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Magnetic Resonance Imaging Finding in Common Knee Joint Diseases

نتائج الرنين المغناطيسي في أمراض مفصل الركبة الأكثر شيوعاً

A thesis submitted for partial fulfillment of the award of M.Sc. degree in medical diagnostic radiology

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الآية

قال تعالى:

﴿نَرْفَعُ دَرَجَاتٍ مَّن نَّشَاءُ وَفَوْقَ كُلِّ ذِي عِلْمٍ عَلِيمٌ﴾

صدق الله العظيم

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Dedication

To my father, mother, sisters,

Brothers, friends, colleagues

And my Teachers.

Acknowledgment

First of all thank to Almighty Allah for giving me the knowledge and strength to complete this dissertation.

I would like to express my deep gratitude to my supervisor Dr.Husain Ahmed Hassan for his keen supervision, encouragement and support through this work.

I'm sincerely thanking all those who helped me specially my lovely Extended family.

Finally, thanks are extended to the staff of MRI Medical Centers, my colleagues and friends for their effort.

List of abbreviations:

ACL	Anterior Circuate Ligament
BMI	Body Mass Index
CL	Cruicate Ligament
CT	Computed Tomography
IT	Iliotibial Band
LCL	Lateral Collateral Ligament
LM	Lateral Meniscus
LR	Lateral Retinaculum
MCL	Medial Collateral Ligament
MCL	Medial Collateral Ligament
MM	Medial Meniscus
MR	Medial Retinaculum
MRI	Magnetic Resonance Imaging
OA	Osteoarthritis change
PCL	Posterior Circuate Ligament
T	Tesla
US	Ultrasound

TABLE OF CONTENTS

List of table

List of figure

Abstract

The study was a retrospective study of MRI finding in common knee joint diseases , this study was conducted in Khartoum state of Sudan in Dar Eleilaj hospital and Antalia medical diagnostic Center from September 2016 to January 2017, and the problem of the study was increasing in patients suffering from knee joint pain ,the study was aimed to find out the most common disease in knee joint ,demonstrate the diagnostic value of MRI in diagnosing presence and absence of this disease and identify whether MRI can lead to accurate diagnoses of Knee joint disease, the data was collected from 100 patients and this data was classified and analyzed using SPSS, and found that meniscus tear is the most common knee joint disease with a prevalence of 29% (18% for medial meniscus tear and 11% for lateral meniscus tear) and 21% for cruciate ligaments tear and 14% for osteoarthritic changes and also found that males (58) were more affected than females(42), and the age group of (36-50) were more exposed to knee joint disease ,finally the study recommended that further studies should be done by larger sample size .

الخلاصة

هذه دراسة وصفية لدراسة نتائج الرنين المغناطيسي في أمراض مفصل الركبة الأكثر شيوعاً وتمت هذه الدراسة في ولاية الخرطوم بالسودان في كل من مستشفى دار العلاج ومركز انطاليا للتشخيص الطبي في الفترة من سبتمبر 2016حتى يناير 2017وتكمن مشكلة الدراسة في ازدياد معاناة المرضى من ألم مفصل الركبة وقد هدفت الدراسة لإيجاد أمراض مفصل الركبة الأكثر شيوعاً وتوضيح القيمة التشخيصية للتصوير بالرنين المغناطيسي في عرض ظهور و غياب هذه الامراض والتثبت إذا ما كان التصوير بالرنين المغناطيسي يقود لنتائج دقيقة وقد تم جمع البيانات من 100 مريض صنفت وحللت نتائجهم باستخدام التحليل الإحصائي العلمي وقد وجدت الدراسة أن انتشار تمزق القضروف المفصلي الهلالي كان في 29٪)الغضروف الأنسي، 18٪، الغضروف الجانبي 11٪ .(وتضمنت النتائج اعتلالات غير طبيعية أخرى بمعدل إنتشار 21٪ لتمزق الرباط الصليبي و 14٪ للتغيرات الالتهابية للمفاصل وخلصت الدراسة لان القضروف الهلالي اكثر تاثرا بامراض مفصل الركبة والذكور (58)اكثر عرضة للاصابة بامراض مفصل الركبة مقارنة بالاناث (42) والفئة العمرية بين 36الى 50هي الاكثر عرضة للاصابة وأوصت الدراسة بدراسات اكثر باستخدام عينة دراسية اكبر .

Chapter one

Chapter one

Introduction:

The knee joint is the largest synovial joint in the body, Since in humans the knee supports nearly the whole weight of the body, it is vulnerable to both acute injury and the development of osteoarthritis, and it is one of the most frequently injured regions of the body, and knee lesions can be of both an acute and chronic nature constitutes a major cause of pain and disability of among the athletic and non-athletic population Over the last decade, advances have been made in the treatment of the knee disorders of equal importance have been improved in the diagnosis of these disorders. (Warrick, 1969)

Arthroscopy is considered as "the gold standard" for diagnosis of traumatic intra articular knee lesions. However, arthroscopy is an invasive procedure that requires hospitalization and anesthesia, thus presenting all the potential complications of a surgical procedure. Magnetic Resonance Imaging (MRI) has now established itself as fast and non-invasive imaging alternative complementing physical examination in the evaluation of injuries of the knee. Although conventional radiography and computed tomography (CT) are frequently used for detection of osseous injuries of the knee, MRI with its much better soft tissue contrast remains the main imaging modality of excellence for accurately depicting abnormalities of articular cartilage and soft tissue injuries of tendons, ligaments, and the menisci, Since its introduction in the 1980's Magnetic Resonance Imaging(MRI) has gained in popularity as a diagnostic tool of the musculoskeletal disorders (Gamsu, 1983)

Especially the knee is the most frequent examined joint with MRI. Many surgeons tend to believe that MRI is an accurate, non-invasive diagnostic method of the knee injuries, enough to lead to decisions for conservative treatment and save a patient from unnecessary arthroscopy MRI of the knee provides detailed images of structures within the knee joint, including bones, cartilage, tendons, ligaments, muscles and blood vessels, from many angles. Magnetic resonance imaging (MRI) is a noninvasive medical test that physicians use to diagnose and treat medical conditions. RI uses a powerful magnetic field, radio frequency pulses and a computer to produce detailed pictures of organs, soft tissues, bone and virtually all other internal body structures. MRI does not use ionizing Radiation (x-rays).Detailed MR images allow physicians to evaluate various parts of the body and determine the presence of certain diseases. The images can then be examined on a computer monitor, transmitted electronically, printed or copied to a CD. (Gamsu, 1983)

- **The Problem of Study:**

Increase patient suffering from knee joint pain.

- **objectives of the study:**

1.3.1 General objective:

To characterize the magnetic resonance imaging findings in knee joint diseases.

1.3.2Specific Objectives:

- To determine knee diseases using magnetic resonance imaging.
- To find the frequencies of knee diseases.

- To detect the diagnostic value of magnetic resonance imaging in diagnosing the presence or absence of the most common injuries of the knee meniscus tears, the cruciate ligament ruptures and the chondral defects.
- To determine whether magnetic resonance imaging can lead to accurate diagnose of knee lesions.

1.4 Research overview:

The research will fall in five chapters : chapter one deal with the introduction, objectives, problem ,where chapter two deal with literature review and previous studies ,chapter three deal with materials and methods where chapter four presents the results and five deal with discussion ,conclusion and recommendations.

Chapter two

Chapter two

Background and literature review

2.1 Anatomy of the Knee joint:

The knee joint is the largest synovial joint in the body. It consists of the articulation between the femur and tibia, which is weight-bearing, and the articulation between the patella and the femur which allows the pull of the quadriceps femori is muscle to be directed anteriorly over the knee to the tibia

without tendon wear Two fibro cartilaginous menisci, one on each side, between the femoral condyles and tibia accommodate changes in the shape of the articular surfaces during joint movements .(Drake, 2013)

The detailed movements of the knee joint are complex, but basically the joint is a hinge joint that allows mainly flexion and extension. Like all hinge joints, the knee joints reinforced by collateral ligaments, one on each side of the joint. In addition, two very strong ligaments interconnect the adjacent ends of the femur and tibia and maintain their opposed positions during movement.

Because the knee joint is involved in weight-bearing, it has an efficient "locking" mechanism to reduce the amount of muscle energy required to keep the joint extended when standing. There are two joints in the knee the tibio femoral joint, which joins the tibia to the femur and the patella femoral joint which joins the knee cap to the femur. These two joints work together to form a modified hinge joint that allows the knee to bend and straighten, but also to rotate slightly and from side to Side. (Drake, 2013)

Anatomically allow describing the body clearly and precisely using planes, areas and lines there are Anterior facing the knee, this is the front of the knee, Posterior facing the knee, this is the back of the knee, also used to describe the back of the knee cap that is the side of the kneecap that is next to the femur. Medial the side of the knee that is closest to the other knee, , the medial side of each knee would touch .Lateral 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. (Drake, 2013)

2.1.1 Articular surfaces:

The articular surfaces of the bones that contribute to the knee joint are covered by hyaline cartilage. The major surfaces involved include the two femoral condyles, and the adjacent surfaces of the superior aspect of the tibial

condyles.The surfaces of the femoral condyles that articulate with the tibia in flexion of the knee are curved or round, whereas the surfaces that articulate in full extension are flat .The articular surfaces between the femur and patella are the V-shaped trench on the anterior surface of the distal end of the femur where the two condyles join and the adjacent surfaces on the posterior aspect of the patella. The joint surfaces are all enclosed within a single articular cavity, as are the intra articular menisci between the femoral and tibial condyles. (Drake, 2013) .

2.1.2 Menisci:

There are two memsci, which are fibro cartilaginous C-shaped cartilages, in the knee joint, one medial (medial meniscus) and the other lateral (lateral meniscus) Both are attached at each end to facets in the inter condylar region of the tibial plateau. The medial meniscus is attached around its margin to the capsule of the joint and to the tibial collateral ligament, whereas the lateral meniscus is unattached to the capsule. Therefore, the lateral meniscus is more mobile than the medial meniscus. The menisci are interconnected anteriorly by a transverse ligament of the knee. The lateral meniscus is alsoconnected to the tendon of the popliteus muscle, which passes superolaterally between this meniscus and the capsule to insert on the femur. The menisci improve congruency between the femoral and tibial condyles during joint movements where the surfaces of the femoral condyles articulating with the tibial plateau change from small curved surfaces in flexion to large flat surfaces in extension.(Drake, 2013)

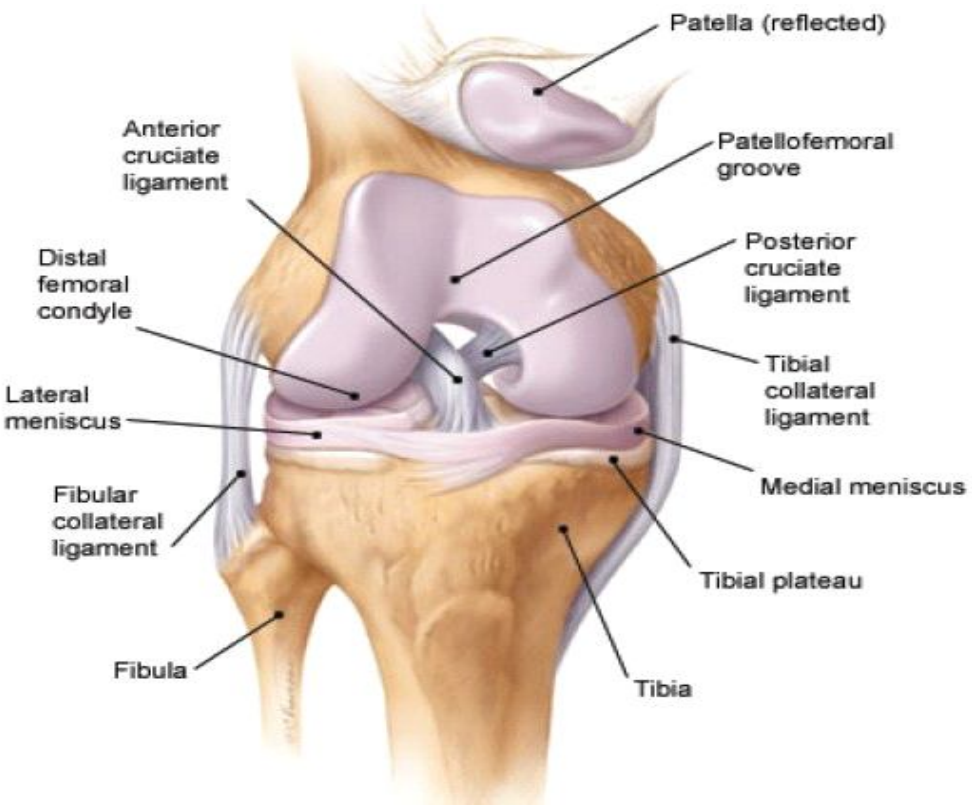

Figure (2.1.1) Bone Of The Knee (.healthpage,2012)

2.1.3 Synovial membrane:

The synovial membrane of the knee joint attaches to the margins of the articular surfaces and to the superior and inferior outer margins of the menisci. The two cruciate ligaments, which attach in the inter condylar region of the tibia below and the inter condylar fossa of the femur above, are outside the articular cavity, but enclosed within the fibrous membrane of the knee joint .Posteriorly, the synovial membrane reflects off the fibrous membrane of the joint capsule on either side of the posterior cruciate ligament and loops forward around both ligaments thereby excluding them from the articular cavity.Anteriorly, the synovial membrane is separated from thepatellar ligament by an infrapatellar fat pad .(Drake, 2013) .

On eachside of the pad, the synovial membrane forms a fringed margin (an alar fold), which projects into the articular cavity. In addition, the synovial membrane coveringthe lower part of the infrapatellar fat pad is raised into asharp midline fold directed posteriorly (the infra patellar synovial fold), which attaches to the margin of the intercondylar fossa of the femur. The synovial membrane of the knee joint forms pouchesm in two locations to provide low-friction surfaces for the movement of tendons associated with the joint the smallest of these expansions is the snbpopliteal recess, which extends posterolaterally from the articular cavity and lies between the later almeniscus and the tendon of the popliteus muscle, which passes through the joint capsule, the second expansion is the supra patellar bursa a large bursa that is a continuation of the articular cavity superiorly between the distal end of the shaft of the femur and the quadriceps femoris muscle and tendon-the apex of this bursa is attached to the small articular is genus muscle, which pulls the bursa awayfrom the joint during extension of the knee.(Drake, 2013)

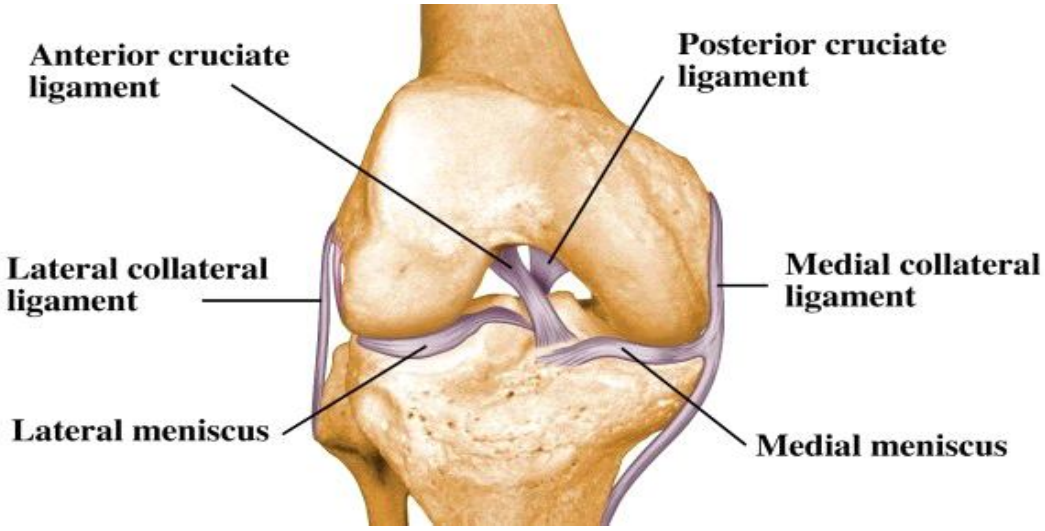

Figure (2.1.2) Ligaments of the Knee (.healthpage,2012)

2.1.4 Ligaments:

The major ligaments associated with the knee joint are the patellar ligament, the tibial (medial) and fibular (lateral) collateral ligaments, and the anterior and posterior cruciate ligaments. Patellar ligament the patellar ligament is basically the continuation of the quadriceps femoris tendon inferior to the patella It is attached above to the margins and apex of the patella and below to the tibial tuberosity. Collateral ligaments the collateral ligaments, one on eachside of the joint, stabilize the hinge-like motion of the knee Patellar ligament The patellar ligament is basically the continuation of the quadriceps femoris tendon inferior to the patella It is attached above to the margins and apex of the patella and below to the tibial tuberosity and collateral ligaments one on each side of the joint. (Drake, 2013).

Stabilize the hinge-like motion of the knee, the cord-like fibular collateral ligament is attached superiorly to the lateral femoral epicondyle just above the groove for the popliteus tendon. Inferiorly, it is attached toa depression on the lateral surface of the fibular head. It is separated from the fibrous membrane by a bursa. The broad and flat tibial collateral ligament is attached by much of its deep surface to the underlying fibrous membrane. It is anchored superiorly to the medial femoral epicondyle just inferior to the adductor tubercle and descends anteriorly to attach to the medial margin and medial surface of the tibia above and behind the attachment of the sartorius, gracilis, and semitendinosus tendons Cruciate ligaments The two cruciate ligaments are in the intercondylar region of the knee and interconnect the femur and tibia and They are termed "cruciate" (Latin for "shaped like a cross") because they cross each other in the sagittal plane between their femoral and tibial attachments. (Drake, 2013) .

The anterior cruciate ligament attaches to a facet on the anterior part of the intercondylar area of the tibia and ascends posteriorly to attach to a facet at the back of the lateral wall of the intercondylar fossa of the femur,the posterior cruciate ligament attaches to the posterior aspect of the inter condylar area of the tibia andascends anteriorly to attach to the medial wall of the intercondylar fossa of the femur. (Drake, 2013)

2.1.5 Cartilage of the knee:

The ends of bones that touch other bones a joint are covered with articular cartilage. Articular cartilage is a white, smooth, fibrous connective tissue that covers the ends of bones and protects the bones as the joint moves. It also allows the bones to move more 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 menisci disc shaped cushions that act .medial meniscus made of fibrous, crescent shaped cartilage and attached to the tibia. (Drake, 2013)

Lateral meniscus made of fibrous, crescent shaped cartilage and attached to the tibia .articular cartilage is on the ends of all bones as shock absorbers. In the knee joint it covers the ends of the femur and tibia and the back of the patella. 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 the 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. (Drake, 2013)

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 the body 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 combination 3 times more slippery than skating on ice, 4 to 10 times more slippery than a metal on plastic kneereplacement. Synovial fluid is what allows us to flex our joints under great pressure without wear.(Drake 2013)

Figure (2.1.3) Cartilage of the knee (.healthpage,2012)

2.1.5 Muscles around the Knee:

The muscles in the leg keep the knee stable, well aligned and moving the quadriceps (thigh) and hamstrings. There are two main muscle groups, the quadriceps and hamstrings. The quadriceps are a collection of four 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 are a group of three muscles on the back of the thigh and control the knee moving from a straight position to a bent. (Drake, 2013)

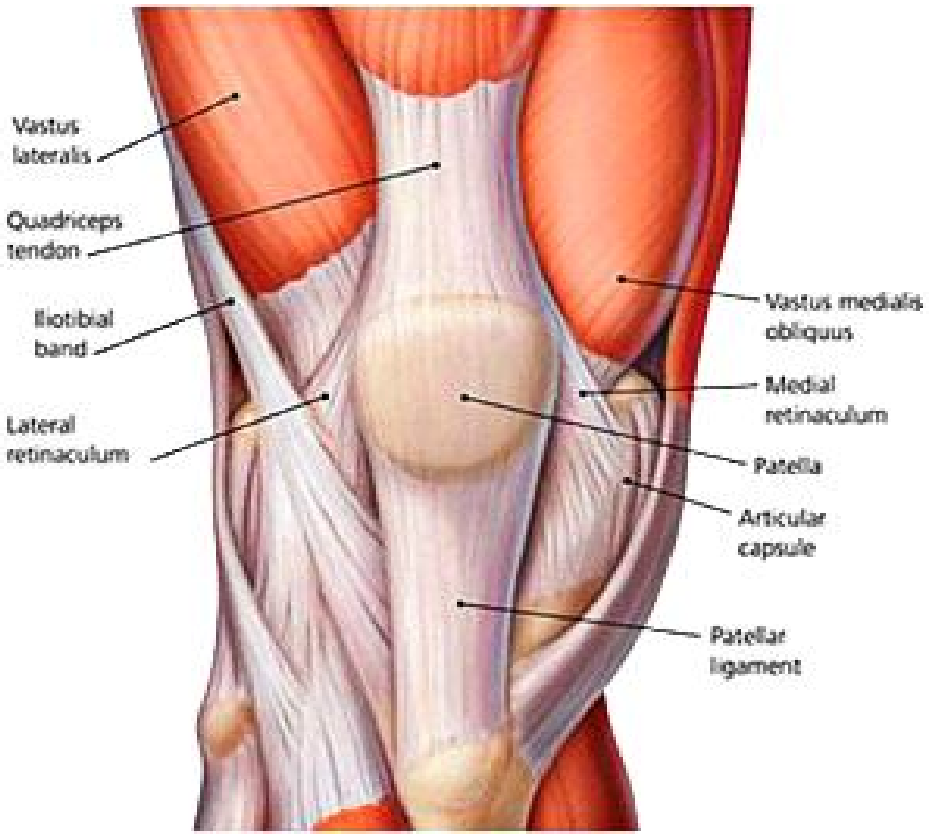

Figure (2.1.4) muscles Around the Knee (.healthpage,2012)

2.1.6 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 line by the synovial, a soft tissue that secretes synovial fluid when it gets inflamed and provides lubrication for the knee. (Drake, 2013) .

2.1.7 Bursa:

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. The prepatellar bursa is one of the most significant bursa and is located on the front of the knee. (Drake, 2013).

2.1.8 Plaice:

Plaice are folds in the synovial. Plaice rarely cause problems but sometimes they can get caught between the femur and kneecap and cause pain. (Drake 2013) .

2.1.9 Knee Arteries and Veins:

The knee joint received it is blood supply from branches of the femoral artery, the popliteal artery and the anterior tibia artery. (Warrick, 1969)

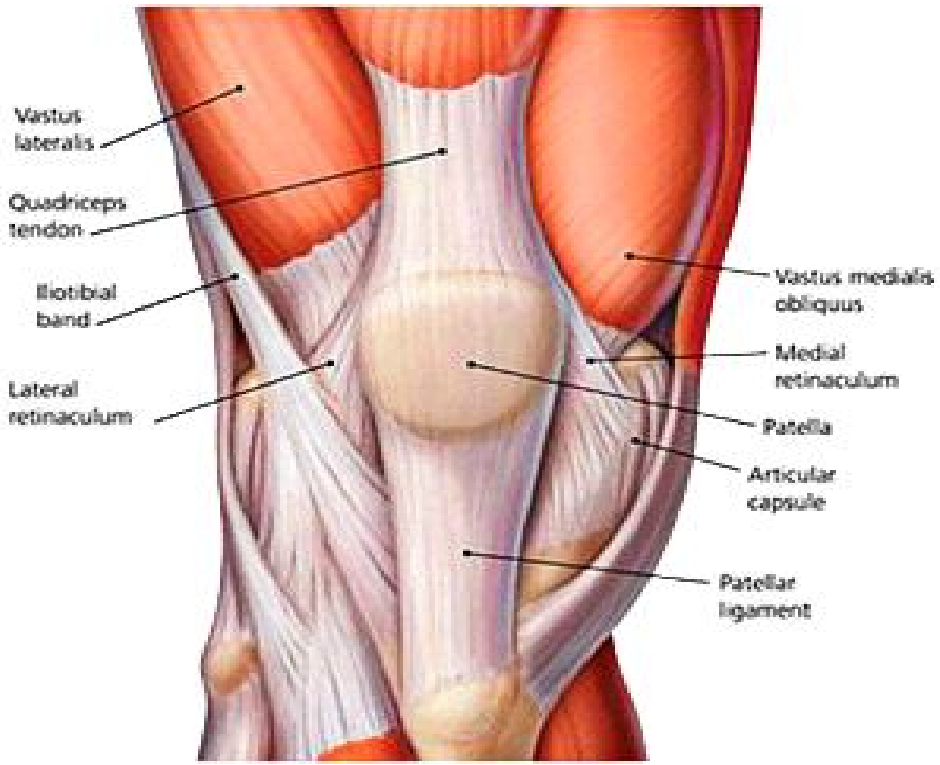

Figure (2.1.5) Knee Arteries and Veins (.healthpage,2012)

2.2 Physiology of knee joint:

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 patella-femoral groove on the front of the femur and acts like a fulcrum to give the leg its power. The patella slides up and 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. (Warrick, 1969)

2.3 Pathology of the knee:

2.3.1trauma or stress (pressure or force):

Knee symptoms come in many varieties. Pain can be dull, sharp, constant or offandon. Pain can also be mild to agonizing. The range of motion in the knee can be too much or too little. Some knee problems only need rest and ice; others need physical therapy or even surgery (Warrick, 1969)

2.3.2 Osteoarthritis:

In this disease, the cartilage gradually wears away and changes occur in the adjacent bone. Osteoarthritis may be caused by joint injury or being overweight. It is associated with aging and most typically begins in people age 50 or older. A young person who develops osteoarthritis typically has had an injury to the knee or may have an inherited form of the disease. (Healthpage,2012).

2.3.3 Rheumatoid arthritis:

Generally affects people at a younger age than does osteoarthritis, is an autoimmune disease. This means it occurs as a result of the immune system attacking components of the body. In rheumatoid arthritis, the primary site of the immune system's attack is the synovial, the membrane that lines the joint. This attack causes inflammation of the joint. It can lead to destruction of the cartilage and bone and, in some cases, muscles, tendons, and ligaments as well. (Healthpage,2012)

2.3.4 Gout:

An acute and intensely painful form of arthritis that occurs when crystals of the bodily waste product uric acid are deposited in the joints. (Healthpage,2012).

2.3.5 Systemic lupus erythematosus (lupus):

An autoimmune disease characterized by destructive inflammation of the skin, internal organs, and other body systems, as well as the joint. (Healthpage,2012).

2.3.6 Ankylosing spondylitis:

An inflammatory form of arthritis that primarily affects the spine, leading to stiffening and in some cases fusing into a stooped position. (Healthpage,2012).

2.3.7 Psoriatic arthritis:

A condition in which inflamed joints produce symptoms of arthritis for patients who have or will developpsoriasis. (Healthpage,2012)

2.3.8 Infectious arthritis:

It is caused by infectious agents, such as bacteria or viruses. Prompt medicalattention is essential to treat the infection and minimize damage to joints, particularly if fever is present.(Healthpage,2012)

2.3.9 Chondromalacia:

Called chondromalacia patellae, refers to softening of the articular cartilage of the knee cap. This disorder occurs most often in young adults and can be caused by injury, overuse, misalignment of the patella, or muscle weakness. Instead of gliding smoothly across the lower end of the thighbone, the kneecap rubs against it, thereby roughening the cartilage underneath the kneecap. The damage may range from a slightly abnormal surface of the cartilage to a surface that has been worn away to the bone. Chondromalacia related to injury occurs when a blow to the knee cap tears off either a small piece of cartilage or a large fragment containing a piece of bone.The most symptom dull pain around or under the kneecap, also pain when climbing stairs or when the knee bears weight as it straightens. The disorder is common in runners and is also seen in skiers, cyclists, and soccer players (Healthpage,2012).

2.3.10 Meniscal Injuries (Injuries to the Menisci):

The menisci can be easily injured by the force of rotating the knee while bearingweight. A partial or total tear may occur .If the tear is tiny, the meniscus stays connected to the front and back of the knee; if the tear is large, the meniscus may be left hanging by a thread of cartilage. The

seriousness of a tear depends on its location and extent .The Symptoms is pain mild or severe and swelling may occur. (Healthpage,2012)

2.3.11 Cruciate Ligament Injuries:

It referred to as sprains. Don't necessarily cause pain, but they are disabling. Most often stretched or torn (or both) by a sudden twisting motion. (Healthpage,2012).

2.3.12 Medial and Lateral Collateral Ligament Injuries:

The cause of collateral ligament injuries is most often a blow to the outer side ofthe knee that stretches and tears the ligament on the inner side of the knee. Such blows frequently occur in contact sports such as football or hockey .the Symptoms pop, buckle sideways, Pain and swelling. (Healthpage,2012).

2.3.13 Tendon Injuries:

Knee tendon injuries range from tendinitis. Tendinitis of the patellar tendon is sometimes called jumper's knee. The Symptoms is pain during running, hurried walking, or jumping. (Healthpage,2012).

2.3.14 Iliotibial Band Syndrome:

Is an inflammatory condition caused when a band of tissue rubs over the outerbone (lateral condyle) of the knee.The symptoms ache or burning sensation at the side of the knee during activity, Pain may be localized at the side of the knee or radiate up the side of the thigh, a snap when the knee is bent and then straight tended and swelling. (Healthpage,2012).

2.3.15 OsteochondritisDissecans:

Results from a loss of the blood supply to an area of bone underneath a joint surface Types of Knee Surgery are Knee Replacement, Knee Arthroscopy. (Healthpage,2012).

4.1 imaging for knee joint:

4.2.1 X-ray:

Radiography is the first step in the evaluation of knee pain. It is quick and inexpensive and can yield many diagnostic clues. It can readily reveal fractures, osteochondral defects, bony lesions, joint effusions, joint space narrowing, and bone misalignment. In patients with knee trauma, supine anteroposterior and cross table lateral radiographic images are generally obtained. In patients whose knee pain is not due to trauma, standing projections are done, as well as dedicated projection of the patella femoral articulation. A standing series is most helpful for evaluating joint space and alignment. (Clark, 2005).

4.2.2 MRI (Magnetic Resonance Imaging):

In MRI can show the ligament, muscle and any pathology in them without usingcontrast media. Limitations of it no signal from bone, long scan time and no signal from even number proton. (DrHans, 1990).

4.2.3 CT (Computed Tomography):

In CT can show the fracture and its fragment with good detail. (Seeram,1994).

4.2.4 US (Ultrasound):

In US can show the muscle which can’t be detected by other modality .basic images are anterior compartment include quadriceps tendon, patellar tendon,

supra patellar tendon, infrapatelar bursa and pesansieine bursa. Posterior compartment include blood supply, medial gastrocenmuis muscle, lower 1/3posterior CL, Gastrocenmuis bursa3. Medial compartment include MCL, MM, MR, Pes.Anseriuns bursa. Lateral compartments include LCL, LM, LR and It. (Frederic,1980).

4.2.5 Nuclear Medicine:

Is a science and clinical application of radiopharmaceutical for diagnostic, therapeutic and investigation, the Indications of it Pain, Fractures, Infection sand Bone tumors. Used Tc99m with MDP Procedure Dynamic or Static. (Smith,1989).

4.2.6 Interventional Radiology:

Interventional radiology can be used for investigation by take biopsy if thereis cyst or any accumulation of fluid, or to remove any abnormality of the knee joint. (Wilfrido,1988).

2.5 Previous Study:

Mandelbaum etal.Studied thattraumatic injury to the knee remains a diagnostic and therapeutic challenge.Magnetic resonance imaging (MRI) has been applied to musculoskeletal pathoanatomy and has been shown to be an effective tool for definition and characterization of knee pathology. A systematic approach is taken to establish anatomical and pathoanatomical correlations, as well as the role of MRI in the management of knee injuries. Imaging was performed at the UCLA Medical Center using a permanent magnet system and a combination of solenoidal surface coils and thin-section, high-resolution scanning techniques. Images depict structural

anatomical and spatial details of the knee that correlate well with corresponding cadaveric cryosections. To determine pathoanatomical correlations and the efficacy of MRI, 105 patients with preoperative diagnoses of meniscal tears, anterior and posterior cruciate ligament tears, tibial plateau fracture, and patella and quadriceps injuries were imaged. Results indicated that for the medial meniscus MRI demonstrated a 95.7% sensitivity, 81.8% specificity, 90% accuracy, 88.2% positive predictive value (PPV), and 93.1 % negative predictive value (NPV). Imaging of the lateral meniscus demonstrated a 75% sensitivity, 95% specificity, 91 % accuracy, 80% PPV, and 94% NPV. MRI of the ACL revealed 100% sensitivity, specificity, and accuracy, positive and negative predictive values. MRI is a noninvasive tool which uses no ionizing radiation and can accurately define and characterize anatomy and pathoanatomy. This study indicates that MRI in conjunction with clinical evaluation can contribute to treatment decision-making processes and assist in preoperative planning. An algorithm demonstrating the potential clinical use of MRI is presented.(Mandelbaum 1986).

Jackson,etal.Studied that Magnetic resonance imaging (MRI) is an accepted noninvasive modality for evaluation of soft tissue pathology without exposure to ionizing radiation. Current applications demonstrate excellent visualization of the anatomy and pathology of various organs. Preliminary studies in the knee reveal fine resolution of anatomy and pathology involving the meniscus. The purpose of this study is to determine a prospective correlation between MRI scans and actual meniscal pathology as documented at the time of arthroscopy. MRI scans were obtained in 155 patients, on 156 knees (one patientwith bilateral scans), with 86 patients (87

knees) eventually undergoing diagnostic and operative videoarthroscopy performed by the same surgeon All images were obtained on the same high-resolution 1.5 Tesla GE Signa Magnetic Resonance Scanner with the same radiologist performing all readings (PEB). The knees were studied in the coronal and sagittal plane using a spin echo sequence and 5 mm slice thicknesses. The menisci were described as having Grade 1, 2, or 3 changes, with Grade 3 reserved for complete tears. Using arthroscopy as the diagnostic standard, the accuracy ofMRI in diagnosing medial and lateral meniscal tears was 93.1 % and 96.6%, respectively with a Grade 3 MRI reading. For tears of the ACL, the accuracy was 96.6% as confirmed at arthroscopy. Fivetears of the PCL were also documented by MRI and correlated with clinical evaluation. Other abnormalities seen were articular cartilage and osteochondral defects, bone tumors, tibial plateau fractures, Baker's cysts, and meniscal cysts. The MRI scan is a highly accurate, noninvasive modality for documentation of meniscal pathology as well as cruciate ligament tears in the knee.(Jackson,1988).

Lapradeetal.Studied that to evaluate the prevalence ofabnormal magnetic resonance imaging scans of the knees of asymptomatic subjects. A prospective analysis of magnetic resonance imaging to arthroscopic findings in symptomatic knees was also performed. The prevalence of meniscal tears found in asymptomatic knees was 5.6% (medial meniscus,1.9%; lateral meniscus, 3.7%). Other abnormal findings included a prevalence of 1.9% for degenerative changes of the medial femoral condyle and 3.7% both for ganglion cysts and patellofemoral joint articular cartilage degenerative changes. There was also a prevalence of 24.1% of Grade II signal changes of the posterior horn of the medial meniscus. Statistical comparison of our

results to previous studies revealed that the magnetic resonance imaging scan readings on the asymptomatic knees in this study were accurate and lesions were correctly identified. We recommend that clinicians match clinical signs and symptoms with magnetic resonance imaging findings before instituting surgical treatment because of a 5.6% prevalence of meniscal tears in the asymptomatic population. The significance of the high percentage of posterior horn medial meniscal Grade II signal changes is unknown.(Laprade, 1994).

Chapter three

Chapter Three

Materials and Methods

3.1 Materials:

3.1.1 Machine used:

MRI machine seimens 1.5T

Knee coil one phase

Air plague.

3.1.2 Populations :

The study sample consist of 100 patients ,58 male and 42 female with different age and abnormal knee joint complain of pain and patient with abnormalities of knee .

3.2 Methods:

3.2.1 Techniques used:

The patient was supine with feet first on MRI table with both legs extended the foot medially rotated to centralize the patella between the femoral condyles ,the knee coil should be in close contact with joint .Centre 2.5 cm below theapex of patella through the joint apace.

3.2.2 Area of the study:

This study conducted at Khartoum state hospitals mostly at Dar Eleilaj Hospital and Antalya Medical Diagnostic Center.

3.2.3 Method of data acquisition:

The patient's data and clinical information were obtained all the axial, coronal and sagittal images were done to identify the pathological changes, the radiologist's reports were collected and all this information were analyzed and presented in tables and graphs.

3.2.4 Ethical clearance:

Ethical approval has been granted from the hospital as well as the radiology department; that this data will be used for research purpose only and the patient will not be subjected to any harm and his information will not be revealed as well as verbal consent from the patients were taken.

Chapter four

Chapter four

4-Results:

Table(4-1) : Frequency distribution of patients gender

Gender	Frequency	Percentage
Male	58	85%
Female	42	42%

Note the males are more than females

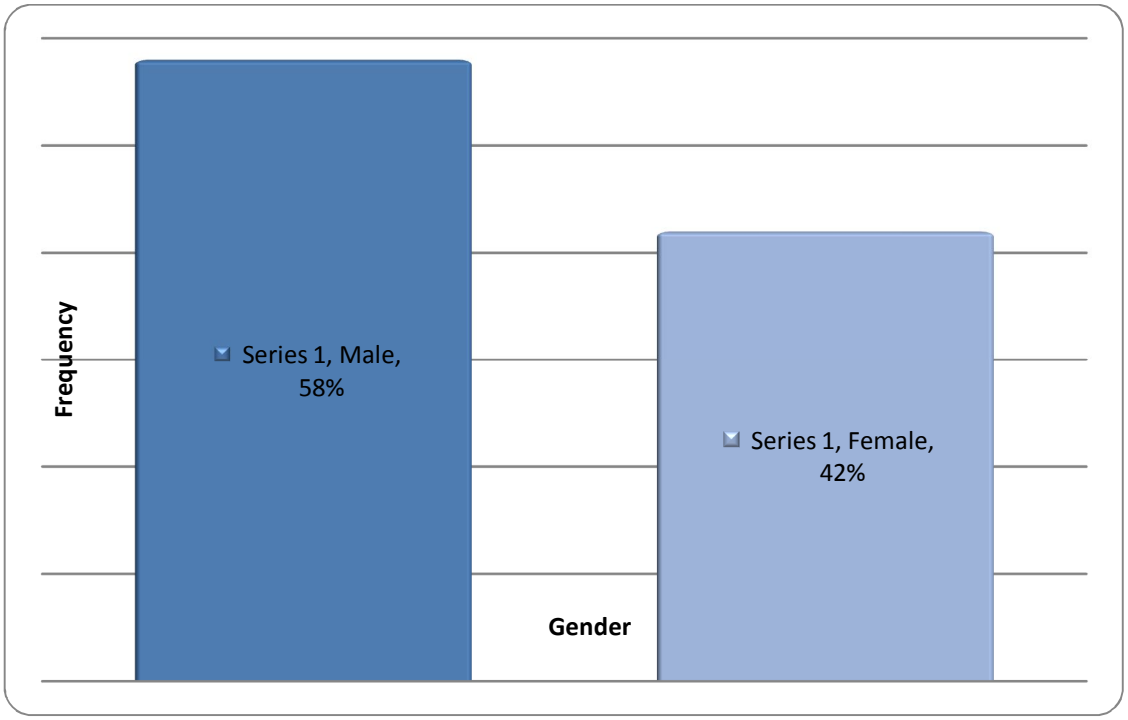

Figure (4-1) : Frequency distribution of patients gender

Table (4 -2): Frequency distribution of patients age

Range of patients age (in years)	Frequency	Percentage
5 _20	4	4%
21_35	18	18%
36_50	36	36%
51_65	35	35%
66_80	6	6%
81_95	1	1%
Total	100	100%

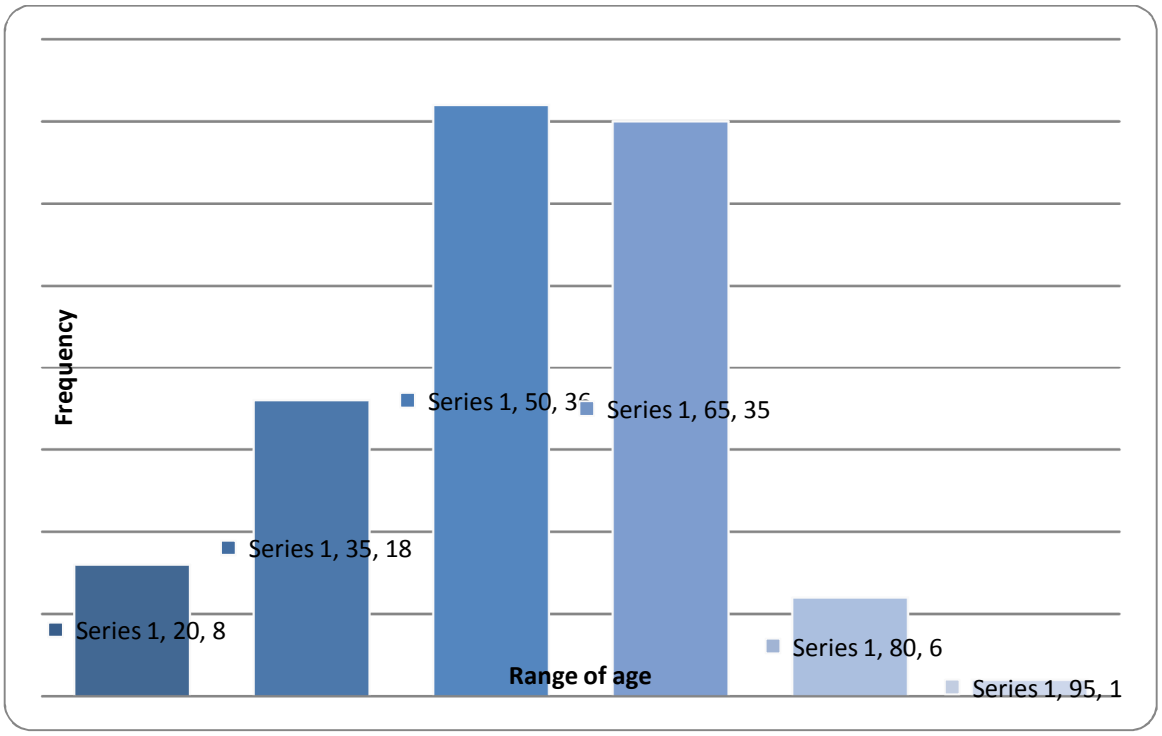

Figure (4-2): Frequency distribution of patients age

Table (4 -3): Frequency distribution of patients diseases

Frequency	Disease	Percentage
29	Meniscus tear	29%
21	Cruciate Ligament tear	21%
14	OA changes	14%
7	CL sprain	7%
3	Chondromalacia Patellae	3%
9	Backer Cyst	9%
2	OsteoSarcoma	2%
3	Bursitis	3%
3	Tendon Rupture	3%
6	Joint effusion	6%
3	Others	3%

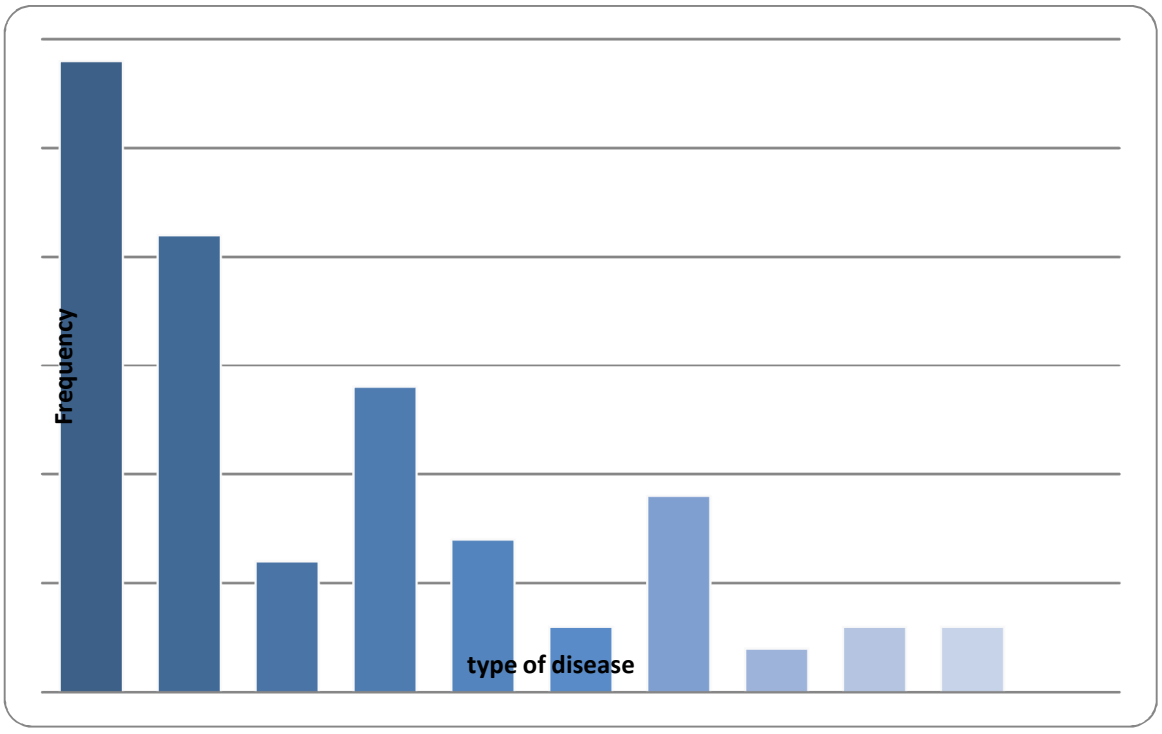

Figure (4 -3): Frequency distribution of patients diseases

Table(4_5) : showed distribution of knee pathology with age groups.

Age groupin years	Meniscus tear	Cruciate ligament tear	OA changes	CL sprain	Chondromalacia Patellae	Backer Cyst	Osteo-sacromaa	Bursitis	Tendon ruptur e	Effusion	Others
5_20	0	1	0	0	0	0	1	0	1	0	1
21_35	5	4	2	2	0	2	0	1	0	2	0
36_50	10	8	7	3	1	2	1	1	1	1	1
51_65	13	5	5	2	1	5		1	1	2	0
66_80	2	1	2	0	0	0	0	0	0	1	0
81_95	0	0	0	0	0	0	0	0	0	0	1

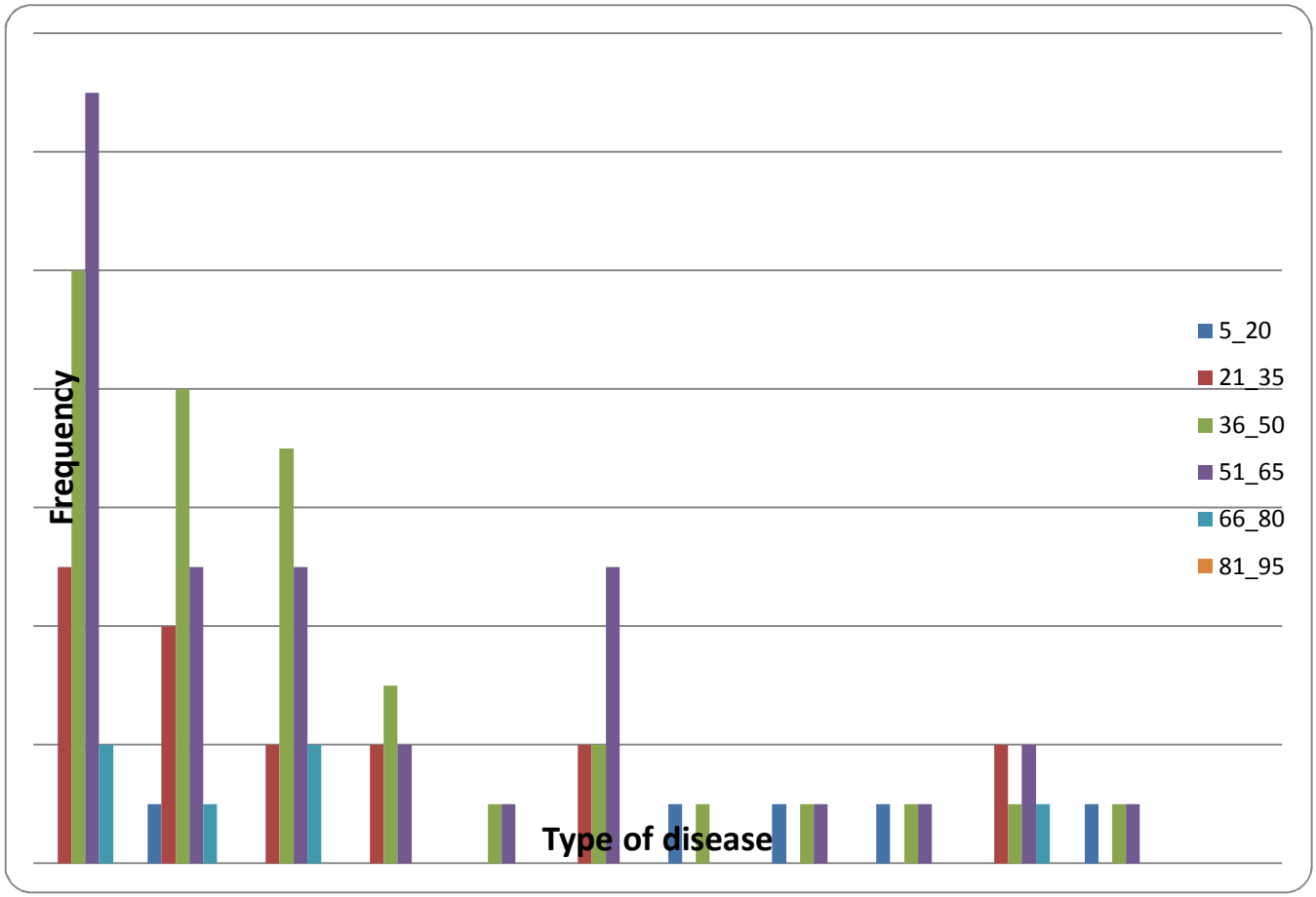

Figure (4_5) : showed distribution of knee pathology with age groups.

Chapter five

Chapter five

Discussion, Conclusion and Recommendation

5.1 Discussion:

The goal of this study was to determine the prevalence of abnormal findings on MRI scans of the knee in symptomatic patients through a controlled, retrospective study. This information may assist the clinician in correlating clinical signs and symptoms to MRI findings before instituting surgical treatment.MRI of the knee joint is non invasive ,safe and good protocol which provide greater details than others modalities like conventional X-ray exams, this study includes 100 patients aged between (5_95) years old, the data were collected by selected 3variables (gender, age and diagnose) using MRI axial, sagittal and coronal view by ,study show that male were affected by pathological change of knee joint more than female and age group of (36_50) and (51_65) were most affected than other age groups, an group (5_20) had the lowest rate of affection. The study showed comparison of about 12 disease types and after analyzed show that meniscus tear had higher rate than other diseases.

5.2 Conclusion:

The MRI is the modality of choice in diagnosing internal lesions of the knee with high details and showed that meniscus tear had the highest prevalenceof the knee pathological change,the result found a relation between patient's age and OA changes of the knee joint but there is no significant relationship between patient gender and specific type of knee disease .

5.3 Recommendations:

We need to have more long-term prospective studies done to determine the true nature of these findings.

Larger study group and further analyzing is recommended.

Three images planes (axial, coronal and sagittal) should be perform together for patients complain of knee pain.

Early detection of many problems helps their speedy recovery.

Well trained technologist maintain well medical services management.

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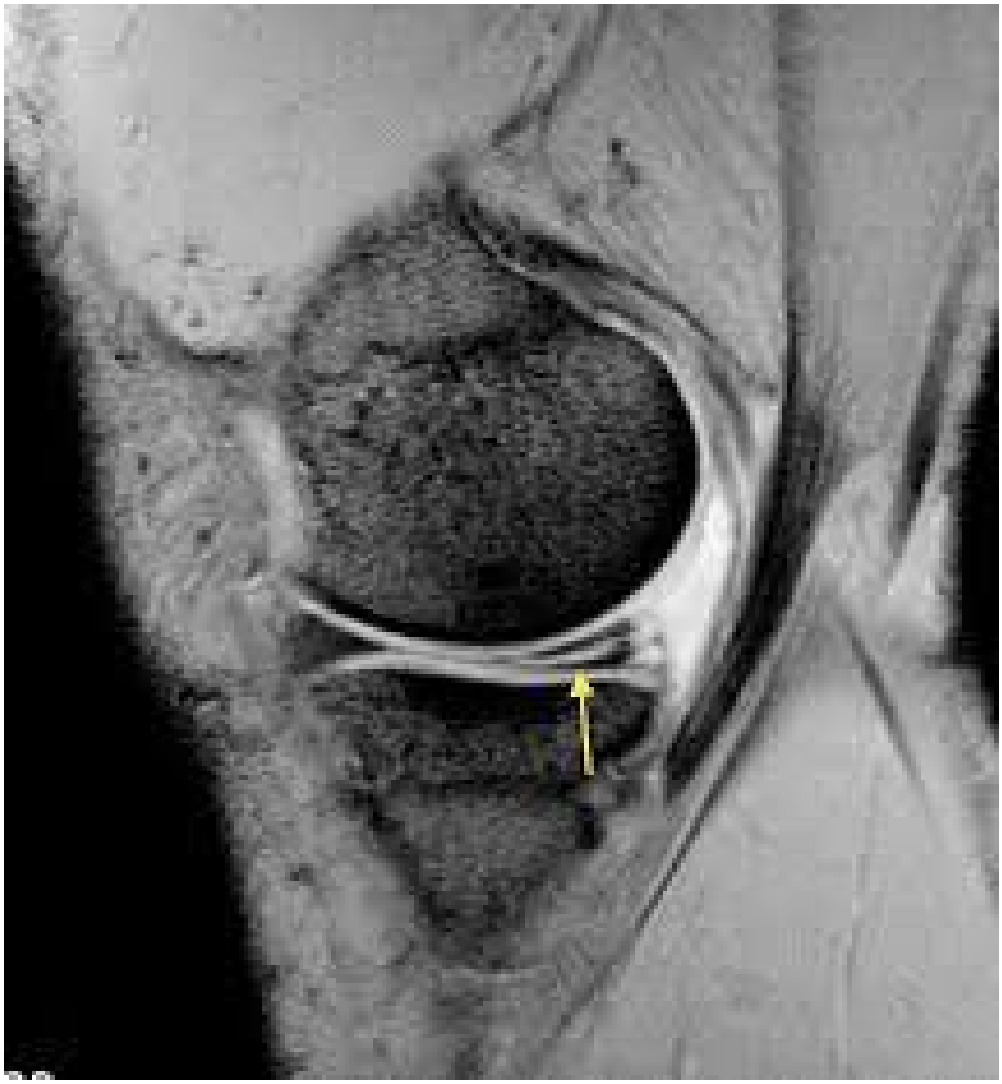
Appendix

Sagittalsection MRI scan demonstrating a meniscus tear.



Sagittalsection MRI scan demonstrating a meniscus tear.

Sagittal section MRI scan demonstrating a cruciate ligament tear

Sagittalsection MRI scan demonstrating a Backer cyst.