

# Magnetic Resonance Imaging of the Spine at the Douala General Hospital (Cameroon)

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**How to cite this paper:** Guena, M.N., Zilbinkai, F.A., Djoungnye, A., Etoundi, R.G.N., Ngadjere, E.V., Wankie, E.M., Nana, N.N., Nguemgne, C., Vanina, W.W.L. and Gonsu, J.F. (2019) Magnetic Resonance Imaging of the Spine at the Douala General Hospital (Cameroon). *Open Journal of Modern Neurosurgery*, 9, 237-247.

<https://doi.org/10.4236/ojmn.2019.93023>

**Received:** April 28, 2019

**Accepted:** May 26, 2019

**Published:** May 29, 2019

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## Abstract

**Objectives:** The objective of this study was to evaluate the interest of MRI in the diagnosis of spinal disorders in our area. **Method:** It was a cross-sectional, descriptive and retrospective study during a nine-month period from January to September 2015 involving all patients who performed a spine MRI in the Imaging Department of Douala General Hospital. All the patients were scanned using an open-sided mid-field MRI APERTO LUCENT (0.4 T) using sagittal and axial slices in T1-weighted and T2-weighted FSE spin echo and STIR sagittal slices and T1 gado. Water-fat saturation (WFS) slices were obtained after injection of a contrast agent. All the data collected were analyzed using Microsoft Excel 2010 and Sphinx version 4.0. **Results:** 220 patients were recruited. The mean age was 46.34. There was male predominance with a sex ratio of 1.5. The main indication was lumbar spine pain (36.8%), followed by cervical spine pain, sensory and motor disorder. Neurosurgeon (33.6%), neurologist (23.1%) and rheumatologist (13.6%) were the main referring physicians. The lumbar spine was the most explored (53.2%). Discal hernia (46.6%), arthrosis (31.3%) and degenerative disc disease (25.5%) were the main observed lesion. Infectious disorders were mainly represented by spondylitis (5%); Traumatic disorders by spondylolisthesis (8.6%). Tumors were mainly metastasis (4%). 21.3% of MRI were normal. MRI-clinical concordance was 78.63%. **Conclusion:** MRI allows an accurate assessment of spinal and spinal cord pathologies without exposing patients to radiation. It helped to confirm or refute the diagnosis suspected by clinics. However, its availability is limited in our country.

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## Keywords

Spine, MRI, Spinal Disorders, Douala General Hospital

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## 1. Introduction

The spine is a complex structure encompassing bones, joints, muscles and discs which supports the head and transmits all the weight of the body to the hip. Thus, it is exposed to mechanical stresses that lead to its alteration. Pain is the main symptom that translates a pathology of the spine and can be responsible for heavy functional sequelae, hence the interest of a diagnosis as early as possible. In France, low back pain affects 80% of people in a significant way at least once in their lives; and if its annual incidence varies by age, it appears to be less important in the age group of 20 - 24 years (4% to 18%) but is highest in the age group of 55 - 64 years (8% to 32%). According to the figures reported in France, the origin of back pain is poorly identified in 95% of cases [1]. In the United States, six million Americans suffer from lumbar pain, and 50% to 90% of the population have low back pain causing serious occupational, sporting or physical disabilities [2]. In Mali, low back pain, which was in 2000, according to Bagayoko, 1.97% of the reasons for Consultation per year [3], increased to 6.39% in 2003 according to Bacurypel [4]. In Cameroon the study conducted by Adamou *et al.* at the Douala General Hospital from January 2003 to October 2005 in the Department of Rheumatology showed that 212 patients who had consulted for low back pain, 15 (7.1%) had a lumbago and 197 (92.9%) had low back pain with or without radicular pain. Their diagnosis must be as early as possible due to the risk of serious complications they may cause [5]. Different radiological methods play an important role in the work-up of patients complaining of spine pain. The morphological study of the spine has long been based on conventional radiological techniques. These technics are difficult to interpret and some of them are invasive, which is risky to the patient. Recent decades have seen new imaging technologies (CT-scan and MRI) that have revolutionized the exploration of spinal pathology with a better sensitivity. Magnetic resonance imaging (MRI) is well established as the investigation of choice for spinal disorders, combining multiplanar exploration capacity and high resolution in contrast [6]. Moreover, it is special because it is non-invasive and non-irradiating and allows an overall study of the whole spine [7]. However it is not yet popularized and the MRI is still making its first steps in our country, its availability being scarce. It is therefore its recent introduction to our country that encouraged us to carry out an assessment in order to determine its contribution in the exploration of the spinal pathology and to identify the local specificities.

## 2. Methods

We carried out a descriptive cross-sectional and retrospective study during a

nine-month period from **January to September 2015** involving all patients who performed a spine (cervical, thoracic or lumbar) MRI in the Imaging Department of Douala General Hospital. All patients whose records were not complete or found were excluded. Data was collected from the radiologist report and request forms of patients. All the patients were scanned using an open-sided mid-field MRIAPERTO LUCENT (0.4 T). After the preparation of the patient (explanation, verification of history of allergic reactions, removal of all metal items, wearing of a hospital gown), they were examined with the following protocol: After a tracking sequence in all 3 plans, to ensure correct positioning of slices, sagittal and axial slices in T1-weighted and T2-weighted FSE spin echo and STIR sagittal slices were obtained. At the lumbar level, we had STIR coronal slices, Axial T2 and T1 FSE, T2 \* slices. The use of contrast agent is not systematic but depends on the indications and the results of the basic sequences initially obtained, if it needs the contrast agent (DOTA-Gadolinium) is injected by the MRI technologist into a vein in the arm or hand and T1 gado, water-fat saturation (WFS) slices were obtained. A  $512 \times 512$  matrix with an FOV of 24 cm and slice thicknesses of 3 - 4 mm were used. All the data collected were analyzed using Microsoft Excel 2010 and Sphinx version 4.0 to produce frequency tables and charts. Ethical approval was obtained from the ethical Committee of Douala General Hospital (DGH).

### 3. Results

The study included 220 patients aged 3 to 88 years with an average of 46.34 years. The male sex (59.54%) was the most represented with a sex ratio of 1.5. Class group of 30 - 40 years (22.7%) and 50 - 60 years (22.4%) were more represented in this study (**Figure 1**).

The main indication was lumbar spine pain (36.8%), followed by cervical spine (11.8%) pain and sensory and motor disorder (11.3%), traumatism (8.1%) and spinal compression (7.7%) (**Table 1**).

Neurosurgeon (33.6%), neurologist (23.1%) and rheumatologist (13.6%) were the main referring physicians (**Table 2**).

The lumbar spine (53%) was the most explored followed by cervical spine (28.6%) (**Figure 2**). Most of patients (60.4%) had no previous examination. 45 (20.4%) patients underwent X-ray, 41 (18.6%) CT scan and one a myelogram (**Table 3**).

According to **Table 4** and **Table 5**, discal hernia (46.6%), arthrosis (31.3%) and degenerative disc disease (25.5%) were the main observed lesions. 21.3% of MRI were normal. Rare lesions like Chiari malformation (1.3%), aneurysm of jugular (0.9%) (**Figures 3-7**).

## 4. Discussion

### 4.1. Epidemiological Factors

The age of our patients ranged from 3 to 88 years with an average of 46.34 years.

This rate is close to those found by Yollo and Dreiser *et al.* with a slightly higher average age of 50.82 and 50 years respectively [7] [8]. In fact, these age groups correspond to the period of life where vertebral disc degeneration and bone demineralization start.

The male sex (59.54%) was the most represented with a sex ratio of 1.5. This rate is similar to the 64% found by Dede *et al.* [9]. Because of their occupational exposure to physical effort, men are more exposed to spinal disorders.

**Table 1.** Distribution of indications.

Indications	Frequency	Percentage
lumbar spine pain	81	36.8
Cervical spine pain	26	11.8
Sensory and motor disorder	25	11.3
Traumatism	18	8.1
Spinal cord compression	17	7.7
Lameness	12	5.4
Discal hernia	8	3.6
Arthrosis	8	3.6
Thoracolumbar spine pain	6	2.7
Myelopathy	4	1.8
Tumor	4	1.8
Cauda equina/horse-tail syndrome	3	1.3
Amyotrophy	2	0.9
Suspicion of Spina bifida	1	0.4
Vascular malformation	1	0.4
Brachial plexus root avulsion	1	0.4
Postoperative control	1	0.4
Suspicion of multiple sclerosis	1	0.4
Suspicion of ankylosing spondylitis	1	0.4
Total	220	100

**Table 2.** Profile of MRI examination applicant.

Referring physician	Frequency	Percentage (%)
Neurosurgeon	74	33.6
Neurologist	51	23.1
Rheumatologist	30	13.6
Orthopedic surgeon	21	9.5
General practitioner	21	9.5
Not mentioned	16	7.2
Anesthesiologist	4	1.8
Pediatric neurologist	3	1.3
Total	220	100

**Table 3.** Previous examination.

Previous examination	Frequency	Percentage (%)
X ray	45	20.4
CT scan	41	18.6
Myelogram	1	0.4
No previous examination	133	60.4
<b>Total</b>	<b>220</b>	<b>100</b>

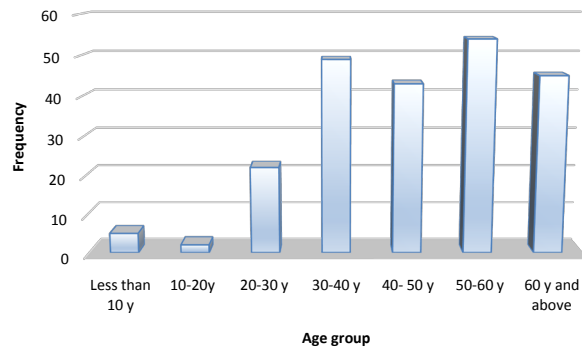
**Table 4.** MRI findings.

MRI results	Cervical spine	Thoracic spine	Lumbar spine	Total
<b>Discal hernia</b>	20 (9%)	0	87 (39.5%)	107 (46.6%)
<b>Arthrosis</b>	18 (8.1%)	0	51 (23.1%)	69 (31.3%)
<b>Degenerative disc disease</b>	8 (3.6%)	2 (0.9%)	46 (20.9%)	56 (25.5%)
<b>Normal examination</b>	12 (5.4%)	8 (3.6%)	27 (12.2%)	47 (21.3%)
<b>Spondylolisthesis</b>	4 (1.8%)	0	15 (6.8%)	19 (8.6%)
<b>Myelopathy</b>	10	1 (0.4%)	3 (1.3%)	14 (6.3%)
<b>Spondylitis</b>	1 (0.4%)	7 (3.1%)	3 (1.3%)	11 (5%)
<b>Metastasis</b>	1 (0.4%)	1 (0.4%)	7 (5%)	9 (4%)
<b>Vertebral compaction</b>	1 (1.4%)	1 (0.4%)	3 (1.3%)	5 (2.2%)
<b>Subdural hematoma</b>	6 (2.7%)	0	1 (0.4%)	7 (3.1%)
<b>Vertebral fracture</b>	4 (1.8%)	1 (0.4%)	1 (0.4%)	6 (2.7%)
<b>Syringomyelia</b>	3 (1.3%)	1 (0.4%)	2 (0.9%)	6 (2.7%)
<b>Ligamentum flavum hypertrophy</b>	0	0	5 (2.2%)	5 (2.2%)
<b>Lumbar spinal sténosis</b>	0	0	5 (2.2%)	5 (2.2%)
<b>Vertebral and medullary cyst</b>	1 (0.4%)	0	4 (1.8%)	5 (2.2%)
<b>Others*</b>	11 (5%)	3 (1.3%)	7 (3.1%)	21 (9.5%)

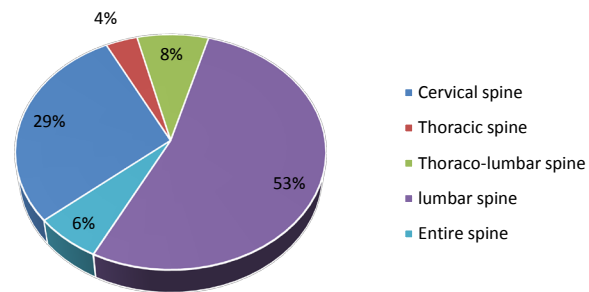
\*See the table below.

**Table 5.** Other pathologies found.

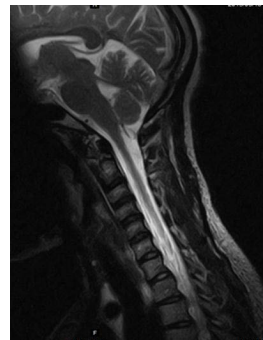
MRI results	Cervical spine	Thoracic spine	Lumbar spine	Total
<b>Chiari malformation</b>	2 (0.9%)	0	1 (0.4%)	3 (1.3%)
<b>Kyphosis</b>	2 (0.9%)	0	1 (0.4%)	3 (1.3%)
<b>Aneurysm of jugular vein</b>	2 (0.9%)	0	0	2 (0.9%)
<b>Ankylosis spondylitis</b>	0	1 (0.4%)	1 (0.4%)	2 (0.9%)
<b>Myelitis</b>	1 (0.4%)	0	1 (0.4%)	2 (0.9%)
<b>Vertebral dislocation</b>	2 (0.9%)	0	0	2 (0.9%)
<b>Vertebral abcess</b>	0	1 (0.4%)	1 (0.4%)	2 (0.9%)
<b>Medullary gliosis</b>	0	1 (0.4%)	0	1 (0.4%)
<b>Neurofibromatosis</b>	1 (0.4%)	0	0	1 (0.4%)
<b>Meningioma</b>	1 (0.4%)	0	0	1 (0.4%)
<b>Lipoma</b>	0	0	1 (0.4%)	1 (0.4%)
<b>Astrocytoma</b>	0	0	1 (0.4%)	1 (0.4%)



**Figure 1.** Distribution of patients by age group.



**Figure 2.** Explored segment.



**Figure 3.** T2W Sag image of normal cervical spine.



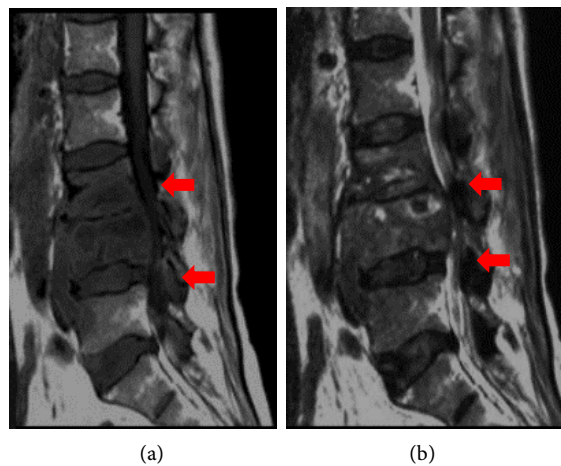
**Figure 4.** T2W Sag image of normal lumbar spine.



**Figure 5.** T2W Sag image showing degenerative disc disease at L4-L5 and L5-S1 (arrows).



**Figure 6.** T2W Sag of discal hernia at L5-S1 level (arrow).



**Figure 7.** Lumbar T1W Sag (a) and T2 W Sag (b) showing spondylitis of L3-L4 and L4-L5 (arrows).

## 4.2. Indications

Spinal pain (48.6%) was the frequent indication for MRI examination in our study. This is in accordance with other published studies [10] [11]. According to Brochard and Loembe, spinal pain is the major symptom that leads patients to consult in almost 90% of cases [12] [13]. Pain is only a symptom and not a disease; as such it can cover many etiologies and in the majority it results from degenerative changes in the spine, involving the intervertebral discs, facet joints and soft tissues, less common causes of pseudoradicular pain include infections, non-infectious inflammation, tumours and metabolic disease (e.g. osteoporosis) [14]. Sensory and motor disorders (11.3%) and traumatism (8.1%) were also frequent as indication. At the cervical segment, the indications found in our study is similar to those of Hari which reports in his study that cervico-brachial neuralgia is frequently found [12]. At the dorsal level, the main indication was suspicion of spinal cord compression with 2.3%. In the lumbar segment, our observation corroborates the findings of Tchuindjang, who found that more than 72.4% of patients received in neurosurgical consultation for suspicion of herniated disc of the lumbar region had lumbosciatic pain [15]. The whole spine was explored mainly in the case of sensory and motor disorders. In other studies, the whole spine was explored when vertebral tuberculosis was suspected [16].

Neurosurgeon (33.6%), neurologist (23.1%) and rheumatologist (13.6%) were the main referring physicians. They are specialists of neurological pathologies and are in the front line in the management of patients suffering from or suspected of having neurological disorders and articular pain.

## 4.3. MRI Results

As results, 78.6% of MRI exams were pathological. Discal hernia (46.6%), arthrosis (31.3%) and degenerative disc disease (25.5%) were the main observed lesion. Kalichman and al and Hicks and al in a similar study found discal hernia in 63.9% and 49% respectively followed by posterior inter-apophyseal arthrosis [17] [18]. These lesions were sitting preferentially at the level of the last lumbar stages, observation made by Cheung *et al.* who mentioned in their study a relatively high-frequency discal hernia at L4-L5 and L5-S1 stages [19]. Kanayama and al had also notified it in agreement with VanRijn and al who estimated the frequency of herniated discs at both last lumbar stages at 90% [20] [21]. Indeed degenerative pathology is a process of aging that happens spontaneously with age.

Hyposignal of intervertebral disc in degenerative disc disease on T2 weighted images is the witness of the dehydration of the disc but can also translate the production sometimes anarchic collagen fibers [14]. Morphological modifications of discs are responsible of almost all root conflicts [22].

Tuberculous spinal infections are not exceptional. Their Clinical presentation is often non specific, and may result in lumbosciatica. In our series, the infectious pathology was represented mainly by spondylitis (5%). The typical ap-



pearance of spondylitis reported in MRI regardless of its etiology associates a hypersignal T2 discal, a hyposignal T1 and T2 hypersignal of the 2 adjacent vertebrae, and thickening of the soft parts paravertebral and/or intra-ductal. Our results corroborate those of Mijiyawa who reported 54 (2.3%) cases of spondylitis for a population of 2358 patients at Tokoin Teaching Hospital in Lomé [23].

We observed 9 (4%) metastasis. Amiel *et al.* reported a case of sciatica revealing pleural mesothelioma and non-Hodgkin lymphoma (NHL) by metastasis of the fifth lumbar vertebra [24] and Bahri and al four sciatic observations revealing metastases of a uterine cancer [25]. As soon as it is found a metastasis must make search of the primitive tumor.

Spondylolisthesis (8.6%) was the most common traumatic pathology. Spinal trauma is a common pathology affecting about 10,000 subjects per year in France [26]. They are complicated in 10% - 20% of the cases of medullary injury. The association with polytrauma is frequent: 70% of traumatized spine have a life-threatening lesion in the short term and 10% of those with multiple trauma have traumatic spinal injury. Spinal injuries mainly affect young adults, male, with a peak frequency between 15 and 24 years. The most common cause are road accidents, followed by accidents at work and sports accidents according to Hu *et al.* [27].

In our study the concordance between the clinic and MRI results was 78.63% for degenerative pathology. In agreement with Abdoulaye and al in their study on the contribution of MRI in the exploration of low back pain at Fann University Hospital Center (Dakar-Senegal) found a concordance between the clinic and MRI of 73.1% [28].

Most of patients (60.4%) had no previous examination. 45 (20.4%) patients underwent X-ray, 41 (18.6%) CT scan and one a myelogram. Through its wide variety of pulse sequences, MRI provide superior contrast resolution to allow different soft tissues to be distinguished with ease. It is generally performed in second or third intention after a conventional X-ray or CT scan.

21.3% of MRI were normal. This rate of normal exams raises the problem of justification of this exam which should not be asked in first line in a context where accessibility to this exam is not within the reach of everyone and there is no referral guideline to help clinicians to choose the most appropriate imaging investigation for specific clinical diagnostic problems.

However, some limitations were encountered in this study, including the lack of therapeutic aspects and the follow-up of these patients, thus we cannot present the results of the treatment nor the complications.

## 5. Conclusion

MRI allows an accurate assessment of spinal and spinal cord pathologies without exposing patients to radiation. It helped to confirm or refute the diagnosis suspected by clinics with a high level of concordance between the clinic and the results of the MRI. Discal hernia, arthrosis and degenerative disc disease were the

main observed lesions. However, its availability is limited in our country.

### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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