full-thickness lesion.*

Bones, Joints, Cartilage, Ligaments, Bursae April 23, Edited By Cindy Schmidler 4 Comments Our musculoskeletal system is made up of muscles, tendons, ligaments, bones, cartilage, joints and bursae. Our muscles work with the nervous system to contract when stimulated with impulses messages through the receptor arc from motor nerves. The muscles are attached to the bones with ligaments. Our skeletal system is made mostly of bones and cartilage. Bones attach to bones with cartilage or ligaments. Bones get their elasticity from tough elastic ropelike fibers of collagen. The core of some small bones is called marrow, it is soft and jellylike. The hard outside of bones is reinforced by strong rods called osteons. Bones have special cells called osteoblasts that make new bone and osteoclasts that break up the old bone. Bones grow by getting longer on the ends called the epiphyseal plate or growth plate. Bones are made rigid by hard deposits of minerals like phosphate and calcium. The bones of the skeleton support our skin, give our body shape, protect and support our organs and make it possible for us to move by acting as single and double levers. Bones do not move on their own; muscles move our bones by pulling on them. Muscles cannot push against the bone, so muscles come in pairs, one muscle pulls the bone one way and the paired muscle pulls the bone back the other way. We have a total of bones. Some bones come in pairs that are almost identical in size and shape â€" the bones in the left arm are the same as the bones in the right arm. There are also single bones in the median plane of our body â€" the vertebrae in our back and neck. However, since our bones are constantly being rebuilt as we get older, both their structure and form can change. Our bones can be rigidly connected to each other or joined by rubbery cartilage, or flexibly linked by muscular or ligamentous joints. An adult skeleton has bones, although some people have extra bones in their spine backbone. As the baby grows, some of the bones fuse such as the bones in the skull and the pelvis. Most girls and women have smaller skeletons than boys and men of the same age. There are two main parts of the skeletonâ€"the axial skeleton and the appendicular skeleton. The Axial Skeleton The axial skeleton trunk is made up of the 80 bones in our upper body. Bones of the axial skeleton include: Skull facial and cranial bones Hyoid Vertebrae in the spine backbones Ribs Our arms and shoulders hang from the axial skeleton. The Appendicular Skeleton There are bones in the arms, shoulders, hips, and legs. The appendicular skeleton is made up of our limbs or appendagesâ€"two arms and two legsâ€"our pelvis and right and left shoulders. Our arms hang from our shoulders and legs attached to our hips. There are about joints in the human body. Joints allow both movement and flexibility. Joints are classified by how much movement they allowâ€"functionâ€"or what they are made ofâ€"structure. Joints are usually classified structurally by the tissue that connects them. The tissue could be cartilage, fibrous tissue, synovial fluid, or some combination of the three. Functionally, joints can be classified by the degree of movement possible, the number of bones involved, and the complexity of the joint. Most body joints allow us to move, and some only allow movement in certain ways. Fixed or immovable joints allow no movement. A dislocated joint happens when the bones of the joint are forced out-of-place, usually while playing sports but can also happen with accidents. There are 3 major functional joints and 3 major types of structural joints. Very little movement is possible. Examples of fibrous joints are sutures, syndesmoses, and gomphoses. The growth plates of long bones are examples of this type of joint. They bones are held together in the joint by ligaments lined with synovial membranes which produce the synovial fluid. These freely moving joints are mostly found in our arms and legs. Synovial joints also include: The articulating surfaces are covered with a layer of hyaline cartilage that cushions and protects the bones. The synovial membrane defines the boundaries of the joint spaceâ€"everything outside of the synovial membrane is outside the joint space. The synovial membrane is wrapped by layers of connective tissue that form the joint capsule. Synovial fluid acts as a lubricant, forms a fluid seal and helps distribute the force placed on the joint. On the outside of the joint capsule are thick strap-like bands, called collateral ligaments. These ligaments direct the force that travels

through the joint and keep the joint on track. Outside of these structures are the muscles that travel across the joint. Types of Synovial Joints Synovial Joints of the Skeletal System Based on the type of movement the joint allows and its structure, synovial joints can be put into several categories. The way they are bound together by the ligaments may not allow movement in all directions. Examples of a gliding joint are the intertarsal and intercarpal joints of the hands and feet. The action of the hinge joint is like that of a door hinge and motion is limited to bending and straightening. Our elbows and knees are examples of hinge joints. Pivot joints allow one bone to pivot on the other bone. An example is head of the radius rotates within the groove of the ulna. These joints allow bending, straightening, abduction, adduction and circumduction. An example of condular joints are in the hands. The only saddle joints are in the thumb. The only ball-and-socket joints are the shoulders and hips. Joint Range of Motion Range-of-motion means how far and in what direction a joint can move. All joints have a normal range of motionâ€”that is when they are healthy and normal they should be able to move a certain distance and direction. Range of motion is measured in angles using a goniometer. Limited motion can be cause be injury, a mechanical problem or a disease process. When you have a physical exam, your range of motion is checked to see if you have full or limited range of motion. Surgery can also cause limit the range of motion in a joint. These are degrees of normal ranges of motion: It is located away from the trunk so the arm can move freely. The arm hangs vertically beside the trunk. When the elbow is bent, the shoulder and metacarpus are in the same plane. The leg hangs vertically below the trunk. The hip joint is where the hipbone joins the femur. The knee is formed by the tibia, fibular, femur and patella. Metatarsalâ€”joints in the foot.

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