

## MRI EVALUATION OF PATIENTS WITH SHOULDER PAIN AT THREE IMAGING CENTRES IN NAIROBI

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### ABSTRACT

**Background:** Shoulder pain is a common reason for visiting a physician. It is the third most common cause of musculoskeletal complaint after low back pain and cervical pain in the USA. No data is available on MRI findings among our local population with shoulder pain despite having an MRI machine in our country since 1996.

**Objective:** To establish the pattern of findings seen at MR imaging among patients with shoulder pain at three imaging centers in Nairobi.

**Design:** This was a cross sectional descriptive study.

**Methodology:** The study was conducted for a period of six months between June 2008 and December 2008. Seventy patients referred for MR imaging were scanned at the three imaging centers. The date of scanning, age, sex and referring clinician were documented. The MR findings were documented. The data was analyzed using Statistical Package for Social Scientists (SPSS-Version 13.0).

**Results:** There were 38 (54.3%) male and 32(45.7%) female patients scanned. The age ranged from 20 to 86 years. The mean age was 48 years. Majority of the patients were aged 46 – 60 years. Patients below 30 years were 9 (12.9%) and over 30 years were 61(87.1%). Most patients referred for examination had pathology in the right shoulder. The commonest lesion was tendinosis with 34 (47.2%) cases and was seen more on the right shoulder. There were 20 (27.8%) rotator cuff tears that mostly involved the supraspinatus tendon. Degenerative disease was found in 13 (18.6%) patients.

**Conclusion:** Among the patients examined the right shoulder had more pathology than the left. Tendinosis of the supraspinatus tendon was the commonest pathology. In rotator cuff tears, supraspinatus was more frequently involved.

### INTRODUCTION

Shoulder pain is a common complaint in medical practice and leads to significant disability. A compromised shoulder due to pain, stiffness or weakness causes substantial disability and affects the person's ability to carry out daily activities. This not only reflects on the person's occupation but also on his social life. In USA, it is the third commonest musculoskeletal disorder after low back pain and cervical pain and it is estimated to affect 17% of men and 25% of women in the elderly population (1). Incidence increases with age. 21% of people over 70 years have shoulder pain (1). Self reported prevalence of shoulder pain is estimated to be 16-26 % in Britain (2). Women have more shoulder problems than men but the frequency in both sexes' increases with age (3, 4, 5). The burden of taking care of the musculoskeletal problem is enormous to the society in terms of lost man-hours, direct hospital bills and workers compensation. This has a tremendous strain on a nation's economy.

Clinical examination alone is not adequate in identifying the cause of pain, thus various imaging

modalities are employed to increase the accuracy of identifying the source of the pain. Plain radiography, arthroscopy, contrast arthrography, Ultrasonography, computer tomography and Magnetic resonance (MRI) are the diagnostic modalities used. Since the commonest cause of shoulder pain is related to soft tissue rather than osseous lesions, MRI is an excellent modality in depicting shoulder pathology. It has an excellent soft tissue contrast and its multiplanar capabilities make it a superior tool in shoulder imaging.

### MATERIALS AND METHODS

This study was carried out in three imaging centers in Nairobi. Two major hospitals: Kenyatta National Hospital a regional referral centre and Nairobi Hospital a private hospital and Plaza Imaging Solutions, a private imaging centre. Patients of all age groups with shoulder pain and referred for MR Imaging during the period between June 2008 and December 2008, were included in the study.

*Sample size determination:* The population consisted of patients referred for MR imaging of the shoulder at Kenyatta National Hospital, Nairobi Hospital and Plaza

Imaging Solutions between June 2008 and December 2008.

The sample size was determined by the following formula by Fischer *et al* (1998)

$$n = \frac{z^2 p(1-p)}{d^2}$$

$d=0.05$ ,  $z=1.96$ , and  $p=6.9\%$ , then  $n=69$

All consenting patients of all age groups with shoulder pain and referred for MR Imaging during the period between June 2008 and December 2008 were included in the study. After obtaining a written consent from each patient the following protocol was used. All the patients were scanned using a 1.5 Tesla MRI machine using a dedicated shoulder coil. At Nairobi Hospital, a 1.5 Tesla Acheiva Philips MRI machine was used. At both Kenyatta National Hospital and Plaza Imaging Solutions, a 1.5 Tesla Intera Philips MRI machine was used. The scanning was done in standard orthogonal planes axial, coronal, oblique coronal, sagittal and oblique sagittal. T<sub>1</sub>W, T<sub>2</sub>W, T<sub>1</sub>W with fat suppression, PDW and FLAIR MR Sequences were used. In suspected labral tears, fat saturated gradient echo sequence was used. Intravenous Gadolinium based

contrast media was used depending on the clinical suspicion and findings on the non contrast images. No intraarticular contrast was used.

## RESULTS

The total number of patients imaged was 70. Among them, 12(16.7%) were imaged at Plaza Imaging Solutions, 13(18.0%) were imaged at KNH and 47(65.3%) were imaged at Nairobi Hospital. Two male patients had both shoulders imaged. MR imaging of 72 shoulders was done at the three imaging centers between June 2008 and December 2008.

Of the 70 patients scanned 38(54.3%) were males and 32(45.7%) were females. The mean age was 48 years. The youngest was 20 years and the oldest was 86 years. Those between 30-45 years were 17(24.3%). Those in the 46-60 years age group were 32(45.7%) and those over 60 years were 12(17.1%).

*Types of lesions seen at MR imaging:* A total of 120 lesions were seen and were more common on the right shoulder 104(86.7%) compared to the left which had only 16(13.3%) lesions. Different lesions were picked on MRI. Table 1 shows the lesions seen.

**Table 1**

*Lesions seen at MR imaging (n=120)*

Type of lesions	Right shoulder	Left shoulder	Total
Tendinitis	31 (25.8)	3 (2.5)	34 (28.3)
Bursitis	11 (9.7)	1 (0.8)	12 (10.0)
Synovitis	0	2 (1.6)	2 (1.6)
Rotator cuff tears	19 (15.3)	1 (0.8)	20 (16.7)
Impingement syndrome	5 (4.2)	0	5 (4.2)
Bankarts	3 (2.5)	1 (0.8)	4 (3.3)
Hill-Sachs	7 (5.8)	0	7 (5.8)
Fractures	4 (3.3)	0	4 (3.3)
Dislocations	2 (1.6)	0	2 (1.6)
Joint effusion	3 (2.5)	6 (5.0)	9 (7.5)
Degenerative diseases	13 (10.3)	0	13 (10.3)
Septic arthritis	1 (0.8)	0	1 (0.8)
Benign tumours	3 (2.5)	1 (0.8)	4 (3.3)
Malignant tumours	1 (0.8)	1 (0.8)	2 (1.6)
Metastatic tumours	1 (0.8)	0	1 (0.8)
Total	104 (86.7)	16 (13.3)	120 (100)

*Rotator cuff tears:* There were 20 (16.7%) rotator cuff tears seen. Nineteen (15.8%) of the lesions were seen on the right and one (0.8%) lesion was seen on the left. All the rotator cuff tears were seen among those over 30 years. Among the twenty tears seen, fifteen were partial and five were complete tears. The MR findings of tendon tear were increase in signal on all sequences carried out but its appearance on T<sub>2</sub> sequence was more specific.

*Tendinosis:* The commonest pathology was tendinosis. Tendinosis involved mainly the supraspinatus tendon. Twenty one (17.5%) lesions were seen on the supraspinatus, twelve (10.0%) were on the biceps tendon and the subscapularis tendon had 2(1.6%) lesions. These are shown in Table 2.

**Table 2**

*Showing the distribution of tendinosis (n=120)*

Lesion: Tendinosis	Frequency	(%)
Supraspinatus	21	17.5
Biceps	11	9.2
Subscapularis	2	1.67

*Degenerative diseases:* Thirteen (10.8%) of these lesions were seen and were exclusively seen on the right shoulder. This pathology was seen only in those over 30 years. Table 3 shows the distributions of these lesions.

**Table 3**

*Association between degenerative diseases and other pathology*

Other pathology	Degenerative, n	P-value
Tendinosis	5	0.485
Bursitis	2	0.891
Tendon tears	4	0.790
Impingement syndrome	1	0.907
Bankart lesions	1	0.710

*Joint effusion:* Effusion in the glenohumeral cavity was encountered in 9 (7.5%) of the cases. In the right shoulder, it was seen in 3 (2.5%) cases and 6(5.0%) on the left. The presence of an effusion was associated with other lesions. It was associated with tendinosis in 6 cases (p-value of 0.212), in tendon tear was seen in 3 cases and in fractures it was seen in 2 cases (p-value of 0.020). It was found in labral tears in 2 cases.

**Figure 1a**

*MR image of the left shoulder of a 28 year old student. He had recurrent shoulder dislocation. Image (a) an axial T<sub>2</sub>WI shows a bony bankart lesion*



**Figure 1b**

*A T<sub>2</sub>W fat suppressed coronal image of the same patient as in figure 1a showing marked joint effusion. The rotator cuff tendon shows a hyperintense signal and a gap on this sequence, findings consistent with tear of the rotator cuff tendon*



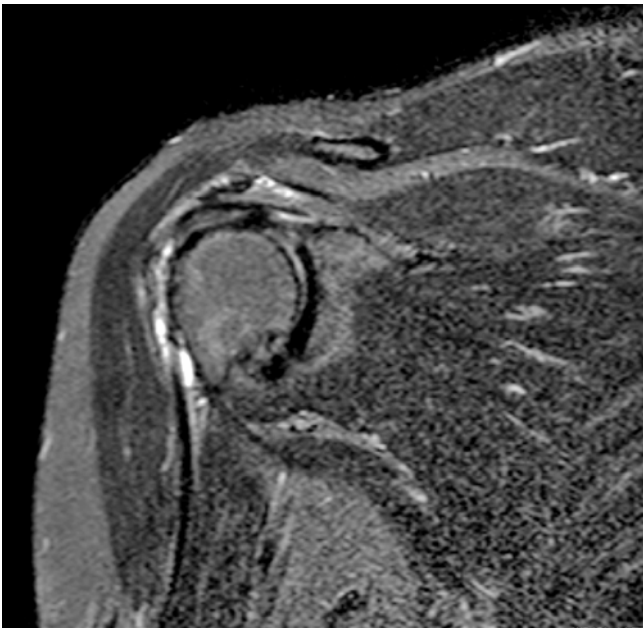
**Figure 2a**

*Coronal T<sub>2</sub>W image of a 43 year old female with recurrent right shoulder pain. There is an inhomogeneous hyperintense signal in the supraspinatus tendon*



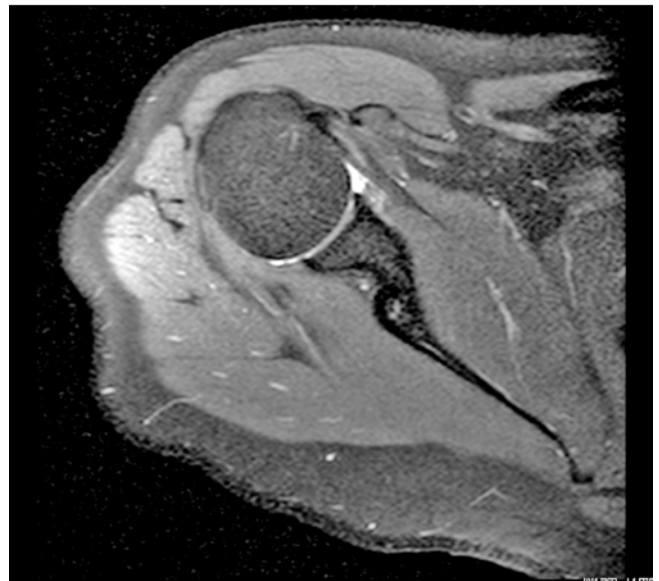
**Figure 2b**

*T<sub>2</sub>W fat suppressed image of the same patient. The hyperintense signal in the supraspinatus tendon is more apparent. MR diagnosis of supraspinatus tendinosis was made*



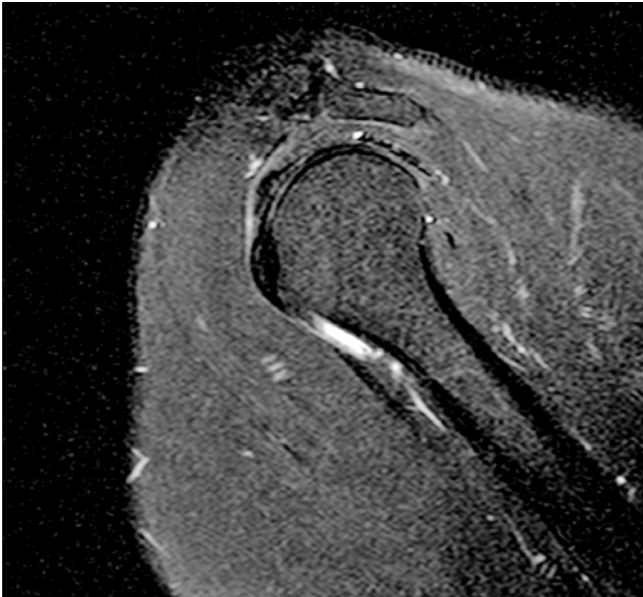
**Figure 3b**

*A PD axial image from the same patient. High signal intensity is noted in the rotator cuff. MR diagnosis of biceps tendinosis and partial rotator cuff tear was made*



**Figure 3a**

*A sagittal oblique T<sub>2</sub>W fat suppressed image of a 54 year old with persistent painful right shoulder. There is hyperintense signal in the biceps tendon*



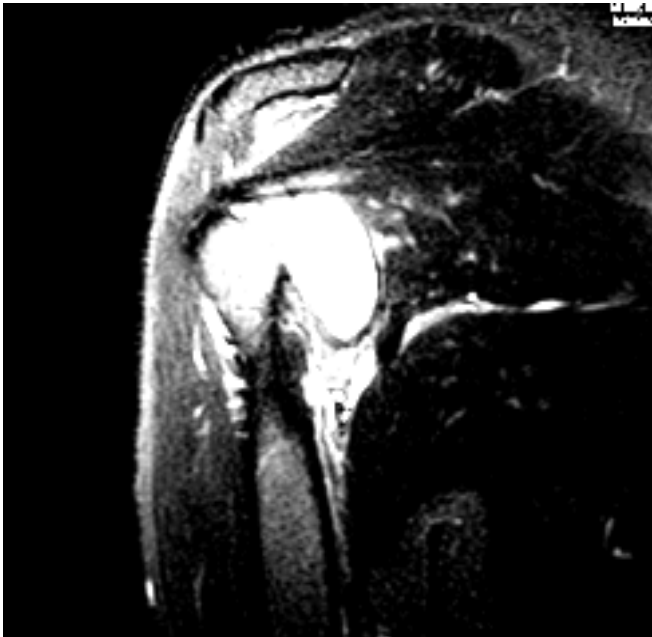
**Figure 4a**

*Coronal T<sub>2</sub>W fat suppressed image of a 39 year old man with painful swollen right shoulder. There is hyperintense inhomogeneous signal intensity at the supraspinatus myotendinous junction. An effusion is seen*



**Figure 4b**

A more posterior scan slice showing marked effusion.  
A MR diagnosis of rotator cuff tendinosis with joint effusion was made



## DISCUSSION

Shoulder pain affects mainly adults, and those with highest incident of shoulder pathology were aged between 46 and 60 years. The incidence of shoulder pathology increases with age and this explains why this age group had more lesions. The expectation is that the age group over 60 years would have more pathology but they were few in this study compared to the 46-60 year age group.

*Lesions seen at MR imaging:* The patients studied showed predominance of lesions on the right shoulder. This is likely due to right handedness in majority of the people. A study by Krief and Huguet, involving 1079 patients found that 916 (85%) had right hand dominance and 163(15%) were left handed. Six sixty nine (62%) of these presented with pain on the right shoulder (6). This study compares well with western studies which have shown the right shoulder is more affected due to right handedness.

*Tendinosis:* In this study, this was the commonest lesion seen. It accounted for 34 (28.3%) of the total lesions seen. The supraspinatus was the most involved tendon with 23(19.2%) of the total lesions. This accounted for 67.4% of the tendinosis. Biceps had 12(10.0%) of the total lesions accounting for 35.3% of the tendinosis and suscapularis had 2(2.8%) of the total lesions translating to 5.9% of tendinosis. This lesions appeared as an inhomogeneous increase in intratendon signal intensity and thickened tendon on MR imaging.

Calcific tendinosis results from deposition of calcium in or around the tendon. In this study it was seen in four

shoulders. Though the pathogenesis of this condition is still debatable, it was grouped together with tendinosis in this study. The MR imaging finding in this condition was low foci of intratendon or peritendinous low signal on T<sub>1</sub>W and T<sub>2</sub>W sequences.

In this study, out of the 34 tendinosis lesions seen, five were in those under 30 years, between 30-45 years had nine lesions. Those between 46-60 years had sixteen lesions and they were seen in four cases among those over 60 years. Tendinosis was more common among those aged between 46-60 years with 16(13.30%) cases in this study. This agrees with a previous study by Vick *et al* (7) that showed the commonest age group affected to be 35-60 years.

*Rotator cuff tears:* A rotator cuff tear was the third most encountered lesion in this study. Tears involving the supraspinatus tendon were the commonest lesion. In Western literature, subscapularis almost always occurs exclusively in association with supraspinatus tear (6,8). In this study, two cases of subscapularis tear were seen. Isolated subscapularis tear was seen in one shoulder while in the second case, there was an associated supraspinatus tear.

The causes of rotator cuff tears are multifactorial with both the intrinsic and extrinsic factors playing a role but in this type of injury, the supraspinatus tendon is involved in most of the cases. A study by Nho *et al* (9) showed impingement factors like acromial shape, acromial spurs, and os acromiale and sports activity as some of the extrinsic factors. Intrinsic factors were noted mainly due to age related degeneration, hypovascularity, inflammation and tendon microtrauma.

*Lesions involving the cartilage and bone:* These lesions involve the cartilaginous part of the glenohumeral joint. They are the Bankart and Hill-Sach's defect. There are various subtypes of these defects. In this study, a total of 11(9.2%) of these lesions were seen. There were 4(3.3%) Bankart and seven (5.8%), Hill-Sach's lesions. These lesions are common in those with dislocation of the shoulder joint.

*Degenerative diseases:* Thirteen (10.8%) of total lesions were degenerative disease. All were seen on the right shoulder. Glenohumeral osteoarthritis is usually secondary to trauma or other disorders such as calcium pyrophosphate or hydroxyapatite crystal deposition, haemophilia, acromegaly, epiphyseal dysplasia and alkaptonuria. Association between osteoarthritis of the glenohumeral joint, rotator cuff diseases and the subacromial impingement syndrome has been documented. Rotator cuff lesions are highly associated with osteoarthritis. Kernwein, in his study found rotator cuff tear in over 90% of shoulders with osteoarthritis at arthroscopy (10). In this study among those who had osteoarthritis five had tendinosis, four had tendon tears, two had bursitis and one had a bankart lesion. Thus there is an increase in association with other pathology

in those with degenerative shoulder disease.

**Joint effusion:** Effusion in the glenohumeral cavity was encountered in 9 (7.5%) of the cases. In the right shoulder, it was seen in 3 (2.5%) cases and 6(5.0%) on the left. The presence of an effusion was associated with other lesions. It was associated with tendinosis in six cases (p-value of 0.212), with tendon tear in three cases and with fractures in two cases (p-value of 0.020). It was found in labral tears in two cases. This is a non specific finding and its finding requires meticulous investigation to find out the specific pathology (11, 12, 14, 15). One case of septic arthritis which was seen on the right had similar MR Imaging finding on non enhanced images. Septic arthritis on MRI abnormalities can be detected as early as 24hrs as joint effusion, perisynovial edema and synovial thickening.

**Tumours:** Seven (5.8%) neoplasms were seen in this study. Four (3.3%) were benign and all were cysts seen in the labrum, humerus and supraspinatus muscle. Two were malignant a fibrosarcoma and a chondrosarcoma. This was a pathological diagnosis from the referring clinician. One metastatic tumour was seen in a male patient proved to have cancer of prostate. This compares well with a study by Schlecht *et al* (17) that showed MRI can diagnose shoulder girdle tumors and show soft tissue extent

## CONCLUSION

- (i) Tendinosis was the commonest lesion seen among these patients. Tendinosis was seen most frequently on the supraspinatus tendon.
- (ii) Twenty (16.7%) of rotator cuff tears were seen in this study and were on the right shoulder. Supraspinatus had most of the tears with 17(14.1%) of the lesions.
- (iii) Degenerative disease was fairly common with 13(10.8%) lesions and was seen exclusively on the right shoulder. This condition was associated with other pathologies. Majority of the people have right hand dominance and this explains why the right shoulder is affected more than the left.

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