COMPUTED TOMOGRAPHY SCAN FINDINGS IN LOW BACK PAIN AT KENYATTA NATIONAL HOSPITAL NAIROBI

A DISSERTATION SUBMITTED IN PART-FULFILMENT FOR THE DEGREE OF MASTERS OF MEDICINE (DIAGNOSTIC RADIOLOGY) UNIVERSITY OF NAIROBI

Ogato J O, MBChB (NBI)

June 1998

DECLARATION

CANDIDATE

This dissertation is my original work and has not been presented for a degree in any other university.

Signed.....

Julius OGATO, MBChB (Nbi)

SUPERVISOR

This dissertation has been submitted with my approval as University Supervisor.

Signed.....

Arnold RODRIGUES, MD(Milan), M.Med(Rad.)(Nbi)

SENIOR LECTURER

DEPARTIMENT OF DIAGNOSTIC RADIOLOGY

UNIVERSITY OF NAIROBI.

ACKNOWLEDGMENTS

I wish to acknowledge my supervisor Dr. Rodrigues for his encouragement and valuable criticism.

Thanks to Dr. Ikundu for agreeing to co-supervise me.

I wish to acknowledge the Nairobi Epidemiology Clinic (INCLEN) and especially Prof. Wafula for the invaluable criticism and suggestions on the study methodology.

I wish to acknowledge The Chief Radiologist of Kenyatta National Hospital and the X-ray department staff for allowing and assisting me to access and use the records from the X-ray department for the study.

Lastly, I wish to thank my teachers and colleagues for their suggestions and support during the study period.

To my parents

CONTENTS

ABSTRACT

A retrospective review of Lumbo-saral spine CT scans done from January 1994 to March 1998 was done. The pattern of abnormal findings was analyzed. In the study period 277 CT Scans of the spine were done. Of these, about 150 were of the Lumbo-sacral Spine. Only 79 cases were available from the X-ray Department records filling section for this study. Seventy of these had a referral diagnosis indicated on the request form while 9 did not have.

The referral diagnosis for Lumbo-sacral spine CT scan were: Low back pain 53(70.8%); Paraplegia 10(12.6%); Paraparesis 4(5.1%); Other diagnosis 3(3.8%); Referral diagnosis missing 9(11.4%).

Seventy four cases had their age indicated while 5 did not have. For those whose ages were indicated abnormal findings were tallied for age and sex. 11 patients had normal CT Scans while 63 had at least one abnormal finding. There were a total of 100 abnormal findings in these 63 patients which were categorized into: Lumbar disk disease 42(42%); Facet joint disease 21(21%); Vertebral body disease 15(15%); Ligamentum flavum hypertrophy 6(6%); Cauda equina tumour 3(3%) and other findings 11(11%).

Of the 79 patients 15 had previously been done plain film myelography. Two were found normal on PFM and on CT one was found to be normal and the other showed a disc bulge. 10 cases had either their diagnosis modified or changed while 3 had the PFM diagnosis sustained.

PFM had nil diagnosis of facet joint disease, hypertrophy of ligamentum flavum, vertebral body disease nor any paravertebral mass. Where disc disease had been noted, it was simply diagnosed as disc herniation.

Intrathecal contrast was used in 25(31.6%) of the 79 cases.

1. INTRODUCTION

The low back pain syndrome properly affects 80% of the general population at some time in their lives [1]. Although it rarely results in mortality, its morbidity is high, inconvenience great and economic burden significant. In fact, it is responsible for a large percentage of patients visiting physicians. The back pain problem alone interferes with enjoyment of life and the ability to work well in a large proportion of the population.

In the United States, every year over four percent of the population are likely to see either the general practitioner because of back pain, and it does seem that the frequency of seeking advice and of losing time off work for this reason is gradually increasing [1].

The global cost of the back pain problem to our society is important in indicating the significance of the problem and the need for extra resources to be directed to improving our current treatment facilities. Unfortunately local figures are lacking.

Around 2,000,000 adults in Great Britain consult their general practitioner each year because of the development of back pain and this problem is the cause of 6.5% of general practice consultations. In total there are 3.4 million consultations due to low back pain per year in general practice and 0.4 million patients are seen in general outpatient clinic for this back problem. This is 5.1% of all patients who attend hospital, and of this 63,000 get admitted and 10,800 undergo surgery [2]

In financial terms the above scenario costs the British society a staggering 1.4 billion pounds [3].

In a study of employed Swedish males from ages 25 to 59 years, Hult considered lifetime history of low back pain. He found that 60% of this population had at some time suffered from symptoms related to low back, 20% of the entire study population had been incapacitated for periods ranging from three weeks to six months because of the symptoms and 4% had been incapacitated for more than 6 months [4].

In their study Dublin AD *et al*, the diagnostic value of Plain Film Myelography (PFM) was compared to Computed Tomographic Myelography (CTM) [7]. CTM provided more significant information than PFM in 40% of the cases (n=106), but showed no advantage in 59% of the cases. In 30 of the 106 cases in which plain CT scans of the spine were also obtained, the addition of intrathecal contrast demonstrated additional pathology in 10 cases. In general CTM was useful in the delineation of a variety of pathological entities, especially neoplasms and congenital leisons.

The decline in use of PFM for degenerative disease of the spine was initially because of CT and especially CTM which is superior in diagnostic accuracy [23]. However, CT is now steadily being replaced by MRI for most screening examinations. Low dose CTM remains the gold standard in cases where the limits of the thecal sac and the nerve root sleeves need to be precisely defined, such as in complex postoperative states. In the cervical spine CT remains the most reliable way to assess foraminal stenosis.

Imaging of the lumbar spine for disc diseases and stenosis has evolved on the past over ten years from predominantly myelography oriented examinations to plain CT and MRI [25]. Multiple studies have shown that CT and MRI are superior to PFM [27].

The single area in which CT is superior to MRI in the lumbar spine is in diagnosis of spondylosis [25]. Pars defects are easily seen in CT whereas that can be difficult to appreciate on MRI. On the other hand, MRI is clearly superior in evaluating the back, post-operatively than CT. The use of intravenous gadolinium with MRI has greatly aided the differentiation of post-operative fibrosis from recurrent disc protrusion.

The normal intervertebral disc has not apparent radiodensity on plain radiographs, which are relatively insensitive to the early changes o disc degeneration [27]. Loss of disc space height and bone sclerosis of the adjacent vertebral bodies are the radiographic manifestations of disc degeneration.

Historically, the role of plain film myelography has been delineation of the thecal sac, spinal cord, and exiting nerve roots and their possible compromise by disc bulging, herniation, and spinal stenosis- a sequale to intervertebral disc degeneration. Surgical correlation with plain film myelography findings has been 80-90% accurate at L4-L5 and lowest at L5-S1, presumably due to the variable size of the anterior epidural space [27]. Plain film myelography is less sensitive for the detection of lateral recess disease, and the nature of extradural disease remains non-specific. The diagnosis is inferred from changes in contour of normal cerebral-spinal fluid-filled spaces rather than direct visualization of the offending structure. In summary, plain film myelography

aids little, if anything, to the evaluation of degenerative disc disease as compared to CT/ MRI [28].

Unlike conventional radiographic studies, CT Scans can demonstrate the intervertebral disc directly [27]. CT changes seen in disc degeneration include annular bulging, herniation, calcification, vacuum phenomenon, and sclerosis of the adjacent intervertebral body. CT is more accurate in detecting disc herniations, primarily because of its sensitivity to disease laterally and at the L5-S1 level [29].

The value of computerized tomography (CT) on the diagnosis of the cause of low back pain is well documented [5,6,7,8]. In their study, Dublin AB MD. *et al* showed that CT myelography provided more significant information than plain film (radiographic) myelography [7].

The major advantage of CT over conventional radiography and plain film (radiographic) myelography are [24].

- The axial display of images demonstrates structures in a third dimension and permits them to be seen unobscured by overlying tissue.
- Reduction in scatter radiation due to optimal collimation improves image detail.
- The ability to detect very fine linear attenuation of X-rays so that structures such as soft tissues, fat and air can be distinguished with greater clarity than on conventional radiographs.

The axial projection of CT allows, for the first time, a convenient method for examining the articular facets. It should be noted, however, that even high resolution CT is limited in spatial resolution to 0.6 mm and that separation of the intervertebral disc and dural sac is not possible without the interposed layer of epidural fat [26].

Three different CT image display techniques are currently used:

- Axial CT Scans.
- Coronal/Sagittal reformation (reconstruction).
- Three dimensional reformation (reconstruction).

Where as the cost of CT Scanning is much higher as compared to plain radiography and plain film (radiographic) Myelography, that of MRI (another method of imaging the spine) is four and half times that of CT, here in Nairobi.

CT is able both to visualize the vertebral column and relate it in cross section to the intervertebral disc, dural sac, nerve root sleeves and pre-vertebral soft tissues. Thus plain radiographs and lumbar radiographic myelography are being relegated to secondary role [10].

The study was designed to determine the pattern of CT findings in patients done lumbosacral CT with emphasis on those with low back pain. Comparison of CT findings with PFM findings at Kenyatta National Hospital was done.

2. BACKGROUND

Low back pain is virtually endemic in Kenya. Unfortunately its incidence and economic burden has not been worked out.

The proper management of low back pain depends on accurate diagnosis of the underlying cause. In absence of CT and MRI accurate diagnosis is unlikely in a significant number of patients and as such a large proportion of patients will not get accurate and specific treatment.

Hitherto, the mainstay of neuroradiodiadiagnostic evaluation of the spine has been plain radiography and plain film (radiographic) myelography. Dublin AD *et al* in their study on the value of CT myelography have shown that, CTM is superior to PFM(RM) [7].

Helms CA, *et al* have shown plain CT is 95% accurate as compared to 90% accuracy of plain film (radiographic) myelography in diagnosing lumbar disc disease [26]. Further, they have demonstrated no statistical difference between plain CT and CTM.

Carrera FC, *et al* in their study on computed tomography of the lumbar facet joints [19] have shown that: CT provides an excellent means of studying these joints because CT distinguishes not only the bony structures but also the soft tissues surrounding the facet joints. Both herniated nucleus pulposus and facet joint disease can be evaluated in a single, rapid non-invasive examination by CT.

In their study on the value of CT myelography in neurological evaluation of the spine [7], Dublin

AB, *et al* have shown that CT myelography provides much more information as compared to plain film (radiographic) myelography. CT myelography is much more specific in delineation of pathology as compared to plain film myelography.

CT myelography is most useful in demonstrating osseous encroachment upon the spinal cord, nerve roots, and evaluating the paraspinal extent of infection and tumor [7].

It is important to note that in Kenya CT units are available in only Nairobi, Mombasa and Eldoret. Consequently in the other regions of this country physicians still rely on plain radiography and plain film (radiographic) myelography to investigate low back pain and other conditions of the spine and cord.

On the other hand, with the acquisition of two MRI units in Nairobi city, physicians may currently be able to refer patients for MRI even when CT is superior and cheaper (as in imaging facet joint and vertebral body diseases), or at least of the same diagnostic accuracy thus increasing the cost of managing low back pain and other conditions of the spine.

3. LITERATURE REVIEW

The role of the radiologist in evaluating patients with low back pain is to identify those individuals with lumbar abnormalities [10]. Most of the important CT information can be localized to either an osseous plane throughout the vertebral body, pedicles, transverse processes and laminae or to an articular plane through the intervertebral disc, intervertebral foraminae and facets [11].

Fig. 1 Normal osseous plane through L4.

The articular plane is more important in the individual with low back pain because it contains most of the nerve endings that cause the symptoms [12].

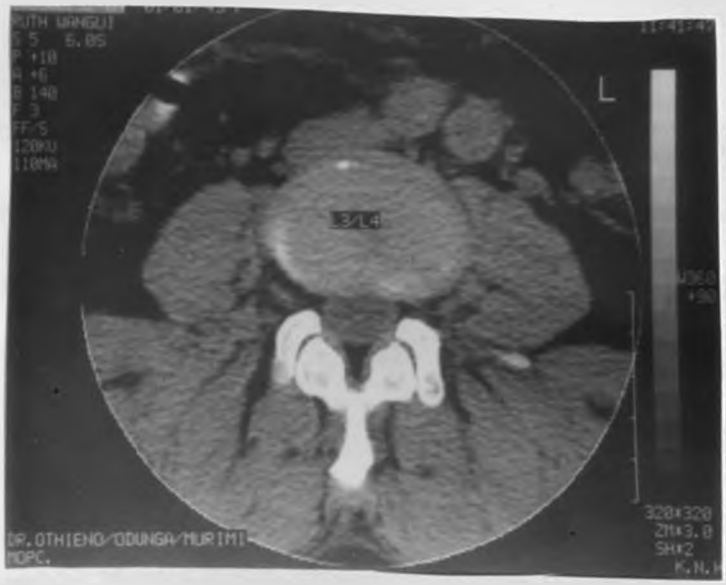

Fig 2 Scan through the articular plane at L3/4 showing a normal disc and exit foraminae

The posterior border of the vertebral body and the intervertebral disc are normally concave dorsally [13]. The herniated disc should therefore be suspected when the posterior margin is convex dorsally or when the anterior epidural fat is effaced [14]. An acute disc lesion is the most common presentation of low back pain in a young person, aged between 20 and 30 years [20].

The nerve roots within the foraminae may be compressed posteriorly by postero-lateral disc herniations or anteriorly by superior facet hypertrophy [15]. The nerve roots may also be compressed by subluxation of one vertebral body on another, either secondary to a pars inter-articularis defect or degenerated intervertebral disc [16]. The pain associated with these lesions is usually caused by direct pressure on the nerve roots. It may also be caused by nerve root ischaemia [17].

The capsule surrounding the facets is innervated by nerve endings that can produce low back pain and sciatica when irritated [18].

Anterior hypertrophy of the superior facet compromises the intervertebral foremen, whereas medial hypertrophy compromises the lateral recess. Hypertrophy of the inferior facet decreases the sagittal diameter of the spinal canal and may result in narrow spinal canal. Articular joint disease can cause osteophyte formation, joint space narrowing, subchondral scleroses, and subchondral cyst formation. These changes can produce symptoms that simulate disc herniation.

Defects in the laminae, through the pars interarticularis may result in spondylolisthesis. This

may cause central spinal stenosis and radiculopathy.

The transverse process of the fifth lumbar vertebra may be sacralized on one or both sides. If it forms a pseudo-articulation with the sacrum and degenerative joint disease occurs, pain may result.

Lumbar spine instability is common and accounts for approximately 80% of low back pain [20]. It is also known as mechanical backache and is sometimes referred to as colloquially as lumbago or simply backache. Patients with mechanical backache are invariably over 40 years of age, are overweight and have a relatively inactive lifestyle. The pain most likely arises from the stress put directly on the facet joints as the disc itself is undergoing degenerative changes [20]. The radiographs are normal apart from loss of disc height.

CT of the lumbar spine is extremely sensitive and has proved to be very specific, with very few false positives having been reported thus far [21]. Conjoined nerve roots (composite root sleeve) may mimic a herniated disc or a free fragment with neural foraminal encroachment [21]. This could be differentiated using the "blink mode". The disk "blinks" at 40-50 HU while the nerve root "blinks" around 10-20 HU [21].

An extruded disc fragment commonly appears on CT Scans as an epidural mass that must be distinguished from either an epidural tumour or anomalous root sleeve [22]. This can be differentiated by measuring tissue densities. In their study Williams AL et al found that: extruded disc material measured 60-105 HU, root sheath anomalies measured 12-42 HU and a

neurofibroma measured 59 HU [22].

Diagnosis of a sequestered disc (extruded disc fragment/free disc fragment) is clinically important and may affect patient management [23]. Sequestered discs:

- May produce misleading localizing signs and symptoms;
- are a contraindication to the use of chymopapain and percutaneous discetomy techniques;
- are a known cause of post-operative pain; and
- may require more extensive surgical approach for complete removal.

CT has enabled the assessment of disc degeneration sequale such as stenosis, facet joint disease and ligamentum flavum hypertrophy. Currently it offers the best modality of imaging the facet joint [27]. Additionally, CT offers 3-D reformatting which allows multiple planes to be reconstructed, and enhanced soft-tissue discrimination of both extra and intradural disease after the intravenous on intra-thecal contrast injection of contrast medium.

The major disadvantages of CT scan arise from limitations in contrast sensitivity between various soft tissues and the limited field of view [27]. Thus global assessment requires integration of multiple axial images or three-dimensional reconstruction.

Degenerative changes of the spine may be detected by bone scintigraphy as mildly to moderately increased uptake eccentrically placed on either side of an intervertebral space. While it is sensitive to changes that increase born turnover (as in osteophytes or discogenic sclerosis), radionuclide imaging has no apparent role in the evaluation of degenerative processes within the intervertebral disc[27].

Discography is a reliable means of investigating the integrity of the invertebral disc. The normal annulus fibrosus offers fair resistance to distension. The normal disc will only accept 1.0-1.5 ml of contrast media [27]. The easy accommodation of 2.0 ml or more of contrast medium by a disc is a sign of some degree of degeneration within the annulus fibrosus and nucleus pulposus. It is important to note that a degenerative pattern is commonly seen in many asymptomatic discs - limiting the test's clinical usefulness. Currently, discography adds little to a diagnostic workup when CT and MRI are available, and it has rightfully fallen from favour.

Unlike CT and radiography which are dependant on information related to electron density, MRI signals are influenced by T1 and T2 relaxation times and proton density, providing greater tissue contrast. Its role goes beyond anatomic appraisal to actual characterization of pathologic and biochemical changes within tissue. MRI may be the most accurate means of evaluating the intervertebral disc [27].

Lumbar facet joint disease is frequently overlooked cause of sciatic pain. It is seldom diagnosed because appropriate radiographic techniques for imaging these joints have not been developed [19]. CT provides an excellent means of studying these joints because the axial images are in proper

orientation and because CT distinguishes the bony structures and the soft tissues surrounding the facet joints.

4. STATEMENT OF RESEARCH PROBLEM

4.1 The General Problem

Previously the main stay of investigating a suspected lumbar intervertebral disc disease has been plain film (radiography) myelography. This has significant drawbacks:

- It has a low diagnostic yield of 71.8% [10] as compared to operative diagnosis;
- It is an invasive procedure necessitating a potentially harzadous lumbar puncture;
- It does not image the disc itself but rather its effect on thecal sac;
- There is poor visualization of the lateral recess the commonest site of symptomatic disc herniation;
- It has poor soft tissue and axial resolution.

The development of CT and MRI scanners have revolutionized the imaging of lumbar spine. CT provides better axial resolution, soft tissue contrast and visualization of the lateral recess.

It is hoped that with acquisition of CT Scanners in three cities in Kenya diagnostic accuracy of lumbar disc disease and other causes of low back pain will improve. This in turn will lead to the provision of specific treatment.

4.2 Justification

The commonest cause of low back pain is lumbar spine instability which results from degenerative disc disease. Low back pain causes a lot of economic loss to the nation in terms of time, manpower and money. As well, it interferes with enjoyment of life.

The accurate diagnosis of lumbar disc disease depends on:

- Accurate elucidation of history and physical examination by the physician;
- suggestive plain radiographs;
- Lumbar CT with or without intrathecal contrast.

Because plain radiographs can only be suggestive (and not diagnostic), plain film (radiographic) myelography has a low diagnostic value and MRI imaging is very expensive, a review of lumbar CT Scan is necessary to assess the wealth of information it provides and where possible compare this with PFM (RM).

4.3 Hypotheses

Lumbar disc disease is the commonest finding in patients referred for lumbar spine CT.

Postero-lateral disc herniation is more common than all other degenerative disc diseases put together.

4.4 Objective of the Study

4.4.1 General objectives

To determine the pattern of abnormal findings as seen in lumbar CT at K.N.H.

4.4.2 Specific objectives

1. To determine the prevalence of lumbar disc disease as diagnosed by CT in patients done lumbo-sacral CT at KNH.

2. To determine the prevalence of facet joint disease as seen on CT in patients done lumbo-sacral CT at KNH.

3. To determine the proportion of patients in whom plain film (radiographic) myelography was reported as normal and CT revealed abnormal finding(s) at KNH.

4. To determine the proportion of patients in whom CT with intrathecal contrast (CT myelography) was done at KNH.

5. METHODOLOGY AND MATERIALS

5.1 Study design

The study was a retrospective survey. All the records of lumbar CT scans available from January 1994 to March 1998 were reviewed. Where the radiologist report differed with CT scans, the scans were reviewed with a specialist radiologist and the findings arrived at used for this study.

5.2 Variables

Variables included in the study were age, sex, use of intrathecal contrast, previous PFM/RM findings, disc disease, facet joint disease, vertebral body diseas, cauda equina disease, referal diagnosis.

5.3 Study Area

The study was carried in KNH, Nairobi. KNH is the main referral and teaching hospital in Kenya. It also serves as the primary hospital for Nairobi City and the surrounding peri-urban areas.

5.4 Study population

Patients done CT at KNH x-ray department are from the Hospital's casualty department, outpatient clinics, wards, Nairobi City Council health facilities, private clinics in the city, private hospitals and nursing homes, and as well from the provincial and district hospitals.

5.5 Sampling

5.5.1 Sampling procedure

All records available of patients done lumbar spine CT scan were included in the study.

5.6 Data collection

Data was collected from the x-ray department records section using data collection form (appendix-i). All the records of patients done lumbar CT scan were retrieved and used in the study. Records of patients whose pain was due to direct trauma were excluded from the study.

5.7 Minimising bias and error

I was the only one collecting data. Where the radiologist report did not agree with the CT scans it was discussed with a specialist radiologist and the findings thereof used for the study.

5.8 Data Processing

Data was analysed using spss computer software package and the results presented in form of frequency tables, and bar charts. Differences between proportions found in different groups were compared using chi-square (X^2) to test for significance.

5.9 Ethical Consideration

This was a retrospective study. Only the patients CT and PFM records were reviewed. Confidentiality of the patients records and data was observed.

6 RESULTS

6.1 Patients

A total of 277 CT scan of the spine were done between January 1994 to March 1998. 150 were of the lumbo-sacral spine. 79 scans were available from the records department for the study. Of the 79 patients 42 (53.3%) were males and 37 (46.7%) were females. The ages of patients scanned ranged from 2 months to 70 years. The majority of patients done CT of the lumbo-sacral spine were in their fourth and fifth decade of life.

AGE	MALE	FEMALE	TOTAL
00-10	3	3	6
11-20	5	4	9
21-30	4	7	11
31-40	11	14	25
41-50	8	5	13
>50	7	3	10
Missing	4	1	5
TOTAL	**42**	**37**	**79**

Table 1 Distribution of study patients by age and sex (n=79)

6.2 Referral diagnosis

The referral diagnoses indicated on the consultation/CT request form were: Low backpain 53 (67.7%), paraparesis 4 (5.1%), paraplegia 10 (12.7%), other diagnosis 3 (3.9%) and referal diagnosis not indicated 9 (11.2%).

Low back pain	53(67.1%)
Paraparesis	4(5.1%)
Paraplegia	10(12.7%)
Other	3(3.9%)
Missing	9(11.2%)
TOTAL	**79(100.0%)**

Table 2 Distribution of referral diagnosis.

6.2.1 Low back pain

The CT findings in patients who had low back pain (n=53) were: Disc disease only 22 (41.6%); degenerative disc disease together with facet joint disease 12 (22.6%); facet joint disease 6 (11.1%); vertebral body disease 4 (7.6%); tumour of the cauda equina 1 (1.9%); other findings 2 (3.8%); and normal CT scan findings 2 (3.8%).

CT FINDINGS	FREQUENCY
Disc disease	*22(41.6%)
Disc disease with facet joint disease	12(22.6%)
Facet joint disease	6(11.6%)
Vertebral body diseae	#4(7.6%)
Disc, facet, vert. Body diseases	4(7.6%0
Cauda equina tumour	1(1.9%)
Other findings	ψ2(3.8%)
Normal	2(3.8%)
TOTAL	**53(100.0%)**

Table3 CT findings in patients with low back pain (n=53)
* One patient had sponylolisthesis at L4-5
# One patient had extradural mass in addition
ψ One patient had post. Sublaxation of L1-2, the other had collapse of T9.

6.2.2 Paraparesis

A total of 4 patients scanned had paraparesis. Their CT findings were: facet joint disease I, vertebral body disease 1 and normal CT findings 2.

CT FINDINGS	FREQUENCY
Disc disease	0
Facet joint disease	1
Vert. Body dis	2
Normal	2
TOTAL	**4**

Table 4. CT findings in patients with due to paraparesis (n+4)

6.2.3 Paraplegia

10 patients were done lumbo-sacral due to paraplegia. Their findings were: degenrative disease of the spine 2, cord compression 3, tumour of causa equina 1, normal CT finding 4. Of the three who had cord compression, 2 had TB and one had metastatic deposit.

CT FINDINGS	FREQUENCY
Degenerative spine disease	2
Cord compression	*3
Cauda equina tumour	1
Normal	4
TOTAL	10

Table 5. CT findings in patients with paraplegia (n=10).
*2 cases had TB spine with cord compression, the other had a metstatic deposit compressing the cord

6.2.4 Referral diagnosing not indicated

9 patients had referal diagnosis not indicateed. Their CT findings were: Disc disease 3; disc disease with facet joint disease and vertebral body disease 1; tumour of cauda equina 2; and normal CT findings 3.

CT FINDINGS	FREQUENCIES
Disc disease	3
Disc, facet, vert. body disease	1
Cauda equina tumour	2
Normal	3
TOTAL	**9**

Table 6. CT findings in patients who had referral diagnosis missing (n=9).

6.3 Lumbo-sacral spine CT pathological findings

CT findings: 74 out of 79 of the scans reviewed had the ages of the patients indicated. These were 38 males and 36 females. The CT findings were grouped into:

1. **Disc diseases**
2. **Facet joint diseases**
3. **Ligamentum flavum hypertrophy**
4. **Cauda equina disease**
5. **Vertebral body diseases**
6. **Other findings**
7. **Normal CT scan**

Forty two (42, 57%) patients had disc disease, 21(29%) facet joint disease, 15(21%) vertebral body disease, 6(9%) ligamentum flavum hypertrophy, 3(4%) cauda equina tumour, other findings 13(18%), normal CT scan 11(15%).

AGE YRS	DISC DISEASE			FACET JOINT DIS.			VERT BODY DIS			LIG. FLAV HYP			CAUD EQNA DIS			OTHER			CT NORM			PTS
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	
00-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	1	1	2	6
11-20	0	0	0	0	0	0	1	1	2	0	0	0	1	0	1	2	1	3	2	2	4	9
21-30	2	3	5	1	1	2	1	1	2	1	0	1	0	1	1	3	1	4	0	2	2	11
31-40	10	11	21	3	2	5	2	1	3	0	0	0	0	1	1	0	2	2	0	2	2	25
41-50	5	3	8	5	3	8	3	0	3	2	1	3	0	0	0	0	0	0	0	0	0	13
>50	6	2	8	4	2	6	1	3	4	2	0	2	0	0	0	0	1	1	1	0	1	10
Σ	23	19	42	13	8	21	9	6	15	5	1	6	1	2	3	6	7	13	4	7	11	74

Table 7.Distribution of CT findings by age and sex (n=74, males=38, females=36)

Lumbar disc disease was found to mainly affect patients in the fourth and fifth decades (29 out of 42 cases, 70%) whereas facet joint disease mainly affected patients in the fifth decade and over (14 out of 21 cases, 70%). Ligamentum flavum hypertrophy affected people in the fifth decade and above except for one case noted in the third decade.

Normal CT findings occurred in the second decade with the highest frequency (4 out of 9, 44.4%). Vertebral body diseases seemed to affect all age groups.

6.3.1 Disc diseases

A total of 59 patients out of 74 had disc disease. No disc lesion was found in the first and second decade. Disc bulge was the commonest disc disease occurring in about half of the patients with disc disease after the second decade (27 out of 59, 46%). Postero-lateral disc herniation was the second commonest disc disease (19 out of 59, 33%), third commonest was posterior disc herniation (12 out of 59, 21%). Disc rupture and disc rupture with free fragment were the least common (5 out of 59, 9% each). Of the 59 patient above 20 years 18 (31%) had normal discs (8 males and 10 females).

AGE YRS	DISC BULGE			POST. HERN.			P-LATER HERN.			DISC RUPT			DSC/RFF			NORM. DISC			PTS
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	
00-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	6
11-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	4	9	9
21-30	1	1	2	0	0	0	0	1	1	0	1	1	0	1	1	2	4	6	11
31-40	8	6	14	6	3	9	9	1	10	2	0	2	1	0	1	1	3	4	25
41-50	4	1	5	1	1	2	4	1	5	1	1	2	2	1	3	4	2	6	13
>50	4	2	6	1	0	1	3	0	0	0	0	0	0	0	0	1	1	2	10
Σ	**17**	**10**	**27**	**8**	**4**	**12**	**16**	**3**	**19**	**3**	**2**	**5**	**3**	**2**	**5**	**16**	**17**	**33**	**74**

Table 8 Distribution of lumbar disc disease by age and sex (n=74, males=38, females=36)

Fig. 3 CT scan throug L4/5 disc showing a posterolateral disc herniation

6.3.2 Facet joint disease

No facet joint abnormality was seen in the first and second decades of life. Only 22 (29.7%) out of the total74 patients had facet joint disease (i.e. 52 patient out of 74 did not have facet joint disease). Osteoarthritis of the facet joint and hypertrophy of the superior articular facet were the commonest facet joint pathologies seen – 18 (24.3%) cases each. Hypertrophy of ligamentum flavum was the third commonest disease 9 (8.1%) and osteophyte of the inferior articular facet was the least commonest 3 (4.1%).

AGE YRS	OSTART. FCT JT			HYPER. SAF			OSTPH.. IAF			HYPER. LG FLV			NORMAL			PTS
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	
00-10	0	0	0	0	0	0	0	0	0	0	0	0	3	3	6	6
11-20	0	0	0	0	0	0	0	0	0	0	0	0	5	4	9	9
21-30	1	1	2	1	1	2	1	0	1	1	0	1	3	6	9	11
31-40	2	1	3	1	2	3	0	1	1	0	0	0	9	11	20	25
41-50	5	3	8	5	1	6	4	0	1	2	1	3	4	1	5	13
>50	4	1	5	5	2	7	0	0	0	2	0	2	2	1	3	10
Total	**12**	**6**	**18**	**12**	**6**	**18**	**2**	**1**	**3**	**5**	**1**	**6**	**26**	**26**	**52**	**74**

Table 9. Distribution of facet joint diseases by age and sex (n=74, males 38, females=36).
Total abnormal findings=45

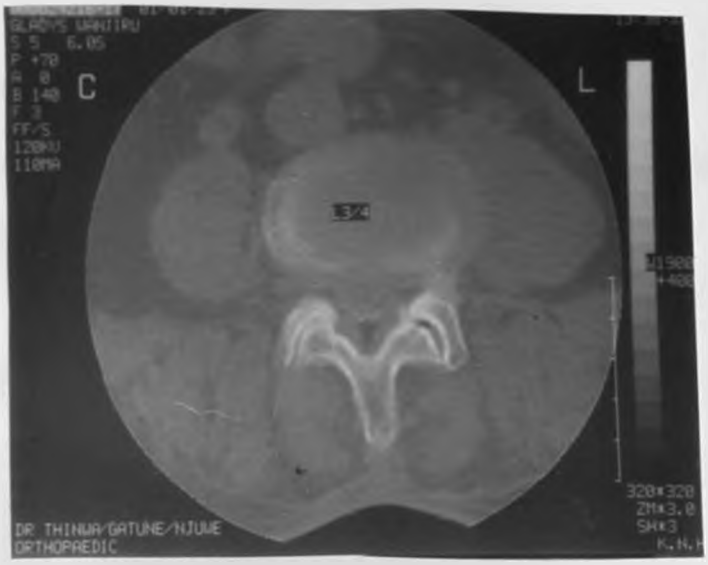

Fig 4 CT scan through L3/4 showing osteathritis of facet joint

6.3.3 Vertebral body disease

The vertebral body was affected in all the age groups. Of the 74 lumbar CT scan reviewed, 12 (16.3%) patients had an abnormal finding in at least one vertebral body. 58 (83.7%) patient had apparently normal vertebral bodies. The 12 patients had a total of 23 abnormal findings. Osteopenia and posterior osteophytes were the commonest finding. Infection of the vertebral body, fractures and tumour of the vertebral body had an equal frequency of occurrence (3).

AGE YRS	POST. OST.PY			DEST RCTN			TUM OR			OSTE OPEN			FRAC TURE			OTHE R			NORMAL			PTS
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	
00-10	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2	2	2	1	3	6
11-20	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	5	3	8	9
21-30	0	0	0	1	1	2	0	0	0	0	1	1	0	1	1	1	0	1	3	6	9	11
31-40	1	1	2	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	9	13	22	25
41-50	3	0	3	0	0	0	1	0	1	2	0	2	0	0	0	0	0	0	5	5	10	13
>50	0	0	0	0	0	0	0	1	1	0	3	3	0	1	1	0	0	0	6	0	6	10
∑	**4**	**1**	**5**	**1**	**2**	**3**	**2**	**1**	**3**	**2**	**4**	**6**	**1**	**2**	**3**	**1**	**2**	**3**	**30**	**29**	**58**	**74**

Table 10 Distribution of vertebral body disease by age and sex (n=74, Males=38, females=36)

6.3.4 Cauda equina disease

Three patients out of 79 reviewed had cauda equina tumour. No syrnx or other finding of cauda equina was found.

AGE YRS	SYRNX			C.EQN DIS.			OTHER			NORMAL			PTS
	M	F	T	M	F	T	M	F	T	M	F	T	
00-10	0	0	0	0	0	0	0	0	0	3	3	6	6
11-20	0	0	0	1	0	1	0	0	0	4	4	8	9
21-30	0	0	0	0	1	1	0	0	0	4	6	10	11
31-40	0	0	0	0	1	1	0	0	0	11	13	24	25
41-50	0	0	0	0	0	0	0	0	0	8	5	3	13
>50	0	0	0	0	0	0	0	0	0	7	3	10	10
Total	**0**	**0**	**0**	**1**	**2**	**3**	**0**	**0**	**0**	**37**	**34**	**71**	**74**

Table 11. Distribution of cauda equina findings by age and sex (n=74, males=38, females-36)
Total abnormal findings=3: males=1, females=2.

6.4 CT myleography

A total of 25 (31.6%) out of 79 patients had CT done with intrathecal contrast. Intrathecal contrast was used in all age ranges.

AGE	USED	NOT USED	TOTAL
00-10	2	4	6
11-20	6	3	9
21-30	2	9	11
31-40	5	20	25
41-50	5	8	13
>50	4	6	10
Missing	1	4	5
TOTAL	**25(31.6%)**	**54(68.4%)**	**79(100.0%)**

Table 12. Distribution of use of intrathecal contrast by age groups and sex (n=79)

6.5 PFM compared with CT

Of the 79 cases reviewed, 15 had a previous PFM done. On doing CT, the PFM diagnosis was sustained in 3 (20.0%) cases, modified in 10 (66.7%) and changed in 2 (3.3%) cases.

CASE	SYMPTOM /SIGN	PFM DIAGNOSIS	CT DIAGNOSIS
11yrs M	Paraplegia	Normal	Normal
35yrs F	LBP	Normal	DB
?yrs F	?	IML	Cauda equina tumour
20yrs M	Paraplegia	Cord comp. T7	Collapse T7, Normal LSS
?yrs M	Paraplegia	DH, IML	DB, DR, OA-FJ, H-SAF, O-IAF, OA-FJ
58YRS m	Paraplegia	DH	DB, PH, PLH, HLF, O-SAF, OA-FJ
12yrs M	Paraplegia	C. comp. T7 collapse T5-9	Fractures VBs, Lumbar paraverteb. Mass
18yrs F	LBP	Normal	Destruction /infn VB
33yrs M	LBP	DH	DB,PH, PLH, DR
38yrs F	LBP	DH	PLH, DR, DRFF
38yrs M	LBP	DH	DH, PH,PLH
40yrs M	LBP	DH	DB, PLH, DR, DRFF
44yrs M	LBP	DH	DB
53yrs M	LBP	DH	OA-FJ, O-IAF
14yrs M	?	IML T12/L1	Cauda equina tumour

Table 13 Comparison of PFM and CT diagnosis (n=15).
LBP=low back pain, IML=intramedullary lesion, DH=disc herniation, PH=posterior herniation PLH=posterolateral herniation, DB=disc bulge, DR=disc rupture, DRFF=disc rupture with Free fragment, OA=osteoarthritis, FJ=facet joint, O=osteophyte

A summary of the above table is reproduced below.

PFM DIAGNOSIS	INFLUENCE OF CT DIAGNOSIS		
	Sustained	Modified	Changed
Normal	1	0	2
Disc hern.	0	8	0
Cord comp.	0	2	0
C. eqn tm/IML	2	0	0
TOTAL	**3(20%)**	**10(66.7%)**	**2(3.3%)**

Table 14. Summary of comparison of PFM and CT diagnoses.

7 DISCUSSION

Low back pain is a wide spread disorder which causes a lot of suffering, economic loss in terms days off work and generally decreases enjoyment of life. It causes need accurate diagnosis for specific management to be instituted.

Of the 53 patients out of 79 with low back pain, 38 (71.8%) had lumbar disc disease (alone or in combination with other diseases). 22 (31.3%) had facet joint disease (alone or in combination with other disease). Combined lumbar disc and facet joint disease accounted for 91% of abnormal findings in patients with low back pain either singly or in combination.

Many studies have shown that CT and MR are superior compared to plain film myelography in evaluation of low back pain.

In this study, only 3 (20%) out of 15 patients done PFM earlier was the diagnosis of plain film myelography sustained on doing CT. In most of the cases, the diagnosis was modified. It appears therefore that CT gave much more information than PFM which would contribute to better patient management. These findings do agree with other studies which have shown that CT is superior to PFM [7,23,26,27].

In none of the patients with facet joint disease, either causing spinal stenosis or directly being the only abnormal finding diagnosed by PFM. This nil diagnosis of facet joint disease by PFM has been shown by various studies [10,11]. It appears that whenever there was thecal sac compression or nerve root sheath compression the radiologist routinely diagnosed disc prolapse.

The nil diagnosis of facet joint disease would be a cause of failed back surgery in this set up. Plain film myelography did not adequately characterize disc disease in this study, which would lead to inappropriate management. For example, if a patient had a disc fragment with a disc prolapse, the sequestered fragment would most likely be missed thus causing failed back surgery.

These results show that disc disease to be more common a decade earlier than facet joint disease (21/25 compared 8/13, i.e 84.0% as compared to 61.5%) as compared to facet joint disease which occurs a decade later (fifth decade facet joint disease 8/13 (61.5%) compared to fourth decade facet joint disease 5/25(20%).

Free disc fragment should be differential from conjoined nerve roots by measurement of their CT densities. The conjoined root has a density close to that of the thecal sac whereas the free disc fragment will have a higher density.

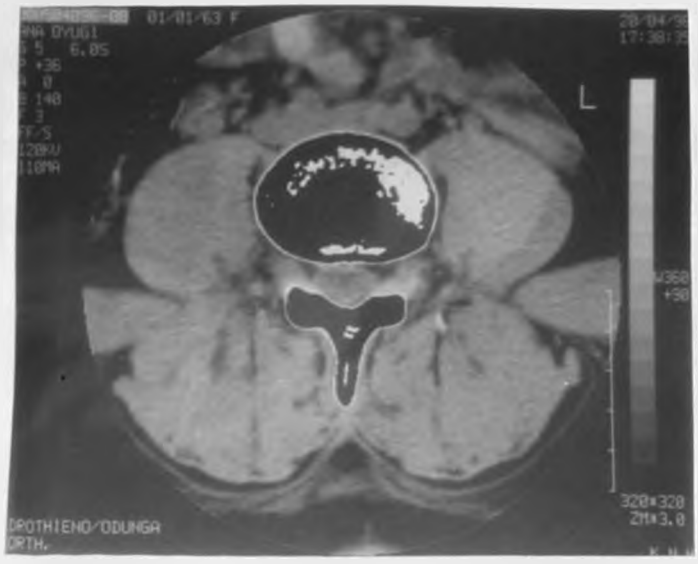

Fig. 5 A scan through L4 showing a free disc fragment.

ateral disc herniation should be clearly described on CT as it necessitates a differential approach from the standard laminectomy. It occurs lateral to the neuroforamina. This ase entity was not demonstrated nor described on PFM in this study despite it being ommon finding on CT.

id not seem to be any criteria for choosing patients in whom intrathecal contrast media :d In most cases the density of intrathecal contrast was too high such that it could easily free disc fragment or any drop metastasis within the thecal sac.

case, it is not necessary to use intrathecal contrast whenever investigating degenerative e of the spine as the epidural fat provides enough contrast.

:ver, contrast could be useful in investigating diseases of the spinal cord. If CT ography must be done then a total of 1g of iodine content and not the standard 3g of iodine. wise a delay of 3-4 hours should be allowed.

Postero-lateral disc herniation should be clearly described on CT as it necessitates a differential surgical approach from the standard laminectomy. It occurs lateral to the neuroforamina. This disc disease entity was not demonstrated nor described on PFM in this study despite it being quite a common finding on CT.

There did not seem to be any criteria for choosing patients in whom intrathecal contrast media was used. In most cases the density of intrathecal contrast was too high such that it could easily mask a free disc fragment or any drop metastasis within the thecal sac.

In any case, it is not necessary to use intrathecal contrast whenever investigating degenerative disease of the spine as the epidural fat provides enough contrast.

However, contrast could be useful in investigating diseases of the spinal cord. If CT myelography must be done then a total of 1g of iodine content and not the standard 3g of iodine, otherwise a delay of 3-4 hours should be allowed.

Postero-lateral disc herniation should be clearly described on CT as it necessitates a differential surgical approach from the standard laminectomy. It occurs lateral to the neuroforamina. This disc disease entity was not demonstrated nor described on PFM in this study despite it being quite a common finding on CT.

There did not seem to be any criteria for choosing patients in whom intrathecal contrast media was used. In most cases the density of intrathecal contrast was too high such that it could easily mask a free disc fragment or any drop metastasis within the thecal sac.

In any case, it is not necessary to use intrathecal contrast whenever investigating degenerative disease of the spine as the epidural fat provides enough contrast.

However, contrast could be useful in investigating diseases of the spinal cord. If CT myelography must be done then a total of 1g of iodine content and not the standard 3g of iodine, otherwise a delay of 3-4 hours should be allowed.

8 CONCLUSION

Degeneratine disc disease is the commonest abnormal finding in lumbar spine in patients with low back pain as seen on CT.

Facet joint disease is the second commonest abnormal finding in lumbar spine of patients with low back pain as seen as CT.

CT is apparently superior to PFM in investigation of the spine as it gives much nerve information including the facet joints and paraverteral structures, which cannot be imaged by PFM.

9 RECOMMENDATIONS

A prospective study comparing the CT disc disease diagnosis and operative diagnosis is suggested to determine the accuracy of CT diagnosis in our set up.

A prospective study comparing PFM, CT of the lumbo-sacral spine and operative diagnosis on disc disease to determine the place of PFM at the present in Kenya is recomended.

Appendix i

Data Collection Form

Hospital Number .....
X-ray Number .....
Date .....
Study Number .....
Age .....
Sex .....

Imaging Information
Referal diagnosis .....
PFM diagnosis Normal .....
Abnormal.....
CT findings Normal.....
Abnormal.....
Disc bulge.....
Posterior herniation .....
Posterolateral herniation.....
Disc rupture.....
Disc rupture with free fragment .....
Hypertrophy of the liamentum flavum .....
Osteo arthritis of facet joint .....
Hypertrophy of the superior articular facet .....
Osteophyte of the inferior articular facet.....
Pedicle hypertrophy.....
Posterior osteophyte of vertebral body.....
Vertebral body infection .....
Vertebral body tumour.....
Vertebral body osteopenia .....
Vertebral body fracture .....
Symx.....
Spinal cord/cauda equina tumour.....
Other .....
Specify.....

Appendix ii

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