

Chapter 1 : Articular cartilage and changes in Arthritis: Cell biology of osteoarthritis

OA, the most common joint disorder, becomes particularly common with age. Key pathophysiologic features include disruption and loss of joint cartilage and bony hypertrophy. OA can affect particular joints (sometimes secondary to injury or another joint problem) or be generalized (often as a primary disorder).

Top of Page What are the risk factors for OA? Joint injury or overuse—Injury or overuse, such as knee bending and repetitive stress on a joint, can damage a joint and increase the risk of OA in that joint. Age—The risk of developing OA increases with age. Gender—Women are more likely to develop OA than men, especially after age 50. Being obese—Extra weight puts more stress on joints, particularly weight-bearing joints like the hips and knees. People who have hand OA are more likely to develop knee OA. Race—Some Asian populations have lower risk for OA. How is OA diagnosed? Top of Page How is OA treated? There is no cure for OA, so doctors usually treat OA symptoms with a combination of therapies, which may include the following: Physical therapy with muscle strengthening exercises. Medications, including over-the-counter pain relievers and prescription drugs. Supportive devices such as crutches or canes. Surgery if other treatment options have not been effective. In addition to these treatments, people can gain confidence in managing their OA with self-management strategies proven to reduce pain and disability so they can pursue the activities important to them. Top of Page What are the complications of OA? Osteoarthritis can cause severe joint pain, swelling, and stiffness. In some cases it also causes reduced function and disability; some people are no longer able to do daily tasks or work. Severe cases may require joint replacement surgery, particularly for knee or hip OA. Experts recommend that adults engage in 150 minutes per week of moderate physical activity, or 30 minutes a day for 5 days. Moderate, low impact activities recommended include walking, swimming, or biking. Regular physical activity can also reduce the risk of developing other chronic diseases such as heart disease, stroke, and diabetes. Learn more about physical activity for arthritis. Go to effective physical activity programs. Classes take place at local Ys, parks, and community centers. These classes can help people with OA feel better. Learn more about CDC-recommended physical activity programs. Join a self-management education class, which helps people with arthritis and other chronic conditions—including OA—understand how arthritis affects their lives and increase their confidence in controlling their symptoms and living well. Learn more about the CDC-recommended self-management education programs. For people who are overweight or obese, losing weight reduces pressure on joints, particularly weight bearing joints like the hips and knees. Reaching or maintaining a healthy weight can relieve pain, improve function, and slow the progression of OA.

Hormone disturbances, such as diabetes and growth hormone disorders, are also associated with early cartilage wear and secondary osteoarthritis. WebMD Medical Reference Reviewed by David Zelman.

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Chapter 3 : Osteoarthritis | Arthritis Foundation

Osteoarthritis (OA) is a type of The pain in an osteoarthritic joint has been related to thickened synovium together with the ending -osis used for disorders.

Why can we talk about a genetic component in osteoarthritis? The most important argument is the existence of family cases, with several people with the disease in different generations: We know of families where there are cases of apparently "primitive" osteoarthritis without cause occurring very early before 30 years of age and in a diffuse way. In addition, the study of identical twins who have the same genetic inheritance, has shown that if one twin suffers from osteoarthritis of the fingers, knee or hip, the second presents a higher risk of developing the disease than other siblings or fraternal twins. However, it is not because one of the two twins is affected that the other will systematically be affected as well. Indeed, genetic factors are not the only ones involved, other factors, known as environmental, also play a role. In the case of osteoarthritis, it primarily involves excess weight and joint injuries. What is meant by the notion of predisposing genes? The human genome is the information contained in the two sets of 23 chromosomes we have in each of our cells, one from our father, the other from our mother. These chromosomes contain our genes which are like phrases of a huge text the genome written in a four-letter letter alphabet ATCG. The gene, thanks to the information it contains, is able to give a specific instruction to the cell such as that of producing collagen, a substance that enters into the composition of cartilage. There are over a million "differences in spelling" in this text, some are irrelevant while others increase the risk of developing a disease: The risk related to a single factor is low, it is the accumulation of several of them, combined with environmental factors, that can promote the onset of the disease. This is why, although some predisposing genes have been discovered, genetic testing is not performed as part of genetic counselling as, with our current knowledge, they would be of no predictive or prognostic diagnostic value. This is one of the big differences with monogenic diseases in which a single gene mutation is directly the cause of the disease and can be transmitted to offspring: In osteoarthritis, observations made in identical twins and the existence of a combination of genetic and environmental factors indicate that the genes involved should be considered only as predisposing or vulnerability genes. Thus, having a mutation in one or several predisposing genes does not mean that you will be ill: How are predisposing genes for osteoarthritis transmitted? The risk of the osteoarthritic disease recurring from one generation to another can be estimated empirically, based on studies carried out on a large number of families. There is no general rule, each disease has its own characteristics, which can include, in particular, the number of genes involved in the development of the disease. Many studies are currently underway to locate vulnerability genes involved in osteoarthritis and some of them have already been identified. Interactions between genetic and environmental factors, however, still remain a mystery. Osteoarthritis can be the result of genuine hereditary genetic diseases and in this case we talk about secondary osteoarthritis Haemophilia is a clotting disorder which is hereditary and results in bleeding in the skin, mucous membranes gums, etc. It is the repeated bleeding in the joints which causes the breakdown of cartilage and thus the onset of osteoarthritis. Haemochromatosis is an inherited disease due to excess iron in the body. It manifests itself by discolouration of the skin, liver abnormalities and diabetes. With regard to the joints, it results in severe osteoarthritis that affects mainly the hands and then other joints if left untreated. Made possible by the sequencing of our genome, the search for genes involved in osteoarthritis is a necessary step in understanding the mechanisms of the disease and then, one day perhaps, in developing treatments that are able to repair the defective mechanisms.

Chapter 4 : Osteoarthritis: Diagnosis and Treatment - - American Family Physician

Osteoarthritis (OA) is the most common chronic (long-lasting) joint condition. A joint is where two bones come together. The ends of these bones are covered with protective tissue called cartilage.

Abstract The reaction patterns of chondrocytes in osteoarthritis can be summarized in five categories: In osteoarthritis, the primary responses are reinitiation of synthesis of cartilage macromolecules, the initiation of synthesis of types IIA and III procollagens as markers of a more primitive phenotype, and synthesis of active proteolytic enzymes. Proliferation plays a role in forming characteristic chondrocyte clusters near the surface, while apoptosis probably occurs primarily in the calcified cartilage. The cells in each of these tissues have independent capacities to initiate and respond to injury in the joint, ultimately resulting in degeneration of cartilage. It is generally believed that degeneration of cartilage in OA is characterized by two phases: New techniques of molecular biology have provided invaluable insights into the function of cells during the onset and perpetuation of OA. Analysis of mRNA levels in cartilage chondrocytes remaining even at joint replacement provided a surprise: The proteins synthesized by OA chondrocytes are structural and functional macromolecules, and degradative enzymes. In addition, the areas of cellular activity and inactivity are now known to be regional. Unfortunately, at some point the biosynthetic anabolic activity is unable to keep pace with the degradative catabolic activity, and degeneration of the tissue results. Influences of cytokines and growth factors In normal adult cartilage, chondrocytes synthesize matrix components very slowly. In normal cartilage, there is strict regulation of matrix turnover: In OA, however, this balance is disturbed, with both degradation and synthesis usually enhanced. It is believed that the production of the catabolic and anabolic cytokines activates the chondrocytes; however, no single cytokine can stimulate all the metabolic reactions observed in OA. Recent reviews explore in detail the role of cytokines and growth factors in the pathogenesis of OA [5 , 6]. Chondrocytes of articular cartilage produce and retain significant amounts of active and inactive BMPs, known to increase extracellular matrix synthesis and induce chondrogenesis and osteogenesis. BMP-7 is found in two forms: In OA cartilage, mature BMP-7 was detected in the superficial layer, whereas the pro form was primarily in the deep layer. These results point to the possibility that one way in which proteinases could regulate anabolic activities is through the conversion of pro-BMPs to mature BMPs, converting inactive BMP to active BMP, which can then stimulate matrix synthesis. Other molecular influences of cartilage degradation are beginning to emerge that have been found to be a result of initial molecular breakdown. It is now known that fragments of fibronectin can induce expression of metalloproteinases and matrix degradation in chondrocytes [9]. The molecular mechanism is probably the induction of enhanced gene expression of collagenase and stromelysin [10]. More recently, a fragment of link protein, part of the large proteoglycan aggregate in cartilage, was found to stimulate proteoglycan and collagen synthesis in cartilage explant culture [11]; consequently the fragments of protein degradation may stimulate the cells to attempt to repair the matrix, as proposed by Hering [12]. Cellular responses in OA cartilage The cellular reaction pattern during the osteoarthritic disease process is at first glance rather heterogeneous. However, the reaction patterns can basically be summarized in five categories: A representation of these responses is shown in Fig.

Chapter 5 : What is the relationship between body weight and osteoarthritis?

Secondary osteoarthritis is a form of osteoarthritis that is caused by another disease or condition. Conditions that can lead to secondary osteoarthritis include obesity, repeated trauma or surgery to the joint structures, abnormal joints at birth (congenital abnormalities), gout, diabetes, and other hormone disorders.

Normal Knee Articular Cartilage and Osteoarthritic Knee Articular Cartilage Effects of Osteoarthritis The effects of osteoarthritis are limited to the joints that starts with gradual stiffening. Soreness leads to joint pain which worsens with activity and is relieved with rest. Osteoarthritis can be local or general. Generalized arthritis means you have arthritis in three or more joints. It affects various joints of the body; hence the affects are specific to that particular joint. When affected, the fingers and thumbs become enlarged and twisted and are accompanied with pain, numbness, and stiffness. This is one of the commonly affected joint with symptoms of stiffness, pain, and swelling. When osteoarthritis affects the knee, it becomes difficult to walk, climb, sit on the chair or get up after sitting for some time. This eventually leads to knee replacement or disability. This is another commonly affected joint which has symptoms of stiffness and pain. The pain can radiate to the groin region, the inner thighs, buttocks, or even to the knees. People affected with hip osteoarthritis often find it difficult to bend or move around. This eventually leads to hip replacement or disability. The symptoms are stiffness and pain in the neck and lower back. With the severity of the arthritis, the pressure builds up on the adjoining nerves, which ultimately exits the spinal column. This results in numbness and weakness of the arms or legs, depending on the particular nerve that is being affected. Apart from the basic symptoms of joint pain and stiffness, the effects of osteoarthritis differ from person to person depending on the severity of the degeneration. The basic effect on the lifestyle of the affected person could include: You doctor will check your joint reflexes and mobility of your problem areas. Depending on what your doctor finds, he may order x-rays to asses the extent of your arthritis. The xrays can show cartilage or bone damage and bony growths or bone spurs. However, early stages of osteoarthritis may not be seen on xrays since not much cartilage is lost in the early stages. An MRI magnetic resonance imaging , which is high-resolution computerized images of the tissues, can show any damage to the adjoining joint ligaments, tissues, or meniscus. A joint aspiration is a process of drawing synovial fluid from the joint with a needle and then examining it under the microscope to find any infection. Certain blood tests may be ordered to rule out other physical ailments which can cause symptoms like osteoarthritis. Treatment options The treatment of osteoarthritis involves four goals: Exercise Exercising is the best treatment for osteoarthritis. Walking, swimming, and water aerobics are good exercises for people with osteoarthritis. A physical therapist can help you find the most appropriate form of exercise to suit your physical condition. He will also teach you how much exercise you can do. Exercising is an inexpensive treatment option. The side effects are almost zero if the exercises are done correctly. Weight Management Osteoarthritis mostly affects people who are overweight or obese. So, to improve your arthritic condition, weight reduction should be a top priority. Weight loss reduces the stress on the affected joints, increases flexibility, and reduces the pain in the joint. A registered dietician or nutritionist can help you with the right weight loss diet to reduce weight and keep up a healthy weight. Rest and Sleep Another important treatment is to rest the affected joint. When the joint is getting tiredâ€”get rest right away. Don;t over exert the affected joint. Splints or braces can provide support for the joint. Using a cane can also relieve pressure on the joint. An occupational therapist can help you find and get fitted for the correct cane or brace. Getting plenty of sleep provides rest and helps manage pain. Pain Relief Without Medicine There are various methods that you can use to relieve pain without medication. Hot packs help increase blood flow and decrease pain and stiffness; cold packs help in reduce inflammation and soreness. TENS or transcutaneous electrical nerve stimulation â€” mild electric pulses are applied to which relieves pain. All these methods should be used after talking with your doctor or physical therapist to choose the right treatment for you and get the most out of treatment. Medicine Most often doctors prescribe pain medications to relieve pain and help patients carry on the activities of daily living. The doctor analyzes factors like unwanted side effects, previous medical history, and other medications the patient is already taking along with

the intensity of pain to prescribe medicine. The doctor can prescribe any of the following medications: Most medications have side effects, so before taking any medicine, learn as much as you can about that particular medicine as well as signs and symptoms of allergic reaction. Surgery Treatment of osteoarthritis with surgery is required: Hip bones , knee bones , and shoulder bones to better understand how osteoarthritis affects joints. Alternative therapies When the usual treatment options fail to provide pain relief, some people try alternative therapies like acupuncture, nutritional supplements glucosamine, chondroitin sulfate, etc. These methods do not have any side effects; however, their benefits have yet to be proved. What Kind of Doctor Treats Osteoarthritis? What You Can Do To Treat Osteoarthritis Your doctor or other health care providers can give you a variety of treatment options or methods to care for your osteoarthritis, but you have to do what is necessary to have as normal a life as possible. The following tips can help you control your symptoms and enjoy better health. Learn as much about the osteoarthritis as you can. A good understanding of osteoarthritis will help you deal with it better. Enroll in an arthritis support group, patient education program, or self-management program. Have an active lifestyle. Include strengthening exercises, aerobics, and range-of-motion exercises to reduce stiffness and maintain your overall strength and fitness. Always talk with your doctor before doing any form of exercise. Your doctor can tell you which exercises will be the best for your situation. Eating a balanced diet can help you keep fit. Avoid foods that make you gain weight. Try to eat a diet that will help you lose or maintain a healthy weight. Added weight puts pressure on your affected joint and cause more discomfort and pain. Getting plenty of sleep every night is important for resting your joints. Rest helps reduce pain and thereby help you do daily activities with less pain and stiffness. If you have problems getting enough sleep because of pain, talk with your doctor who can prescribe pain medicine. Your doctor can advise you on proper bedding or sleeping positions and even the timing of medicines to help you sleep. Also, avoid caffeine or alcohol at night, make your room dark, quiet and comfortable while going to sleep, or taking a warm bath before going to bed. Most importantly, keeping a positive attitude can affect your physical health. Participate in fun activities like sports or other hobbies. If the pain keeps you from being active, talk with your physical or occupational therapist for ways to overcome problems. When you occupy your mind with things you enjoy you will feel better!

Chapter 6 : Osteoarthritis - Wikipedia

Osteoarthritis, is the most prevalent disorder of the joint, and is seen in at least 70 per cent of those over the age of This volume, which grew out of collaborative efforts of clinical and basic scientists, contains information on osteoarthritic disorders, and suggests further research areas.

Hand OA can have a big impact on your ability to do the tasks associated with day-to-day living. However, treatments ranging from lifestyle changes to surgery can help. Read more about OA in the hands and how to treat it. Osteoarthritis in your hips OA can occur in one or both hips. In this way it differs from RA, which usually occurs in both hips at the same time. Hip OA is a slowly degenerative condition. Supports, such as canes, can also help. Age, genetics, and knee injury may all play a role in knee OA. Athletes who concentrate solely on one sport that creates extensive, repetitive motion, such as running or tennis, may be at increased risk of OA. Likewise, if you pursue only one type of physical activity, this may overuse some muscles and underuse others, causing weakness and instability in the knee joint. Varying your activities helps to work different muscle groups, allowing all the muscles around your knee to be strengthened. Osteoarthritis knee brace Wearing a brace around your knee can be an excellent nonsurgical treatment for knee OA. Braces can reduce swelling and pressure. They can also increase stability in your knee by shifting your weight away from the damaged part of your knee. This allows for greater mobility. There are several types of knee braces. Some may be custom fitted for you, and others are available OTC. Your doctor may recommend that you try different kinds of braces for different activities. Find out what the best type of brace for your OA is. It occurs in both men and women. The cervical spine is located in the neck and contains facet joints. These joints help to maintain flexibility in the spine, allowing for a full range of motion. When the cartilage around the facet joints starts to wear away, cervical OA results. If it does, symptoms can range from mild to severe and include: This condition affects the facet joints located in the lower back and buttocks. Age and spine trauma are both potential factors in spinal OA. Women are more likely than men to get this condition. People who are overweight, or whose jobs require squatting and sitting, may also be at increased risk. If left untreated, spinal OA can worsen, causing more severe symptoms and disability. Read more about OA of the spine. But other risk factors can be controlled, and managing them can help reduce your risk of OA. The following tips can help you manage the risk factors under your control: Wear athletic supports and shoes that reduce impact on your knees. Also make sure to vary your sports , so that all of your muscles get a workout, not just the same muscles every time. Keep your body mass index BMI in the appropriate range for your height and gender. Keep a healthy diet. Eat a range of healthy foods , with a focus on fresh vegetables and fruits. Give your body ample opportunities to rest and to sleep. The sooner you speak with your doctor, the sooner you can receive a diagnosis, begin treatment, and improve your quality of life.

Chapter 7 : Osteoarthritis - Symptoms and causes - Mayo Clinic

Osteoarthritis is the most prevalent disorder of the joint, and is seen in at least 70 per cent of those over the age of 60. This volume contains information on osteoarthritic disorders, and suggests.

In osteoarthritis of the spine, disks narrow and bone spurs form. Osteoarthritis of the hip

Osteoarthritis of the hip The hip joint shown on the left side of the image is normal, but the hip joint shown on the right side of the image shows deterioration of cartilage and the formation of bone spurs due to osteoarthritis. Osteoarthritis symptoms often develop slowly and worsen over time. Signs and symptoms of osteoarthritis include: Your joint may hurt during or after movement. Your joint may feel tender when you apply light pressure to it. Joint stiffness may be most noticeable when you wake up in the morning or after a period of inactivity. You may not be able to move your joint through its full range of motion. You may hear or feel a grating sensation when you use the joint. These extra bits of bone, which feel like hard lumps, may form around the affected joint.

Request an Appointment at Mayo Clinic Causes Osteoarthritis occurs when the cartilage that cushions the ends of bones in your joints gradually deteriorates. Cartilage is a firm, slippery tissue that permits nearly frictionless joint motion. In osteoarthritis, the slick surface of the cartilage becomes rough. Eventually, if the cartilage wears down completely, you may be left with bone rubbing on bone. Risk factors Factors that may increase your risk of osteoarthritis include: The risk of osteoarthritis increases with age. Carrying extra body weight contributes to osteoarthritis in several ways, and the more you weigh, the greater your risk. Increased weight puts added stress on weight-bearing joints, such as your hips and knees. In addition, fat tissue produces proteins that may cause harmful inflammation in and around your joints. Injuries, such as those that occur when playing sports or from an accident, may increase the risk of osteoarthritis. Even injuries that occurred many years ago and seemingly healed can increase your risk of osteoarthritis. If your job includes tasks that place repetitive stress on a particular joint, that joint may eventually develop osteoarthritis. Some people inherit a tendency to develop osteoarthritis. Some people are born with malformed joints or defective cartilage, which can increase the risk of osteoarthritis. Complications Osteoarthritis is a degenerative disease that worsens over time. Joint pain and stiffness may become severe enough to make daily tasks difficult. Some people are no longer able to work. When joint pain is this severe, doctors may suggest joint replacement surgery.

Chapter 8 : Osteoarthritis - Physiopedia

Although osteoarthritis can damage any joint in your body, the disorder most commonly affects joints in your hands, knees, hips and spine. Osteoarthritis symptoms can usually be effectively managed, although the underlying process cannot be reversed.

Stiffness, particularly in the morning Sensitivity when kneeling or bending [15] Decrease in the abilities of daily functioning More commonly diagnosed [4] Loss of mobility in the affected joint Decrease in muscle power Crepitations This type of OA can be caused by obesity, trauma, inflammatory or genetically [4] X-ray: The basic X-ray is used to research breakdown of cartilage, narrowing of joint space, forming of bone spurs and to exclude other causes of pain in the affected joint. A sterile needle is used to take samples of joint fluid which can then be examined for cartilage fragments, infection or gout. The European League Against Rheumatism developed diagnostic criteria for diagnosing knee osteoarthritis. The most important factors are shown in the following figure. Mind the position of the joints when in rest and how the patient moves. This can be accomplished by making the patient perform simulations of daily activities such as getting up from and down on a chair, stair climbing, etc. Also be wary of possible bone spurs osteocytes that have formed on the edge of the joint. These osteocytes are a serious indication towards osteoarthritis. Examination of basic functions: Testing of muscle power, coordination, mobility, balance and also stability of the joint. These factors can be tested by active test like standing on one leg and passive manual tests. When testing stability of the joint muscle strength and proprioception are of significant importance. Medical Management [20] The main goal of any therapy for patients with knee OA in most cases is to reduce pain and improve the physical functioning. The summary [20] as mentioned above is consisted of numerous treatments for osteoarthritis, divided into medical and physical therapy management. Although pharmacological treatment is not proven to have outcomes that are of crucial importance and despite its controversy, medications are often recommended by doctors. Because of its safety and mild effectiveness, it is one of the most used oral medicine. NSAIDs are primarily used for joint pain. Both Tramadol and codeine contain opioids, which are refractory pain relieving medicines that are generally used for the treatment of moderate to severe knee OA. They are directly injected into the arthritic joint of the knee in full extension. All drugs have side effects, some more than other, thus it is very important that patients with other health issues verify if they may use a particular medication. Cardiovascular gastrointestinal are the most common side effects. Some medications are not recommended for patients with OA, due to their unproven benefit or negative reactions: Because of their lack of benefit, they are not recommended; ditto for chondroitin sulfate. Physical Therapy Management Pain is a common symptom that occurs in many levels e. When properly instructed these exercises can be performed at home, though research has shown that group exercise combined with home exercise is more effective. Hydrotherapy Is a non-invasive and non-interventional therapeutic intervention that is recommended in international guidelines. Many consider water-based exercises as a good preparation of exercise ashore. The strength of muscles around the affected joints can be built up by graduated exercises making use of buoyancy and floats in the later stage of the treatment. Functional difficulties of osteoarthritis patients are generally walking and climbing stairs and much can be done to re-educate such patients in the pool. Many patients are more mobile in water than on land and this gives them greater confidence and a sense of achievement. Examples of hydrotherapeutic exercises: Muscle strengthening Aerobics Despite the controversy, other studies show that aquatic exercises Aquatherapy have some short-term beneficial effects. Thus, the results indicate that hydrotherapy is applicable and efficient for patients with knee OA. Though there are short-term effects, long-term effects have yet to be investigated. Manual therapy Has proven effective to locate and eliminate factors like pain and joint immobility. However, it is only effective when combined with active exercise. This progress can enable further or advanced exercises. One study proved that manual therapy can relieve pain and decrease stiffness. Whether ice packs relieve pain is still unknown, thus further investigation is needed. However, newer studies have shown that ultrasound reduces pain and improves the aerobic condition. Knee braces are used as a therapeutic procedure for patients with OA that involves the medial and lateral tibiofemoral compartments. Their purpose is to

diminish the articular contact stress in those compartments. There are various types of braces [4]: They provide and reduce compression of the joint and improve proprioception and strengthening of the quadriceps. Has proven to be slightly effective in decreasing pain and disability for patients with knee OA. There are various types of knee OA surgery [4]: Level of Evidence 2A Arthroscopic surgery: Damaged cartilage will be removed. It only has short-term effects. It is proven to reduce pain and increase the mobility. This type of surgery has long-term beneficial effects. Post-operative exercises are very much recommended. Exercises to improve the function of the new joint and muscle strengthening are most effective. Ottawa Panel of evidence suggests the use of therapeutic exercises or exercises with manual therapy to be most beneficial for patients with knee OA Level of evidence 1A. Glass, MD, Osteoarthritis of the Knee. American Academy of Orthopaedic Surgeons, ; Rosemont xxi - v. Osteoarthritis of the Knee. Clinical aspects, pathology and pathophysiology of osteoarthritis. J Musculoskelet Neuronal Interact ; 6 4: Knee Osteokinematics and Arthokinematics. A minireview, World Journal of Stem Cells, , 6 5: R21 Level of Evidence: Moran, Pharmacological treatment of osteoarthritis of the hip and knee, BC Medical Journal, , 52 8: Aquatic physical therapy for hip and knee osteoarthritis: Journal of Physical Therapy 87 1 , Level of evidence: Journal of Advanced Nursing, 57 2 , Level of evidence: Ottawa panel evidence-based clinical practice guidelines for therapeutic exercises and manual therapy in the management of osteoarthritis. Clinical hip tests and a functional squat test in patients with knee osteoarthritis: J Orthop Sports Phys Ther. A Systematic Review and Meta-analysis. S12â€”S19 Aug Level of evidence 1A.

Chapter 9 : Osteoarthritis (OA) | Basics | Arthritis | CDC

osteoarthritic disorders using receiver operating characteristic curves. Int Arch BioMed Clin Res 3: Ganguly A (b) Assessment of relationship between.