Sudan University of Science and Technology

College of Graduate Studies

Study of Lower Back Pain Using Magnetic Resonance Imaging

دراسة الالم أسفل الظهر باستخدام التصوير بالرنين المغنطيسي

A Research submitted for partial fulfillment for the Requirements of M.Sc. degree in Diagnostic Radiologic Technology

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الآية

قال الله تعالي :

(وَأَطِيعُوا اللَّهَ وَرَسُولَهُ وَلَا تَنَازَعُوا فَتَفْشَلُوا وَتَذْهَبَ رِيحُكُمْ ۖ وَاصْبِرُوا ۚ إِنَّ اللَّهَ مَعَ الصَّابِرِينَ)

صدق الله العظيم

سورة الانفال الاية 46

Dedication

To my family

To my friends and my colleagues

I dedicate this work

Acknowledgement

Firstly, I would like to express my gratitude and appreciation to the Almighty Allah from whom I have power and aid.

I would also like to express my sincere gratitude to my supervisor **Dr. Afraa Siddig Hassan Omer** for her suggestions, patience, guidance, encouragement, cooperation and supervision of this work.

Finally, I would like to thanks every person who helped me ingathering different information, collecting data and guiding me from time to time in making this study.

Abstract

This was descriptive cross sectional study aimed to study lower back pain using MRI, conducted in Khartoum stat of Sudan in Omer Sawi during the period from February to August 2022, 78 patients were selected 37(47.7%) male and 41(52.6%) female.

The purpose of this study , the study lower back pain by using MRI and correlated to age , gender,

The study found most patients in age group (46-60) were 37(47.4%), affected at level L5,S1 were 37(47.5%) and at level L4,L5 were 28(35.9%), MRI findings showed 41(52.6%) had Disc Bulge, 7(9%) had Spondylolisthesis, 1(1.3%) had Spondylitis arthritis, 10(12.8%) had Disc degeneration, 8(10.3%) had Disc protrusion and 11(14.1%) had Other findings, there was statistically insignificant correlation between findings and age groups (p-value = 0.22), between findings and affected level of spine (p-value = 0.142), there was statistically significant correlation between findings and gender (p-value = 0.007) and three was statistically significant difference in findings between males and females (sig. = 0.00).

The study concluded to most patients had Disc Bulge and Disc degeneration affected at level L5, S1 and L4, L5, there was statistically significant correlation between findings and gender and there was statistically significant difference in findings between males and females.

المستخلص

كان هذه الدراسة القصيرة الهادفة إلى دراسة آلام أسفل الظهر المزمن الناجمة عن الانزلاق الغضروفي، أجريت في ولاية الخرطوم في السودان في عيادات خلال الفترة من فبراير إلى أغسطس 2022، تم اختيار 78 مريضًا 37 (47.7٪) ذكور و 41 (52.6٪) إناث.

وجدت الدراسة أن معظم المرضى في الفئة العمرية (46–60) عامًا 37 (47.4٪)، تأثروا في معظم الفقرة القطنية العاشرة والعظمة العجزية الأولى عامًا 29 (47.5٪) وفي معظم الفقرة القطنية الرابعة والعظمة العجزية كانوا 28 (35.9٪)، وأظهرت نتائج الدراسة المزمن الناجمة عن الانزلاق الغضروفي 41 (52.6 ٪ لديهم انتفاخ في القرص، 7 (9 ٪) لديهم انزلاق الفقار، 1 (1.3 ٪) لديهم الظهاب الفاصل الظهاب الفقار، 10 (12.8 ٪) لديهم تمزق القرص، 8 (10.3 ٪) لديهم نتوء قرصي و 11 (14.1 ٪) لديهم نتائج أخرى، بان هناك ارتباط ذو دلالة إحصائية بين النتائج والفئات العمرية (القيمة الاحتمالية = 0.22)، بين النتائج والجنس (القيمة الاحتمالية = 0.142)، بان هناك ارتباط ذو دلالة إحصائية بين النتائج والجنس (القيمة الاحتمالية = 0.007) وثلاثة بانوفوق ذات دلالة إحصائية في النتائج بين الذكور والإناث (sig. = 0.00).

خلصت الدراسة إلى أن معظم المرضى عانوا من انتفاخ القرص وتآكل القرص الأكثر شيوعا من الفقرة القطنية الرابعة والعظمة العجزية الأولى الفقرة القطنية الرابعة والعظمة العجزية، وبان هناك ارتباط ذو دلالة إحصائية بين النتائج والجنس، وبان هناك فرق معنوي إحصائيًا في النتائج بين الذكور والإناث.

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List of Abbreviations

DDD	Degenerative disc disease
DLSD	Degenerative lumbar spine disease
FSC	Fast spine echo
GRE	Gradient echo
LBP	Low back pain
L1	First lumbar disc level
L2	Second lumbar disc level
L3	Third lumbar disc level
L4	Fourth lumbar disc level
L5	Fifth lumbar disc level
MRI	Magnetic resonance imaging
SE	Spine echo
T1	Longitudinal Relaxation Time
T2	Transverse Relaxation Time
TR	Repetition Time
TE	Echo Time

Chapter one

Introduction

Chapter one

1.1. Introduction:

Lower back pain can best described in terms of specific accompanying features. (Levin, 2010)

Lower back pain can be caused by a variety of problems with any parts of the complex, interconnected network of spinal muscles, nerves, bones, discs or tendons in the lumbar spine.(Ullrich, 2015)

The lumbar (or lower back) region is made up of five vertebrae (L1L5), sometimes including the sacrum. In between these vertebrae are fibro cartilaginous discs, which act as cushions, preventing the vertebrae from rubbing together while at the same time protecting the spinal cord. Nerves come from and go to the spinal cord through specific openings between the vertebrae, providing the skin with sensations and messages to muscles. Stability of the spine is provided by the ligaments and muscles of the back and abdomen. Small joints called facet joints limit and direct the motion of the spine .(Wikipedia, 2022)

Magnetic resonance imaging (MRI) is the preferred investigation for most spinal diseases and is increasingly requested for people with low back pain (LBP). However, determining the cause of back pain is complicated as it is often multifactorial and anatomical abnormalities are common in the spine and may not necessarily translate into clinical symptoms. (Ann, 2010)

MR images of the spine are clear and more detailed than with other imaging method. This detail makes MRI an invaluable tool in early diagnosis and evaluation of many spinal condition including tumors. (Suwaid, et al., 2014)

1.2 Problem:

The lower back pain usual causes and sources of in the late stage huge problem lead to patients stills in our houses and that affect to economic and otherwise lead to death.

1.3 Objectives:

1.3.1 General Objective:

The aim of Study to lower back pain using MRI

1.3.2 Specific Objectives:

- To identify and diagnose the causes of lower back pain.
- To detect the most common of level of the lumber spine affected by lower back pain
- To determine the relationship between the age ,gender of the lower back pain

1.4 Importance of study:

The role of this study provide diagnose and investigation for most spinal disease and lower back pain by using MRI Diagnosis lower back pain and disease

1.5 Overview of study:

This study will consist of five chapters chapter one deal with the introduction chapter two include literatures review chapter three detailed the materials and methods then chapter four presents the results and chapter five presents the discussion conclusion and recommendations.

Chapter Tow

Literature Review

Chapter two

Literature Review

2.1 Anatomy of spine:

The human vertebral column is the back bone or spine, consisting of twenty four articulating vertebrae, and nine fused vertebrae in the sacrum and the coccyx. The vertebrae in the column are separated from each other by intervertebral discs. It houses and protects the spinal cord in its spinal canal. There are normally thirty-three vertebrae; the upper twenty four are articulating and separated from each other by intervertebral discs, and the lower nine are fused, five in the sacrum and four in the coccyx or tailbone. The articulating vertebras are named according to their region of the spine. There are seven cervical vertebrae, twelve thoracic vertebrae and five lumbar vertebrae. The number of vertebrae in a region can vary but overall the number remains the same. The number of those in the cervical region however is only rarely changed. (Gray, 1979) |

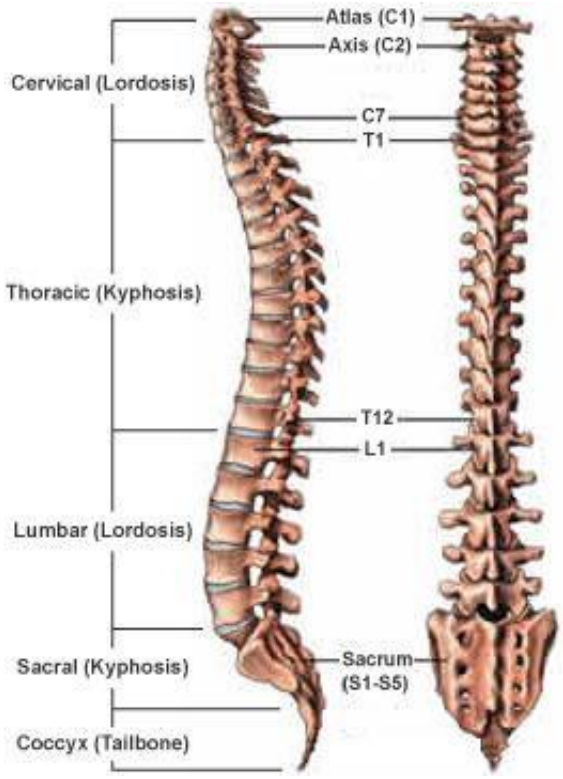


Figure 2.1 Anatomy of spine (Gray, 1979) |

2.1.2 Anatomy of lumbar spine:

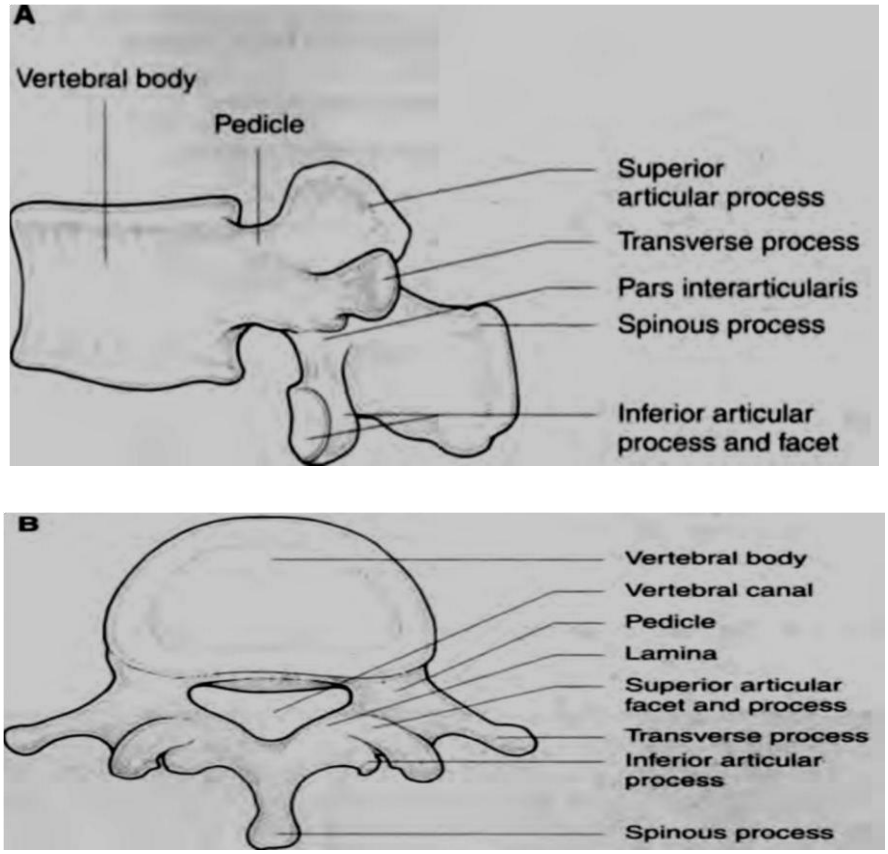


Fig 2.2 Typical lumbar vertebra: (a) lateral view; (b) superior view

Elsevire, 2011)

2.1.2.1 Bones and Joints

The human spine is made up of 24 spinal bones, called vertebrae. Vertebrae are stacked on top of one another to form the spinal column. The spinal column is the body's main upright support. From the side, the spine forms three curves. The neck, called the cervical spine curves slightly inward. (http://medicalmultimediagroup.com)

The middle back, or thoracic spine curves outward. The outward curve of the thoracic spine is called kyphosis. The low back, also called the lumbar spine curves slightly inward. An inward curve of the spine is called lordosis. (http://.medicalmultimediagroup.com)

The lumbar spine is made up of the lower five vertebrae. Doctors often refer to these vertebrae as L1 to L5. The lowest vertebra of the lumbar spine, L5,

connects to the top of the sacrum, a triangular bone at the base of the spine that fits between the two pelvic bones. Some people have an extra, or sixth, lumbar vertebra. This condition doesn't usually cause any particular problems. (http:// medicalmultimediagroup.com)

Each vertebra is formed by a round block of bone, called a vertebral body. The lumbar vertebral bodies are taller and bulkier compared to the rest of the spine. This is partly because the low back has to withstand pressure from body weight and from movements such as lifting, carrying, and twisting. Also, large and powerful muscles attaching on or near the lumbar spine place extra force on the lumbar vertebral bodies. (http://.medicalmultimediagroup.com)

A bony ring attaches to the back of each vertebral body. This ring has two parts. Two pedicle bones connect directly to the back of the vertebral body. Two lamina bones join the pedicles to complete the ring. The lamina bones form the outer rim of the bony ring. When the vertebrae are stacked on top of each other, the bony rings form a hollow tube that surrounds the spinal cord and nerves. The laminae provide a protective roof over these nerve tissues. (http://.medicalmultimediagroup.com)

A bony knob projects out at the point where the two lamina bones join together at the back of the spine. These projections, called spinous processes, can be felt as you rub your fingers up and down the back of your spine. Each vertebra also has two bony knobs that point out to the side, one on the left and one on the right. These bony projections are called transverse processes. The projections in the low back are broader than in other areas of the spine because many large back muscles attach and impart powerful forces on them. (http://medicalmultimediagroup.com)

Between the vertebrae of each spinal segment are two facet joints. The facet joints are located on the back of the spinal column. There are two facet joints between each pair of vertebrae, one on each side of the spine. A facet joint is made of small, bony knobs that line up along the back of the spine. Where these

knobs meet, they form a joint that connects the two vertebrae. The alignment of the facet joints of the lumbar spine allows freedom of movement as you bend forward and back. (http://.medicalmultimediagroup.com)

The surfaces of the facet joints are covered by articular cartilage. Articular cartilage is a smooth, rubbery material that covers the ends of most joints. It allows the ends of bones to move against each other smoothly, without friction. (http://.medicalmultimediagroup.com)

On the left and right side of each vertebra is a small tunnel called a neural foramen. (Foramina is the plural term.) The two nerves that leave the spine at each vertebra go through the foramina, one on the left and one on the right. The intervertebral disc (described later) sits directly in front of the opening. A bulged or herniated disc can narrow the opening and put pressure on the nerve. A facet joint sits in back of the foramen. Bone spurs that form on the facet joint can project into the tunnel, narrowing the hole and pinching the nerve. (http://.medicalmultimediagroup.com)

2.1.2.2Nerves

The hollow tube formed by the bony rings on the back of the spinal column surrounds the spinal cord. The spinal cord is like a long wire made up of millions of nerve fibers. Just as the skull protects the brain, the bones of the spinal column protect the spinal cord. The spinal cord extends down to the L2 vertebra. Below this level, the spinal canal encloses a bundle of nerves that goes to the lower limbs and pelvic organs. The Latin term for this bundle of nerves is cauda equina meaning horse's tail. Between vertebrae, two large nerves branch off the spinal cord, one on the left and one on the right. The nerves pass through the neural foramina of each vertebra. These spinal nerves group together to form the main nerves that go to the organs and limbs. The nerves of the lumbar spine (cauda equina) go to the pelvic organs and lower limbs. (http://.medicalmultimediagroup.com)

2.1.2.3 Connective tissue

Ligaments and tendons are fibrous bands of connective tissue that attach to bone. Ligaments connect two or more bones together and help stabilize joints. Tendons attach muscle to bone. Tendons vary in size and are somewhat elastic and attach bones to muscles. (Wilson, 2018)

2.1.2.4 Ligaments

The system of ligaments in the vertebral column, combined with the tendons and muscles, provides a natural brace to help protect the spine from injury. Ligaments aid in joint stability during rest and movement and help prevent injury from hyperextension and hyper flexion (excessive movements). (Wilson, 2018)

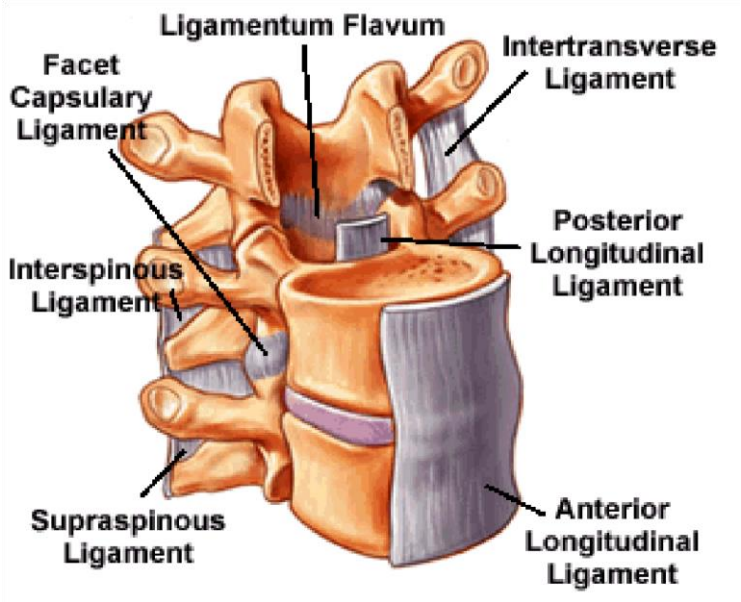


Figure 2.3 shows the vertebral ligament (Gray's 2005)

Table (2.1) shows the description of the ligament

Ligament Name	Description
Anterior Longitudinal Ligament (ALL) A primary spine Stabilizer	About one-inch wide, the ALL runs the entire length of the spine from the base of the skull to the sacrum. It connects the front (anterior) of the vertebral body to the front of the annulus fibrosis.
Posterior Longitudinal Ligament (PLL) A primary spine Stabilizer	About one-inch wide, the PLL runs the entire length of the spine from the base of the skull to sacrum. It connects the back (posterior) of the vertebral body to the back of the annulus fibrosis.
Supraspinous Ligament	This ligament attaches the tip of each spinous process to the other.
Interspinous Ligament	This thin ligament attaches to another ligament called the ligamentum flavum that runs deep into the spinal column.
Ligamentum Flavum The strongest	This yellow ligament is the strongest. It runs from the base of the skull to the pelvis, in front of and between the lamina, and protects the spinal cord and nerves. The ligamentum flavum also runs in front of the facet joint capsules.

2.1.2.5 Tendons and Muscles

Tendons are similar to ligaments, except these tension-withstanding fibrous tissues attach muscle to bone. Tendons consist of densely packed collagen fibers. Muscles, either individually or in groups, are supported by fascia. Fascia is strong sheath-like connective tissue. The tendon that attaches muscle to bone is part of the fascia. The vertebral column surrounds the spinal cord. It travels within the spinal canal, a central hole within each vertebra. The spinal cord is part of the central nervous system that supplies nerves and receives information from the peripheral nervous system within the body. (Wilson, 2018)

The spinal cord consists of grey matter and white matter and a central cavity. Adjacent to each vertebra emerge spinal nerves. The spinal nervous provide

sympathetic nervous supply to the body, with nerves emerging forming the sympathetic trunk and the splanchnic nerves .The spinal canal follows the different curves of the column; it is large and triangular in those parts of the column which enjoy the greatest freedom of movement, such as the cervical and lumbar regions; and is small and rounded in the thoracic region, where motion is more limited. The spinal cord terminates in the conus medullaris and cauda equine. (Wilson, 2018)

2.1.2.5 Blood supply

The anterior and posterior spinal arteries descend in the pia from the intracranial part of the vertebral artery. They are reinforced serially by branches from the ascending cervical, the cervical part of the vertebral, the intercostal and the lumbar arteries.(Richard & Groen. 2014)

2.2 Physiology:

Lumbar spine is designed to protect the spinal cord, support the body and facilitate movement (http//neurospineinstitute.org/) .

2.2.1 Vertebrae

The vertebrae support the majority of the weight imposed on the spine. The body of each vertebra is attached to a bony ring consisting of several parts. A bony projection on either side of the vertebral body called the pedicle supports the arch that protects the spinal canal. The laminae are the parts of the vertebrae that form the back of the bony arch that surrounds and covers the spinal canal. There is a transverse process on either side of the arch where some of the muscles of the spinal column attach to the vertebrae. The spinous process is the bony portion of the vertebral body that can be felt as a series of bumps in the center of a person's neck and back (http//neurospineinstitute.org/)

2.2.2 Intervertebral Disc

Between the spinal vertebrae are discs, which function as shock absorbers and joints. They are designed to absorb the stresses carried by the spine while allowing the vertebral bodies to move with respect to each other.

Each disc consists of a strong outer ring of fibers called the annulus fibrosis, and a soft center called the nucleus pulposus. The outer layer (annulus) helps keep the disc's inner core (nucleus) intact. The annulus is made up of very strong fibers that connect each vertebra together. The nucleus of the disc has a very high water content, which helps maintain its flexibility and shock-absorbing properties
(http//neurospineinstitute.org/) .

2.2.3 Facet Joint

The facet joints connect the bony arches of each of the vertebral bodies. There are two facet joints between each pair of vertebrae, one on each side. Facet joints connect each vertebra with those directly above and below it, and are designed to allow the vertebral bodies to rotate with respect to each other (http//neurospineinstitute.org/) .

2.2.4 Neural Foramen

The neural foramen is the opening through which the nerve roots exit the spine and travel to the rest of the body. There are two neural foramen located between each pair of vertebrae, one on each side. The foramen creates a protective passageway for the nerves that carry signals between the spinal cord and the rest of the body (http//neurospineinstitute.org/) .

2.2.5 Spinal cord and nerves

The vertebral column surrounds the spinal cord. It travels within the spinal canal, a central hole within each vertebra. The spinal cord is part of the central nervous system that supplies nerves and receives information from the peripheral nervous system within the body. The spinal cord consists of grey matter and white matter and a central cavity. Adjacent to each vertebra emerge spinal nerves. The spinal nervous provide sympathetic nervous supply to the body, with nerves emerging forming the sympathetic trunk and the splanchnic nerves .The spinal canal follows the different curves of the column; it is large and triangular in those parts of the column which enjoy the greatest freedom of

movement, such as the cervical and lumbar regions; and is small and rounded in the thoracic region, where motion is more limited. The spinal cord terminates in the conus medullaris and cauda equine. (Wilson, 2018)

2.2.6 Spinal Muscles

Many muscle groups that move the trunk and the limbs also attach to the spinal column. The muscles that closely surround the bones of the spine are important for maintaining posture and helping the spine to carry the loads created during normal activity, work and play. Strengthening these muscles can be an important part of physical therapy and rehabilitation. (http//neurospineinstitute.org/) .

2.2.7 Nervous System

All of the elements of the spinal column and vertebrae serve the purpose of protecting the spinal cord, which provides communication to the brain, mobility and sensaton in the body through the complex interaction of bones, ligaments and muscle structures of the back and the nerves that surround it. The true spinal cord ends at approximately the L1 level, where it divides into the many different nerve roots that travel to the lower body and legs. This collection of nerve roots is called the cauda equina, which means ―horse's tail,‖ and describes the continuation of the nerve roots at the end of the spinal cord (http//neurospineinstitute.org/) .

2.3 Pathology

The are several common potential sources and causes of back pain : these include spinal disc herniation and degenerative disc disease or isthmic Spondylolisthesis ,osteoarthritis (degenerative joint disease) and lumber spinal stenosis , trauma, cancer, infection , fracture and inflammatory disease. (Richard & Groen. 2014)

2.3.1 Developmental Abnormalities

Developmental abnormalities are uncommon, occurring in an estimated 1 in 1,000 live births. These anomalies may range from nothing more serious than an unfused spinous process to a severe form of spinal dysraphism, usually with multiple associated abnormalities. Other anomalies include hemivertebrae, congenital fusions, both of which often result in scoliosis, and cervical ribs. Among the plethora of associated findings are neurologic abnormalities such as hydrocephalus and urinary tract problems. Because of advancements in medical, surgical, and rehabilitation therapy, patients with severe spinal abnormalities can survive into adulthood and lead productive lives. More common are segmentation anomalies occurring in the lumbar region and producing.

Either lumbarization of S1 or sacralization of L5 .This terminology can be a source of confusion and some have recommended the use of the term transitional lumbosacral vertebra. If surgery or radiation therapy is to be performed, it is important for the correct level to be identified. Therefore, it is imperative that radiographs be obtained to accompany all vertebral

CT and MR studies. (Richard & Groen. 2014)

Large defects are associated with spinal cord abnormalities and may lead to a variety of muscular abnormalities and lack of bladder or bowel control. In many cases a slight dimpling of the skin or a tuft of hair over the vertebral defect indicates the site of the lesion. Large defects in the lumbar or cervical spine may be accompanied by herniation of the meninges (meningocele), or of the meninges and a portion of the spinal cord or nerve roots (myelomeningocele). A patient with a meningocele may be asymptomatic. Other malformations associated with a meningocele are clubfoot, gait disturbances, and bladder incontinence. The myelomeningocele has associated neurologic deficits at and below the site of protrusion. (Richard & Groen. 2014)

2.3.2. Lumbar Spinal Stenosis

Lumbar spinal stenosis (LSS) is any narrowing in the lumbar spinal canal or lateral recess. It can be developmental, congenital, or acquired. This article discusses acquired degenerative lumbar spinal stenosis. Lumbar spondylosis refers to degenerative changes of the lumbar spine. Facet joint hypertrophy, thickening and bulging of the ligamentum flavum , outward bulging of the intervertebral disc, and disc degeneration, or degenerative Spondylolisthesis, are all manifestations of lumbar spondylosis. These degenerative changes may cause a reduction in the sagittal diameter of the spinal canal, commonly referred to as (central canal stenosis). The normal horseshoe-shaped spinal canal becomes a flattened triangular shape . Lateral recess stenosis also is a result of hypertrophy of the facet joints, loss of disc space height, posterolateral bulging of the disc, or degenerative Spondylolisthesis. There can be central canal stenosis in the absence of lateral recess stenosis. (Richard & Groen. 2014)

Spine extension (bending backward) causes posterior disc bulging and bulging of the ligamentum flava, which Results in further narrowing of the central and lateral canals. To compensate, a forward-flexed posture alleviates some of the narrowing caused by the hypertrophied ligamentum flavum and facets. (Richard & Groen. 2014)

2.3.3 Degenerative disc disease

As a normal sequel of aging, disc degeneration begins early in life due to loss of hydration resulting in disc height loss and diffuse bulging.

Degenerative lumbar spine disease (DLSD) includes spondylotic (arthritic) and degenerative disc disease of the lumbar spine with or without neuronal compression or spinal instability. DLSD is common. Patients with DLSD often present with range of symptoms such as, lumbar back pain , sciatica and claudication . In symptomatic patients, a significant proportion of symptoms are due to bony, discal or ligamentous compression of neural elements at the spinal canal or nerve root exit foramina. Cauda equina syndrome due to compression

of the cauda equina by a herniated central lumbar disc is a specific condition requiring emergency neurosurgical attention .In terms of aetiology, in most patients DLSD is the result of "normal" wear and tear associated with the aging process or overuse. Other causes include a congenitally narrowed spinal canal, genetic predisposition to early disc disease, trauma, infection, inflammation and rarer conditions such as ossification of the posterior longitudinal ligament. (Richard & Groen. 2014)

2.3.3. DLSD due to normal aging process can be divided into:

Spondylatic degenerative change:

2.3.3.1 Spondylolysis

In spondylolysis, a crack or stress fracture develops through the pars interarticularis, which is a small, thin portion of the vertebra that connects the upper and lower facet joints. Most commonly, this fracture occurs in the fifth vertebra of the lumbar (lower) spine, although it sometimes occurs in the fourth lumbar vertebra. Fracture can occur on one side or both sides of the bone. The pars interarticularis is the weakest portion of the vertebra. For this reason, it is the area most vulnerable to injury from the repetitive stress and overuse that characterize many sports. Spondylolysis can occur in people of all ages but, because their spines are still developing, children and adolescents are most susceptible. (American Academy of Orthopaedic Surgeons. AAOS.1997-2017)

2.3.3.2. Spondylolisthesis

Spondylolysis can weaken the vertebra so much that it is unable to maintain its proper position in the spine. This condition is called Spondylolisthesis. In Spondylolisthesis, the fractured pars interarticularis separates, allowing the injured vertebra to shift or slip forward on the vertebra directly below it. In children and adolescents, this slippage most often occurs during periods of rapid growth—such as an adolescent growth spurt. Doctors commonly describe Spondylolisthesis as either low grade or high grade, depending upon the amount of slippage. A high-grade slip occurs when more than 50 percent of the width of

the fractured vertebra slips. forward on the vertebra below it. Patients with high-grade slips are more likely to experience significant pain and nerve injury and to need surgeryto relieve their symptoms. (American Academy of Orthopaedic Surgeons.AAOS.1997-2017)

2.3.4. Bulging Disc

A Bulging Disc occurs when the tough outer fibers of the spinal disc weaken and stretch allowing the " jelly center" of the disc to " bulge" outward . A Disc bulge is generally considered the first step toward a more serious problem called a Herniated Disc . A Herniated Disc is similar to a Disc Bulge except that the outer layers of the disc actually weaken to the point of tearing . (Richard & Groen. 2014)

The majority of symptoms caused by a Bulging Disc are related to irritation of spinal nerves . These nerves exit the spine through small holes called foramen . The spinal disc are located next to these nerve passageways . The bulging of the disc material caused by a Bulging Disc can "pinch" these nerves creating a variety of uncomfortable and sometimes debilitating symptoms. A disc bulge in the low back can causes low back pain or numbness, Tingling, burning pain or weakness in the legs or feet .Sharp pain along the back of the legs is often referred to as sciatica. (Richard & Groen. 2014)

2.3.5. Herniated Disc

Pinal disc herniation, also known as a slipped disc, is a medical condition affecting the spine in which a tear in the outer, fibrous ring of an intervertebral disc allows the soft, central portion to bulge out beyond the damaged outer rings. Disc herniation is usually due to age-related degeneration of the outer ring, known as the anulus fibrosus, although trauma, lifting injuries, or straining have been implicated as well. Tears are almost always postero-lateral (on the back of the sides) owing to the presence of the posterior longitudinal ligament in the spinal canal. This tear in the disc ring may result in the release of chemicals causing inflammation, which may directly cause severe pain even in

the absence of nerve root compression. Disc herniations are normally a further development of a previously existing disc protrusion, a condition in which the outermost layers of the anulus fibrosus are still intact, but can bulge when the disc is under pressure. In contrast to a herniation, none of the central portion escapes beyond the outer layers. Most minor herniations heal within several weeks. Anti-inflammatory treatments for pain associated with disc herniation, protrusion, bulge, or disc tear are generally effective. Severe herniations may not heal of their own accord and may require surgery. The condition is widely referred to as a(slipped disc), but this term is not medically accurate as the spinal discs are firmly attached between the vertebrae and cannot "slip" out of place. (Richard & Groen. 2014)

Figure 2.4 Herniated Disc (Wikipedia, 2022)

2.3.6. Infectious spine diseases

2.3.6.1. Arthritis

The word ―arthritis‖ translates to ―inflammation of a joint.‖ So, spinal arthritis, literally means inflammation of the facet or spinal joints. Spinal arthritis is one of the common causes of back pain. Spinal arthritis is the mechanical breakdown of the cartilage between the aligning facet joints in the back portion (posterior) of the spine that quite often leads to mechanically induced pain. The facet joints (also called vertebral joints or zygophyseal joints) become inflamed and progressive joint degeneration creates more frictional pain. Back motion and flexibility decrease in proportion to the progression of back pain induced while standing, sitting and even walking. (Richard & Groen. 2014)

Over time, bone spurs (small irregular growths on the bone also called osteophytes) typically form on the facet joints and even around the spinal vertebrae. These bone spurs are a response to joint instability and are

nature's attempt to help return stability to the joint. The enlargement of the normal bony structure indicates degeneration of the spine. Bone spurs are also seen as a normal part of aging and do not directly cause pain, but may become so large as to cause irritation or entrapment of nerves passing through spinal structures, and may result in diminished room for the nerves to pass (spinal stenosis). (Richard & Groen. 2014)

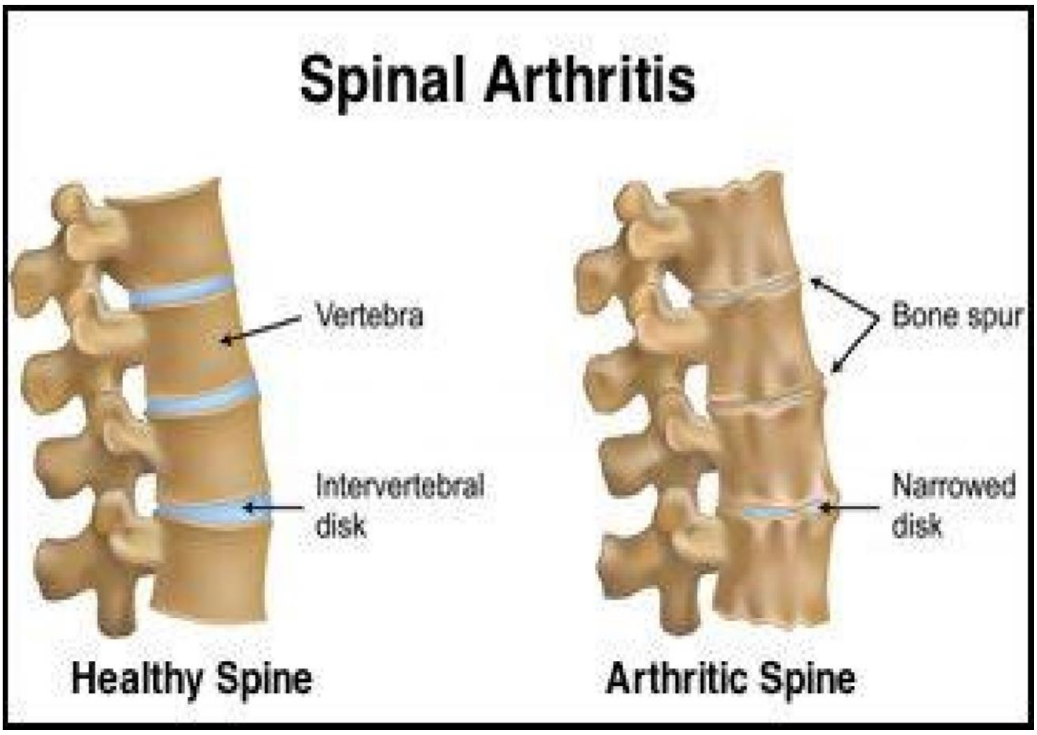


Figure 2.5 Spinal arthritis (Richard & Groen. 2014)

2.3.6.2. Tuberculous Osteomyelitis

Tuberculous osteomyelitis (which is rare today) most commonly involves the thoracic and lumbar spine. Pott's disease (tuberculosis of the spine) occurs in the midthoracic spine and thoracolumbar region. Irregular, poorly marginated bone destruction within the vertebral body is often associated with a characteristic paravertebral abscess, an accumulation of purulent material that produces a fusiform soft tissue mass about the vertebra The spread of tuberculous osteomyelitis causes narrowing of the adjacent intervertebral disk and the extension of infection and bone destruction across the disk to involve the adjacent vertebral body. Unlike bacterial infection, tuberculous osteomyelitis is rarely associated with periosteal reaction or bone sclerosis.T1 signal and the L3 posterior elements. (Richard & Groen. 2014)

Fig: 2.6 Sagittal STIR image shows loss of disc height (Richard & Groen. 2014)

2.3.7 Spinal injury :

The spinal cord contains the nerves that carry messages between your brain and body. The cord passes through your neck and back. A spinal cord injury is very serious because it can cause loss of movement (paralysis) below the site of the injury spinal cord injury may be caused by Bullet , stab wound Traumatic injury to the face, neck, head, chest, or back (for example, a car accident),Diving accident. Electric shock Extreme twisting of the middle of the body, Landing on the head during a sports injury ,Fall from a great height. (American Collage of Surgons , 2017)

2.3.8. Trauma to the spinal column

Fractures occur when internal or external forces on the vertebrae exceed their structural strength. Common causes are vehicle accidents, sports, violence, and falls. Fractures can be further classified into two more groups: minor and major. When a posterior column element, such as the facet joint, is fractured it is

"minor" because that structure is not vital to the stability of the spine. On the other hand, if the vertebral body is fractured (middle or anterior column), it is "major" because the stability of the spine may be at risk or damage to the spinal cord may occur. Vertebral body fractures may be further termed as stable or unstable. If a fracture is unstable, the bone fragments can damage the spinal cord and immediate intervention is necessary. (Richard & Groen. 2014)

2.3.8.1. A Compression fractures

As the name implies, compression fractures occur from excessive axial forces disrupting the continuity of the anterior column of the vertebral body Osteoporosis is a leading precursor to compression fractures because of the vertebrae's lower ability to support a load. A missed step or even a cough can result in a compression fracture. People often accept back pain as a normal part of aging. Repeated compression fractures can result in the loss of six inches or more in height. Another common cause of compression fracture is trauma, such as a fall. Click on the button below to witness a sudden vertical impact to the vertebral column .Often, vertebral compression fractures eventually heal on their own. Aspirin and other nonsteroidal anti-inflammatory drugs (NSAIDs) can be taken to relieve pain. More aggressive techniques include vertebroplasty, the injection of bone cement into the vertebra to stabilize it. Kyphoplasty is similar, but the vertebra is first expanded to near normal height and then stabilized with cement or mechanical devices. (Gray's 2005).

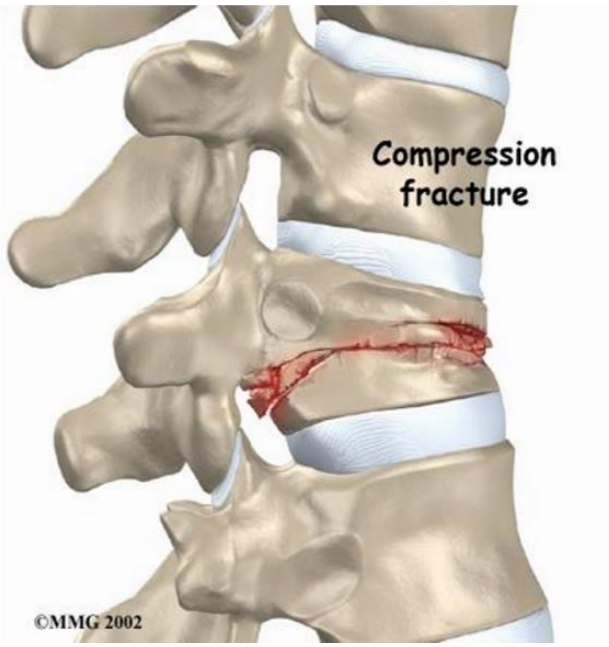


Figure 2.7 compression fracture (Gray's 2005).

2.3.8.2. Burst fractures

Burst fractures usually occur from severe trauma such as a vehicle accident or a fall. Burst Fxs are more dangerous than compression Fxs for two reasons. The anterior and middle columns of the vertebral body are broken into several fragments, which are more likely to cause spinal cord injury. Since the vertebral body has lost its structural integrity, the spinal column is less stable .If the burst Fx does not impinge on the spinal cord, it may be treated non-surgically. However, if there are loose fragments or nerve injury, surgery is usually performed. The spine can be accessed anteriorly, posteriorly, or both. Loose fragments may be moved into a better position or removed. The spine may be reduced (elongated) for alignment. The fragments may be stabilized with screws and other mechanical means. In severe cases, the entire Fx vertebral body is removed and the adjacent vertebrae fixed in place with rods and screws. A bone-conductive reinforcement structure replaces the vertebra. (Gray's 2005).

2.3.8.3. Flexion-distraction fracture

This type of fracture is sometimes called a "Chance" fracture. It was often caused by lap seat belts without shoulder restraints in cars. The initial collision

can cause extreme flexion of the vertebral column, soon followed by the distraction of the rebound. In this fracture, all three columns of the vertebral body can fail and there may be injury to bone, ligaments and discs as well as other internal injuries .Chance fractures are inherently unstable and require immediate intervention. These fracture types represent about 10% of lumbar spine fractures. The posterior column may be damaged by rupture of the spinus process or posterior longitudinal ligament, or both (Gray's 2005).

2.3.8.4. Stable versus unstable fractures

If only the anterior column is damaged, as in the case of most wedge and compression fractures, the fracture is considered stable. When both the anterior and middle columns are involved, the fracture may be considered

more unstable. When all three columns are involved, the fracture is by definition considered unstable, because of the loss of the integrity of the vertebra and posterior stabilizing ligaments. Stable fractures do not pose a threat to the spinal cord. Unstable fractures endanger the spinal column and, depending on circumstances, may require immediate surgical intervention. (Gray's 2005).

2.3.9. Hyperlordosis of the spine

Lordosis describes the natural curvature of the lumbar spine, but Hyperlordosis is a pathologically exaggerated lumbar curvature, commonly called "swayback .Hyperlordosis is usually accompanied by the pelvis tilting abnormally forward, often causing an exaggerated protrusion of the buttocks .Symptoms may include pain and numbness if the nerve trunks are compromised. . (Gray's 2005).

Typically, the condition is attributed to weak back muscles or a habitual hyperextension, such as in pregnant women, men with excessive visceral fat, and some dance postures. Hyperlordosis is also correlated with puberty. Treatment for hyperlordosis isn't required unless it may progress, causes pain, or compromises nerves. Initially analgesics and antiinflammatory medication are administered. . (Gray's 2005).

Physical therapy to build strength, flexibility, and increase range of motion is common. The reduction to ideal body mass index is recommended. In adolescents, bracing may be applied to control progression. In severe cases with neurological involvement, surgery should be considered. This typically involves a fusion of L4-L5 and L5S1.This is a younger person's disease, often associated with overtraining in active sports. There is also a hereditary correlation to weakness in the pars region, suggesting a genetic component. (Gray's 2005).

2.3.10. Tumors of the spine

here are three common types of spinal tumors that can cause back pain: vertebral column tumors, intradural - extramedullary tumors, and intramedullary tumors.

Figure 2.8 Tumors of the spine (http://clinicalgate.com 2022)

Sagittal T2WI demonstrates heterogeneous marrow signal with areas of high and low signal that both correspond to metastatic deposit Primary tumors: These tumors occur in the vertebral column, and grow either from the bone or disc elements of the spine. They typically occur in younger adults. Osteogenic sarcoma (osteosarcoma) is the most common malignant bone tumor. Most primary spinal tumors are quite rare and usually grow slowly. Metastatic tumors: Most often, spinal tumors metastasize (spread) from cancer in another area of the body These tumors usually produce pain that does not get better with

rest, may be worse at night, and is often accompanied by other signs of serious illness (such as weight loss, fever/chills/shakes, nausea or vomiting). In women, spinal tumors most frequently spread from cancer that originates in the breast or lung. In men, spinal tumors most frequently spread from cancer that originates in the prostate or lung. (Mosby, 2012)

2.3.10.1. Intradural-Extramedullary Tumors

Intradural-Extramedullary (inside the dura) tumors grow within the spinal canal (under the membrane that covers the spinal cord) but outside of the nerves. Usually these tumors are benign and slow growing. However, they can cause symptoms of pain and weakness.

Most of these spinal tumors are:

Meningiomas that occur in the membranes surrounding the spinal cord and are usually benign but may be malignant. These tumors are more common in middle age and elderly women. Nerve sheath tumors (schwannomas and neurofibromas) that arise from the nerve roots that come off the spinal cord. Again, this type of tumor is usually benign and slow growing, and it may be years before any neurological problems occur. (Mosby, 2012)

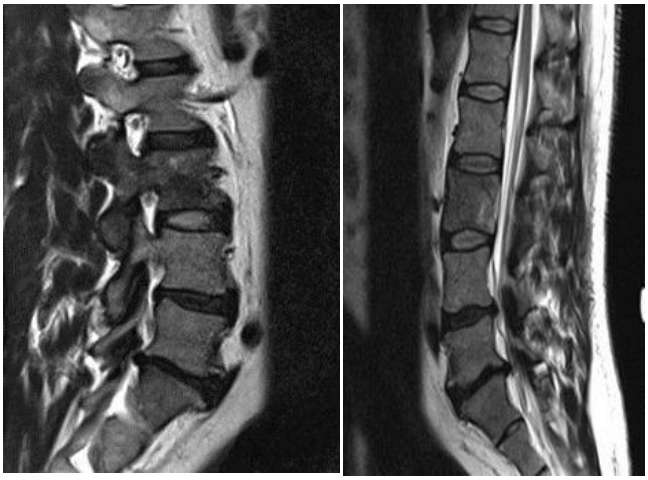
2.3.10.2. Intramedullary Tumors

Intramedullary tumors grow from inside the spinal cord or inside the individual nerves and often arise from the cells that provide physical support and insulation for the nervous system (glial cells). These tumors occur most often in the cervical spine (neck). They tend to be benign, but surgery to remove the tumor may be difficult. The two most common types of intramedullary tumors are astrocytomas and ependymomas. (Mosby, 2012)

2.4.11. Paget's Disease

Paget's disease (osteitis deformans) is one of the most common chronic metabolic diseases of the skeleton. Destruction of bone, followed by a reparative process, results in weakened, deformed, and thickened bony structures that tend to fracture easily. The disease, seen most commonly during

middle life, affects men twice as often as women and has been reported to occur in about 3% of all persons older than 40 years. Although the destructive phase often predominates initially, there is more frequently a combination of destruction and repair in the pelvis and weight-bearing bones of the lower extremities. The reparative process may begin early and may be the prominent feature, often involving multiple bones. Paget's disease affects particularly the pelvis, femurs, skull, tibias, vertebrae, clavicles, and ribs. (Mosby, 2012)



(A) (B)

Fig:2.9 (A) T1 signal and enlargement of the L3 posterior elements low (B) Heterogenous low T2 signal within L3 vertebral body (https://www.mypacs.net/cases 2022)

2.5. Magnetic Resonance Imaging (MRI):

Magnetic Resonance Imaging (MRI) has emerged as a noninvasive multi-planar imaging modality with a superior soft tissue contrast resolution which can better define degenerative changes in the lumbar spine.

2.5.1 Equipment:

• Posterior spinal coil/multi-coil array spinal coil.

• Foam pads to elevate the knees.

• Earplugs/headphones. (Westbrook, 2014)

2.5.2 Patient positioning:

The patient lies supine on the examination couch with their knees elevated over a foam pad, for comfort and to flatten the lumbar curve so that the spine lies nearer to the coil. The coil should extend from the xiphisternum to the bottom of the sacrum for adequate coverage of the lumbar region. The patient is positioned so that the longitudinal alignment light lies in the midline, and the horizontal alignment light passes just below the lower costal margin, which corresponds to the third lumbar vertebra. Depending on the particular coil configuration, the patient may be placed either head first or feet first. If the patient is anxious or claustrophobic, when/if possible, the feet-first position may be better tolerated. (Westbrook, 2014)

2.5.3 Suggested protocol:

Sagittal/coronal SE/FSE T1 or coherent GRE T2: Acts as a localizer if three-plane localization is unavailable. The coronal or sagittal planes may be used. Coronal localizer: Medium slices/gaps are prescribed relative to the vertical alignment light, from the posterior aspect of the spinous processes to the anterior border of the vertebral bodies. The area from the conus to the sacrum is included in the image. (Westbrook, 2014)

P 20mm to A 30mm

Sagittal localizer: Medium slices/gaps are prescribed on either side of the longitudinal alignment light, from the left to the right lateral borders of the vertebral bodies. The area from the conus to the sacrum is included in the image. (Westbrook, 2014)

Figure 2.10 Sagittal FSE T1-weighted midline slice through the lumbar spine showing normal appearances (Westbrook, 2014)

Sagittal SE/FSE T1 (Figure 9.13): Thin slices/gaps are prescribed on either side of the longitudinal alignment light, from the left to the right lateral borders of the vertebral bodies (unless the paravertebral region is required). The area from the conus to the sacrum is included in the image. (Westbrook, 2014)

L 22mm to R 22mm

Sagittal SE/FSE T2 or coherent GRE T2: Slice prescription as for sagittal T1. Axial/oblique SE/FSE T1/T2 or coherent GRE T2: Thin slices/gaps are angled so that they are parallel to each disc space and extend from the lamina below to the lamina above the disc. The lower three lumbar discs are commonly examined. (Westbrook, 2014)

Figure 2.11 Sagittal FSE T2.weighted midline slice through the lumbar spine showing normal appearances. (Westbrook, 2014)

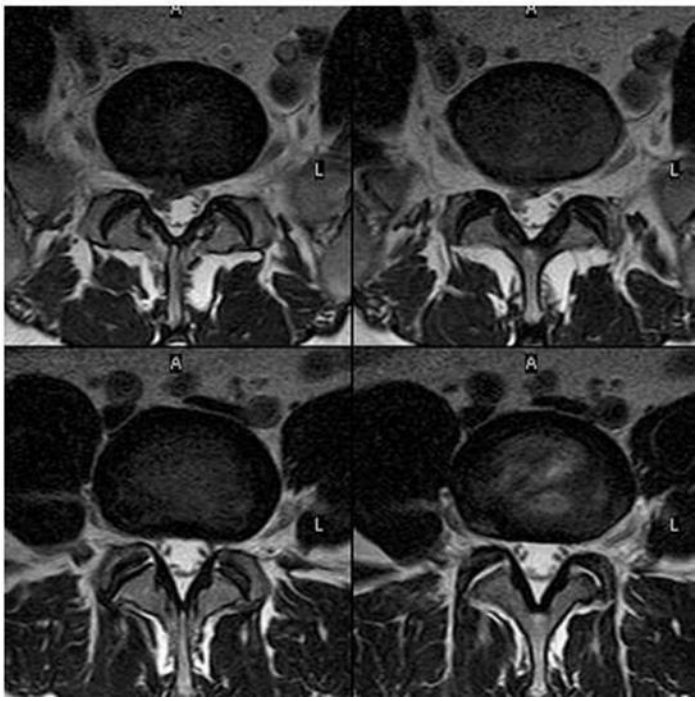


Figure 2.12 Axial/oblique FSE T2.weighted image of the lumbar spine (Westbrook, 2014)

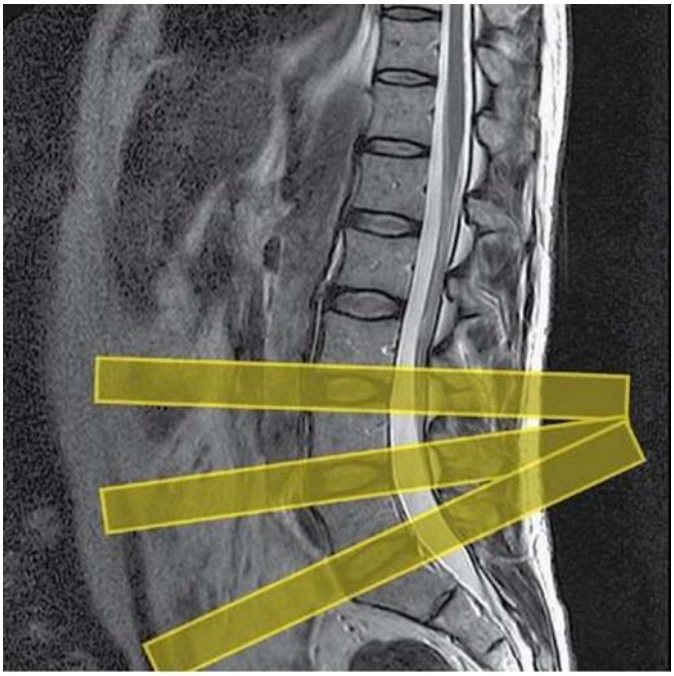


Figure 2.13 Sagittal FSE T2.weighted midline slice showing slice prescription boundaries and orientation for axial/oblique imaging of lumbar discs. (Westbrook, 2014)

2.4.4 Additional sequences:

Axial/oblique or sagittal SE/FSE T1: With contrast for determining disc prolapse versus scar tissue in failed back syndrome, and for some tumours. Without contrast in spinal dysraphism. Tissue suppression is beneficial to differentiate between fat and enhancing pathology. (Westbrook, 2014)

Coronal SE/FSE T1: For cord tethering or alternative view of conus when sagittals are inconclusive. (Westbrook, 2014)

Axial/oblique FSE T2: For arachnoiditis. As for axial/obliques, except prescribe one slice through, and parallel to, each disc space and vertebral body from the sacrum to the conus. (Westbrook, 2014)

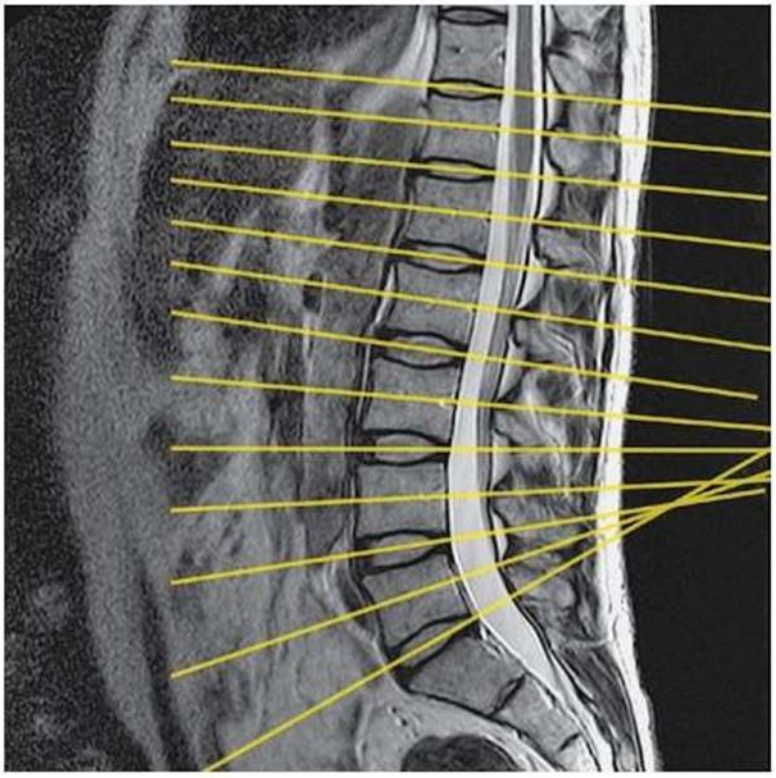


Figure 2.14 Sagittal FSE T2.weighted image of the lumbar spine showing axial/oblique slice prescription for arachnoiditis. (Westbrook, 2014)

STIR: While FSE sequences provide excellent T2.weighted images of the spine, the signal intensity from the normal fat in the marrow of the vertebral bodies is generally high, even with longer TE times. For that reason, marrow pathology, such as tumours or fractures, may not be adequately visualized on T2.weighted FSE sequences. A STIR sequence can be utilized to visualize bone marrow abnormalities better. (Westbrook, 2014)

The T1-weighted FSE shows an acute fracture of the L1 vertebral body. The T2.weighted FSE also shows the fracture, but the majority of the bone marrow signal in the L1 vertebral body appears similar to the other vertebral bodies. The STIR clearly shows the increased signal within the L1 vertebral body consistent with an acute fracture. (Westbrook, 2014)

2.6 Previous Studies:

- Chou (2011) conducted a systematic review of studies to evaluate the role of routine MRI in the clinical management of patients with chronic low back pain .

These review focused on studies addressing the relationship between degenerative changes detect through MRI , and chronic low back pain, and that compared surgical and nonsurgical treatment of these degenerative changes . The authors identified five cross sectional studies , four of which showed statistically significant association between the presence of disc degenerative and chronic low back pain (odds ratio , 1.82.8) . The authors considered the overall strength of evidence to be insufficient to establish an association between degenerative changes detected by MRI and the presence of chronic low back pain . Based on these results the authors recommend against routine use of MRI for chronic low back pain evaluation . In addition , regarding efficacy of surgical treatment of degenerative changes detected through MRI , the authors recommend strongly against the surgical treatment of chronic low back pain based solely on MRI- detected degenerative changes.

- Endean (2011) , in a systemic review and meta-analysis , examined the potential value of MRI abnormalities in refining case definition for mechanical low back pain epidemiological research . These researchers asked : to what degree can low back pain (LBP)be attributed confidently to abnormalities detected on magnetic resonance imaging (MRI) ? the authors found that base on MRI findings of disc protrusion , nerve root displacement or compression , disc degeneration , and high intensity zone are all associated with low back pain , but individually , none of these abnormalities provides a strong suggestion that low back pain(LBP) is the result of underlying disease . The limits their value in refining epidemiological case definitions for low back pain based on MRI findings .(Endean A,,2011)

- Sahar (2012) (Assessment of Severe Lower Back Pain Disorders using MRI) . This study was to assess the severe lower back pain disorders using MRI . The study was found that disc bulge was the most common causes 46% ,disc bulge & disc herniation 6% ,disc bulge generative 10% ,disc bulge ,degenerative & stenosis 2%, disc bulge ,degenerative & spondylolisthesis 2%, disc bulge

,degenerative &other 8%, disc bulge, disc herniation, degenerative , other 4%, disc bulge & spondylolisthesis 2% ,disc bulge & other 2% ,disc herniation 6%,normal 8%and others 4% . The incidence of LBP is equal between the men and female. Most patients affected by diseases their age range between 40-69 yrs. The L4/L5 was the most level of spine affected by diseases. MRI has become promising modality for diagnosis the causes of low back pain

- Wasiema (2013) (Evaluation of Lower Back Pain Using Magnetic Resonance Imaging) . This study showed that the correlation between the subject's age, weight and height and lower backache duration shows a linear relationship between the sample age, weight, height and lower back pain duration. The results show that 31 cases with disc bulge, 10-disc degeneration and 7 disc prolapsed on MRI. Finally the researcher conclude that imaging studies (MRI) are helpful in cases of lower back pain but they aren't the only factor to determine low back etiology, for that proper history and clinical examination are very necessary to determine which type of imaging is need, and it will also allow the technologist to focus the effort of the examination at the proper disc level.

Chapter three

Materials and Methods

Chapter three

Materials and Methods

3.1 Materials:

3.1.1 Study Type:

Descriptive Cross sectional study.

3.1.2 Study Area:

The study was carried out at Khartoum state, the data were collected from Omer Sawi Hospital.

3.1.3 Study Duration:

The study conducted from February to August 2022.

3.1.4 Sample size:

78 patients were enrolled in this study.

3.1.5 Inculcation criteria:

Non-traumatic Sudanese patients who underwent to MRI lumbar spine scan were included.

3.1.6 Instrumentation:

Open MRI machines Newsoft with .

3.2Methods:

3.2.1 Technique used:

The patient lies supine on the examination couch with their knees elevated over a foam pad, for comfort and to flatten the lumbar curve so that the spine lies nearer to the coil. The coil should extend from the xiphisternum to the bottom of the sacrum for adequate coverage of the lumbar region. The patient is positioned so that the longitudinal alignment light lies in the midline and the horizontal alignment light passes just below the lower costal margin, which corresponds to the third lumbar vertebra. MRI of lumbar spine was performed with Multiplan image. Sagittal/coronal SE/FSE T1 or coherent GRE T2*(Acts as a localizer if three-plane localization is unavailable) , Sagittal SE/FSE T1 (Thin slices/gap are prescribed on either side of the longitudinal alignment light

, from the left to the right lateral borders of the vertebral bodies), Sagittal SE/FSE T2 or coherent GRE T2* , Axial/oblique and SE/FSE T1/T2 or coherent GRE . Additional protocol Sagittal SE/FSE T1 With contrast for determining disc prolapse versus scar tissue in failed back syndrome, and for some tumors.

3.2.2 Data collection:

The data were collected by data collection sheets specifically designed for this study that contains all study variables.

3.2.3 Data analysis:

The data were analyzed using static package for social science (SPSS).

3.2.4 Data storage:

The data were storage in personal hard disk, personal computer and personal phone.

3.2.5 Data presentation:

The data were present in Tables and graphs.

Chapter four

Results

Chapter four

Results

Table (4.1): Show frequency distribution of gender:

		Frequency	Percent
Valid	Male	37	47.4%
	Female	41	52.6%
	Total	78	100%

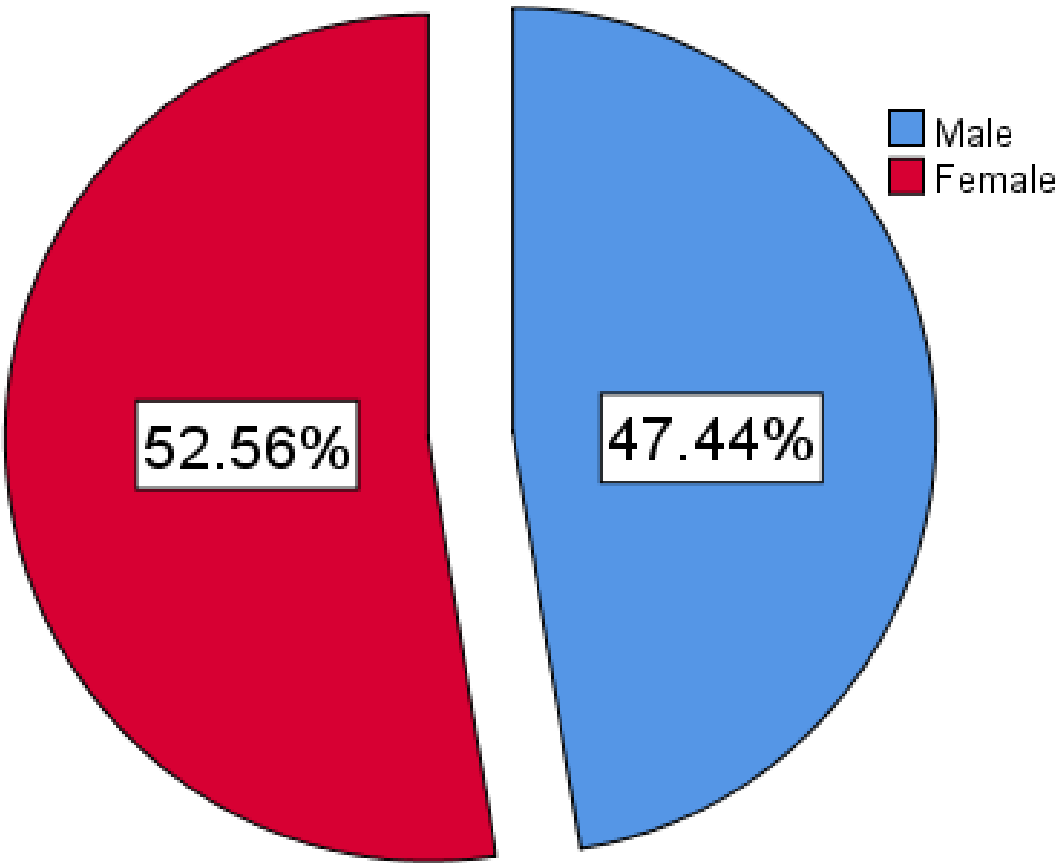


Figure (4.1): Show frequency distribution of gender

Table (4.2): Show frequency distribution of age groups:

		Frequency	Percent
Valid	(16-30)	7	9%
	(31-45)	24	30.8%
	(46-60)	37	47.4%
	(>60)	10	12.8%
	Total	78	100%

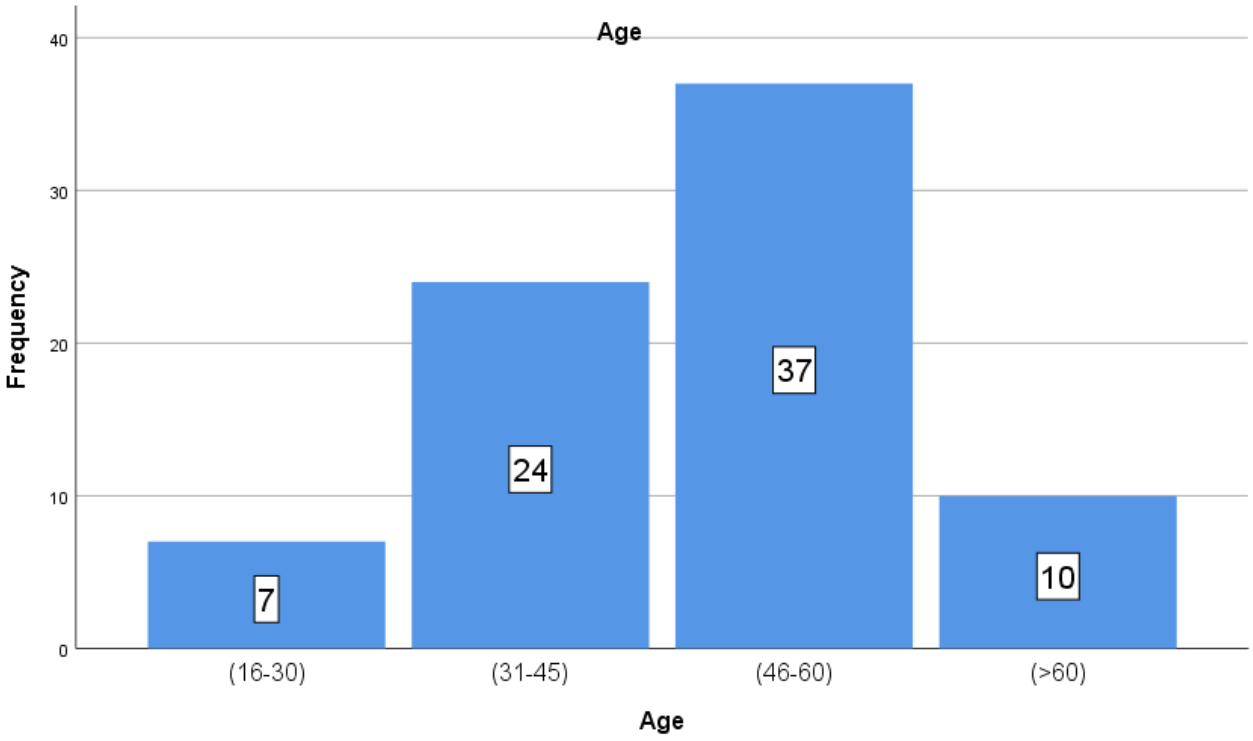


Figure (4.2): Show frequency distribution of age groups

Table (4.3): Show frequency distribution of level of spine:

		Frequency	Percent
Valid	L1,L2	1	1.3%
	L2,L3	2	2.6%
	L2,L5	1	1.3%
	L3,L4	9	11.5%
	L4,L5	28	35.9%
	L5,S1	37	47.5%
	Total	78	100%

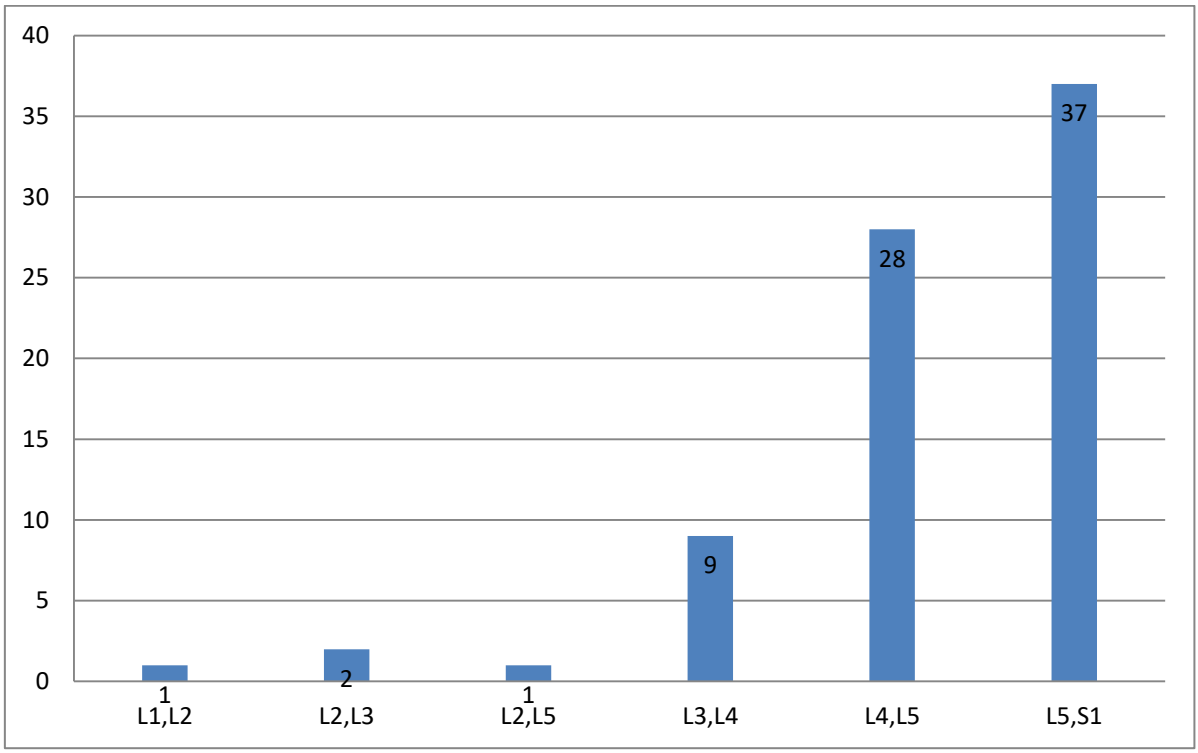


Figure (4.3): Show frequency distribution of level of spine

Table (4.4): Show frequency distribution of MRI findings:

		Frequency	Percent
Valid	Disc Bulge	41	52.6%
	Spondylolisthesis	7	9%
	Spondylitis arthritis	1	1.3%
	Disc degeneration	10	12.8%
	Disc protrusion	8	10.3%
	Other	11	14.1%
	Total	78	100%

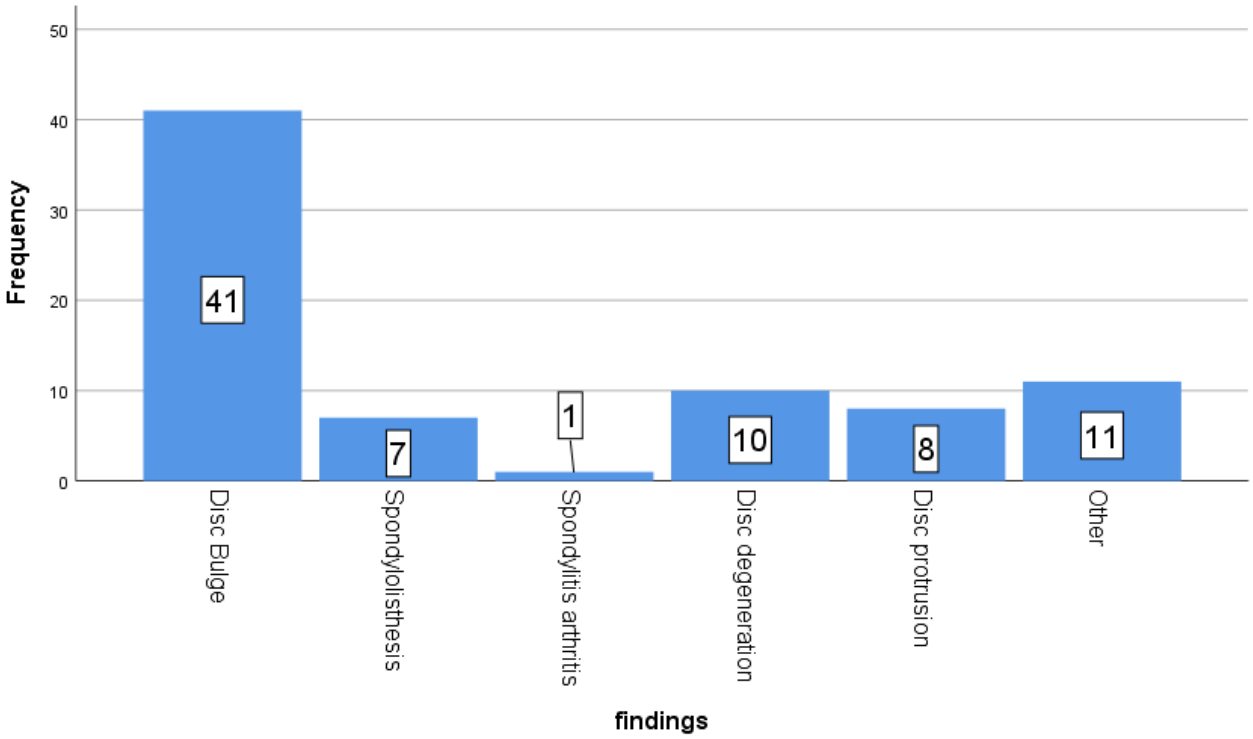


Figure (4.4): Show frequency distribution of findings

Table (4.5): Show cross tabulation between findings and age:

		Age				Total
		(16-30)	(31-45)	(46-60)	(>60)	
Findings	Disc Bulge	3	15	20	3	41
	Spondylolisthesis	0	1	3	3	7
	Spondylitis arthritis	0	0	1	0	1
	Disc degeneration	1	5	3	1	10
	Disc protrusion	0	1	6	1	8
	Other	3	2	4	2	11
Total		7	24	37	10	78
p-value = 0.22						

Table (4.6): Show cross tabulation between findings and gender:

		Gender		Total
		Male	Female	
Findings	Disc Bulge	12	29	41
	Spondylolisthesis	5	2	7
	Spondylitis arthritis	1	0	1
	Disc degeneration	4	6	10
	Disc protrusion	6	2	8
	Other	9	2	11
Total		37	41	78
p-value = 0.007				

Table (4.7): Show cross tabulation between findings and level of spine:

		Level of spine						Total
		L1,L2	L2,L3	L2,L5	L3,L4	L4,L5	L5,S1	
Findings	Disc Bulge	1	2	0	4	14	20	41
	Spondylolisthesis	0	0	0	1	2	4	7
	Spondylitis arthritis	0	0	0	0	1	0	1
	Disc degeneration	0	0	0	2	5	3	10
	Disc protrusion	0	0	1	1	5	1	8
	Other	0	0	0	1	1	9	11
Total		1	2	1	9	28	29	78
		p-value = 0.142						

Table (4.8): Show Independent Samples Test between for compare findings between genders:

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Findings	Equal variances assumed	14.271	0.000	3.530	76	0.001	1.759	0.498
	Equal variances not assumed			3.473	64.975	0.001	1.759	0.507

Chapter Five

Discussion, Conclusion and Recommendations

Chapter Five

Discussion, Conclusion and Recommendations

5.1 Discussion:

This was descriptive cross sectional study aimed to study lower back pain using MRI, conducted in Khartoum stat of Sudan in Omer Sawi and Dar during the period from February to August 2022, 78 patients were selected 37(47.7%) male and 41(52.6%) female. Table, Figure (4.1).

The study showed most patients in age group (46-60) were 37(47.4%) then age group (31-45) were 24(30.8%), followed by age group (>60) were 10(12.8%) and at last age group (16-30) were 7(9%). Table, Figure (4.2).

Regarding to distribution of affected level of spine the results found most patients affected at level L5,S1 were 37(47.5%), at level L4,L5 were 28(35.9%), at level L3,L4 were 9(11.5%), at level L,S were 8(10.3%), at level L2,L3 were 2(2.6%), at level L1,L2 were 1(1.3%) and at level L2,L5 were 1(1.3%). Table, Figure (4.3). agree with Sahar who found that the L4/L5 was the most level of spine affected by diseases.

In concern MRI findings the results showed 41(52.6%) had Disc Bulge, 7(9%) had Spondylolisthesis, 1(1.3%) had Spondylitis arthritis, 10(12.8%) had Disc degeneration, 8(10.3%) had Disc protrusion and 11(14.1%) had Other findings. Table, Figure (4.4). agree with Sahar who found that the most common causes was disc bulge and with Wasiema who found that most cases with disc bulge.

The results found there was statistically insignificant correlation between findings and age groups (p-value = 0.22); the majority in age group (46-60) had Disc Bulge were 20 patients. Table (4.5).

The results found there was statistically significant correlation between findings and gender (p-value = 0.007); the majority in male had Disc Bulge were 29 patients. Table (4.6).

The results found there was statistically insignificant correlation between findings and affected level of spine (p-value = 0.142); the majority in level [L5, S1] had Disc Bulge were 20 patients. Table (4.7).

Finally the results found three was statistically significant difference in findings between males and females (sig. = 0.00) Table (4.8). disagree with Sahar who found that the incidence of LBP is equal between the men and female.

5:2. Conclusion

1. Lower back pain have become common among the adults and older people . Obviously , they have relation with age and lower back pain duration .
2. The analysis of abnormal MRI finding in this study showed that Disc bulge , spondylolisthies, Spondylatic arthritis, disc degeneration ,disc prolapsed and disc protusion.
3. Disc bulge is common causes of lower back pain41 % of the study cases.
4. The common level of lumbar spine affected by disease is L4/L5
5. MRI have big role in diagnosis of lumbar spine pathologies and has ability to differentiate between them.

5.3. Recommendations:

The study recommended the following:

1. Before doing MRI complete history is necessary to determine the site, position and necessity factor for radiological examination.
2. More research should be do
3. ne using a large sample of patients for further assessment.
4. Researcher suggests that doing the same studies for all patients complaining of lower back pain to exclude major causes of lower back pain.

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Appendix

Appendix A

Sudan University of Science and Technology

College of Graduate Studies

Evaluation of patients with Lower back pain using Magnetic Resonance Imaging (MRI)

Data Collection Sheet

No	Gender	Age	Level of spine	Findings

Findings

Disc Bulge

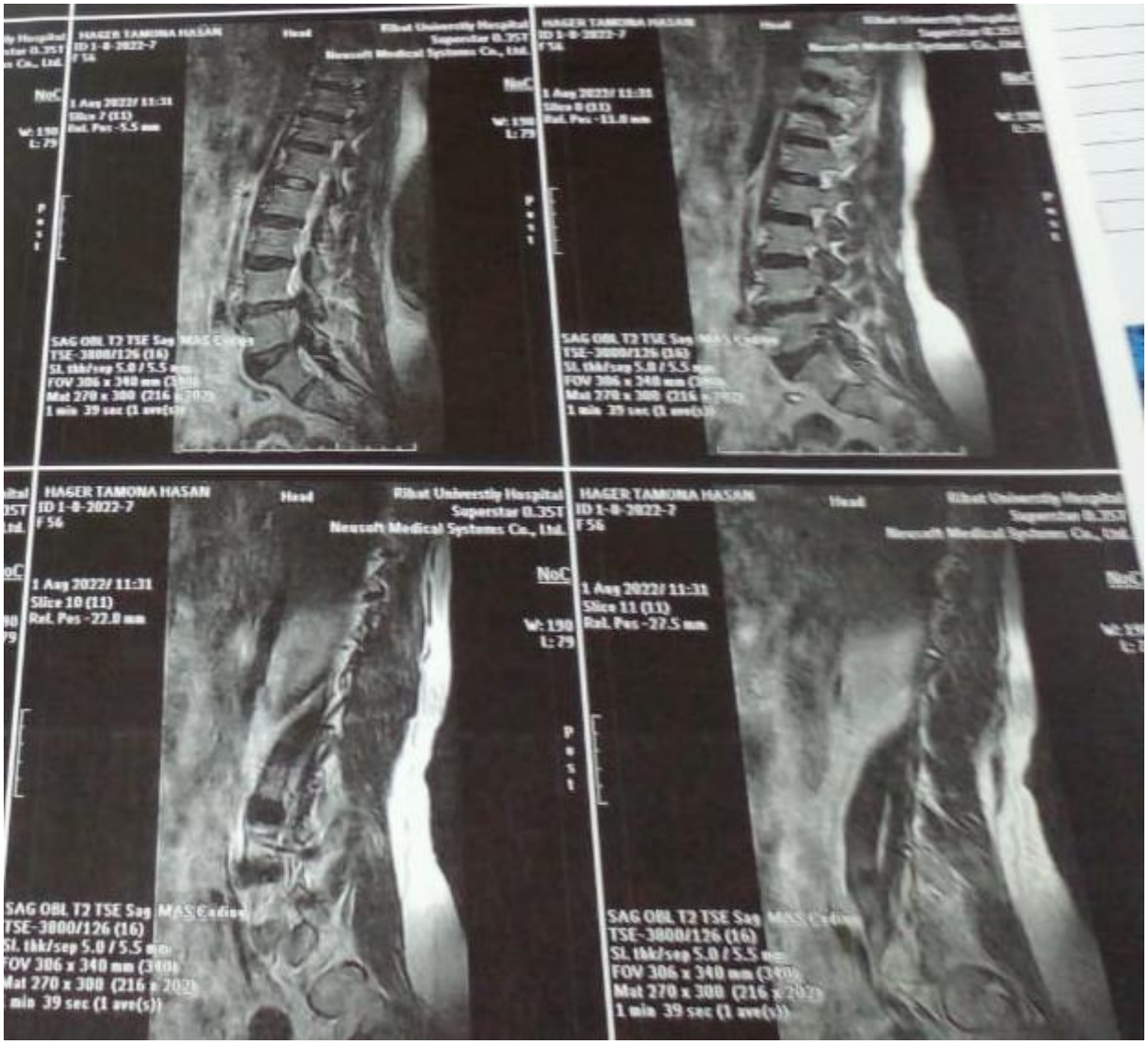
Spondylolisthie s

Spondylatic arthritis

disc degeneration

disc prolapsed

disc protusion


HAGER TAMONA HASAN
ID 1-8-2022-7
F 56
Head
Ribat University Hospital
Superstar 0.35T
Neusoft Medical Systems Co., Ltd.
1 Aug 2022/ 11:31
Slice 10 (11)
Rel. Pos -22.0 mm
Slice 11 (11)
Rel. Pos -27.5 mm
W: 190
L: 79
SAG OBL T2 TSE Sag
TSE-3800/126 (16)
SL thk/sep 5.0 / 5.5 mm
FOV 306 x 340 mm
Mat 270 x 300
1 min 39 sec (1 ave(s))


EEHLAS MOHAMED
Head
Rbat University Hospital
Superstar 0.35T
Neusoft Medical Systems Co., Ltd.
NoC
SAG OBL T2 TSE Sag MAS Coding
TSE-3000/126 (16)
FOV 306 x 340 mm (340)
Mat 270 x 300 (216 x 202)
1 min 39 sec (1 ave(s))