REVIEW ARTICLE

Musculoskeletal Ultrasound Practice: A Reflective Account of our Experience and Window of Opportunity in Nigeria and Sub-Saharan Africa

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ABSTRACT

Bearing in mind that plain radiography imaging, general ultrasound, computerised tomography (CT) scan and magnetic resonance imaging (MRI) are the common imaging modalities in public and private diagnostic practice among developing nations like Nigeria and Sub-Saharan Africa; our objective in this paper is to raise awareness and sensitize the reader that musculoskeletal (MSK) ultrasound needs to be developed and offered to patients in this part of the world. The issues discussed in this paper are a reflection of our experience in MSK ultrasound practice. Here we present the benefits of advantages of MSK ultrasound currently in practice in the western world that are yet to be explored in our native-local environment.

Keywords: *Musculoskeletal Ultrasound, Sonography, Ultrasonographers, Radiologists.*

ACKNOWLEDGMENT

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INTRODUCTION

Currently, training in plain radiography imaging, general ultrasound, CT and MRI form the standard components of our radiography and radiology residency programs in Nigeria and Sub-Saharan Africa. With cross-sectional imaging involving CT and MRI used to revolutionise diagnostic imaging; and the rapid improvements in technology in sonographic technology, MSK ultrasound service is widely used in the UK, Western Europe and North America. However, its use in Nigeria and other sub-Saharan Africa countries is almost non-existent.

The Benefits of MSK Ultrasound Experienced in Practice

Our experience in practice has shown that: MSK sonography has the advantage of extended field of view (EFOV) during scanning; it allows real-time dynamic examination of joints; and it can be used to bilaterally compare different body anatomy[1]. It also has strong abilities to image in real time, diverse dynamic osteo-articular pathologies such as femoral acetabular impingement, shoulder impingement syndrome, snapping hip syndrome, peroneal tendon subluxation, tendon gliding abnormalities, intersection syndrome and ulnar nerve dislocation[2].

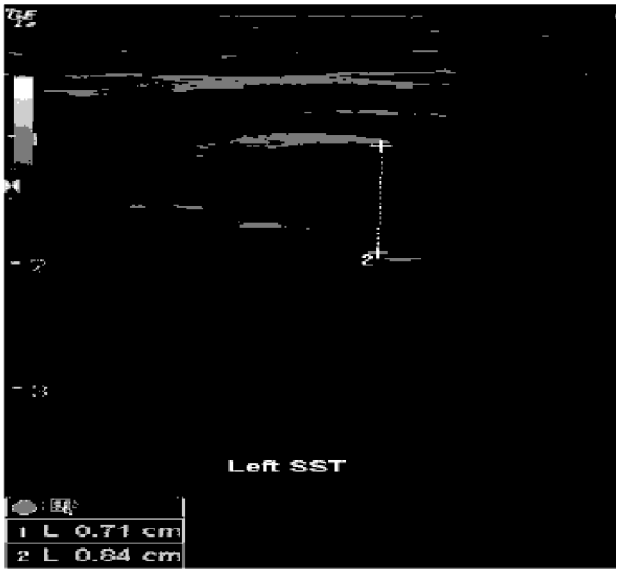

Fig. 1

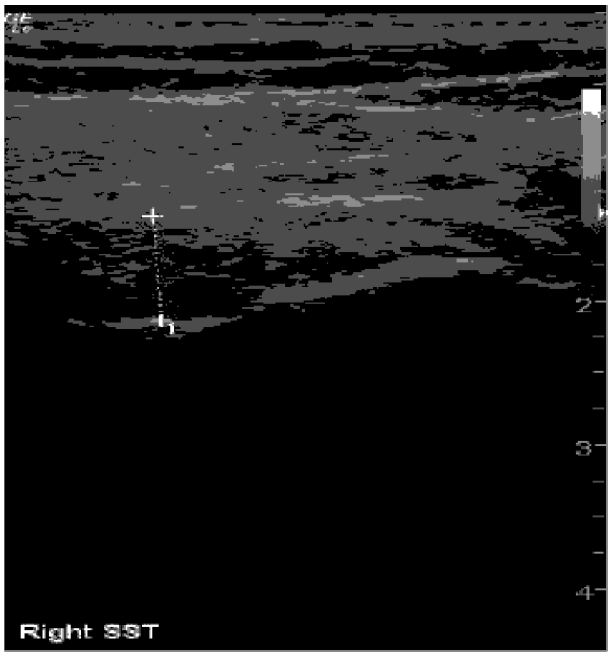

Fig 1-2. Comparative assessment of the SST in the same patient showing difference in thickness of the SST

While many of these abnormalities may simply be shown on static CT scan, MRI or plain radiography images; it is needful to point out that detailed wealth of information about the status of the ligaments; articular cartilages and joints spaces can be obtained with stress dynamic sonography performed during stress movements such as valsalva manouevers, flexion and extension of the elbows and knee joints. This would otherwise not be possible with these other imaging modalities.

From our current experience in MSK ultrasound and MRI practice, one can arguably say that most MSK abnormalities are not highlighted when the patient is at rest. This makes the evaluation of such abnormalities using CT, MRI or x-ray limited as most patients are either lying down or sitting up when examined[3]. A patient may feel pain, hear a clicking sound, feel a mass, or other symptom that occur only when specific movements are undertaken

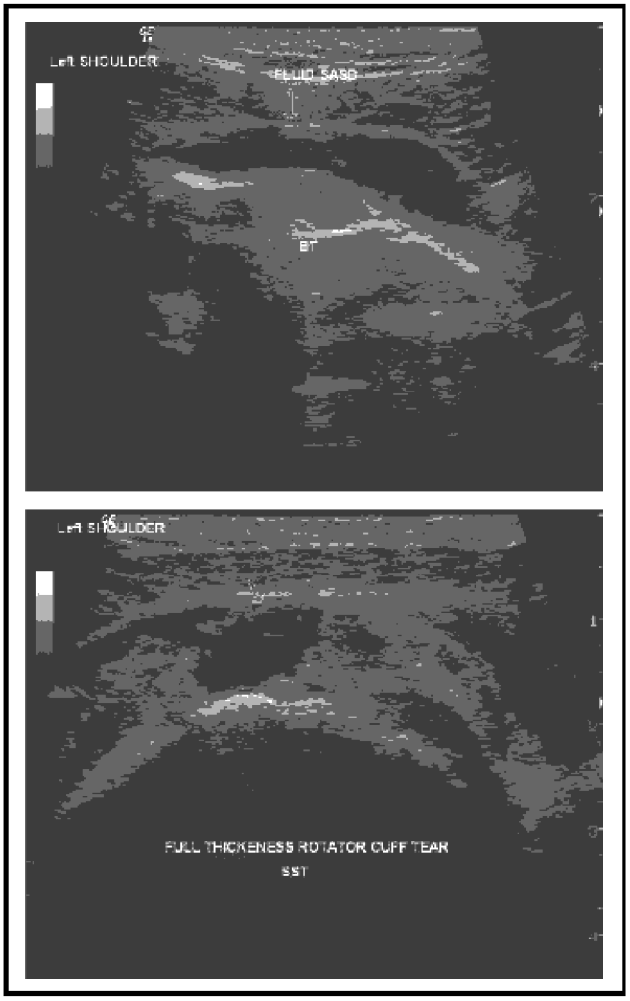

Fig 3-4. Presence of bursa fluid collection to be drained using ultrasound guided approach in a shoulder with full thickness tear of the SST of the rotator cuff

In patients with unusual body habitus, there is a wide degree of anatomic variability in the musculoskeletal system. It is needful to bilaterally compare the body parts in order to detect a unilateral or bilateral abnormality which may be present. For example, it is easy to relatively compare the shoulder ligaments and tendons in a patient if one is in doubt of the thickness or otherwise of its morphology. This is vital as the MSK practitioner keeps in mind that MSK abnormalities may be bilateral even if the symptoms are unilateral. Although cross sectional and plain radiography imaging have a dynamic field of view (FOV) for a given anatomic segment[4], sonography has a better advantage in that the ultrasound probe can be moved extensively from one anatomic segment to another because of its EFOV facility.

For example, ultrasound can be used to trace the whole length of the ulnar nerve in a patient with ulnar neuropathy along the upper extremity. Common sites of compressive neuropathy such as the cubital tunnel, carpal tunnel and Guyon's canal can also be imaged in rapid succession. The same could be used for flexible assessment of the gastrocnemius muscle and tendon, the supra and infra patellar tendons in the knee.

Our experience and literature review of published tutorials of renowned MSK practitioners also indicate the following: sonography can resolve finer details better than CT, MRI & plain-radiography; the ultrasound probe can be used to compress a superficial mass[5]; and it is better for highlighting internal complexity of masses. An unparallel advantage of real-time sonography over plain radiography imaging, MRI and CT is its ability to be used in guiding a wide range of interventional procedures. Such procedures include subacromial subdeltoid bursal injection, supraspinatus calcification barbotage, acromioclavicular joint injection, shoulder arthrography/injection, intra-articular elbow injection, tendon sheath injection, knee joint aspiration and synovial biopsy, Morton's neuroma injection, carpal tunnel injection, aspiration and injection of the adult hip, adductor origin and symphyseal injection, etc.

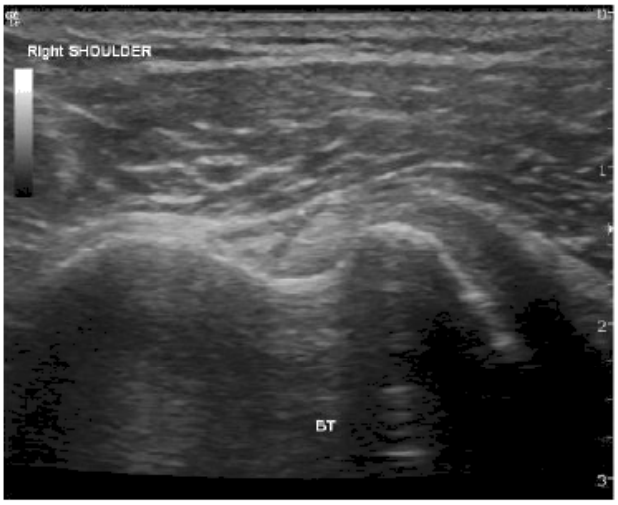

Fig 5

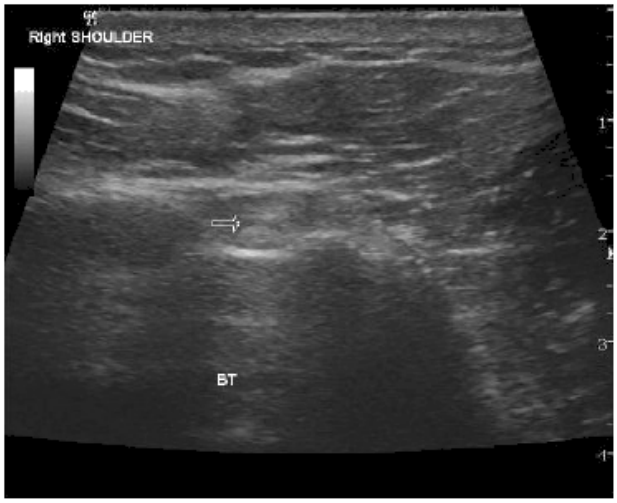

Fig 5-6. LHBT in the bicipital grove seen on dynamic assessment of the shoulder joint

These procedures can be undertaken within a few minutes relative to the extensive time and preparations required to undertake say, a fluoroscopic arthrography either in the theatre or in a dedicated x-ray room. It also has the advantage of avoiding the radiation exposure both to the patient and to the radiologist and the radiographer who may have to undertake this procedure ether as a CT scan guided procedure or x-ray arthrography[6]. Fine needle aspiration cytology (FNAC) and biopsies are best undertaken using ultrasound relative to these other imaging modalities. From the patient's standpoint, MSK ultrasound provides a unique opportunity to both diagnoses and treatment in one session. A patient can arrive in the ultrasound department in pain, have the diagnosis made, and by virtue of a sonographically guided intervention, leave the department already on the road to recovery. Such "one-stop shopping" is more difficult to achieve with these other imaging modalities.

With the use of high-frequency probes (7-18 MHz) MSK sonography can detect with better clarity, tiny abnormalities that simply cannot be shown by CT scan, MRI or plain radiography. The axial resolution of a 12-16 MHz probe is much better and is currently being used in evaluating soft tissue lipomas, carpal tunnel syndromes, rotator cuff tears and insertional enthesopathies of ligaments and tendons. Calcification and neovascularisations of tendons are also best

examined with high frequency probes. These abnormalities would not be seen on plain radiography films. More so, the fibrillar echotexture of tendons, produced by ultrasound are not comparable to that of MRI or CT. Our experience also indicates that many pathologies on MSK such as rotator cuff tears, ganglions, pre-, supra-and infra-patellar bursitis may either be asymptomatic or symptomatic. Placing the high frequency ultrasound probe directly over the source of the pain increases the likelihood of detecting the abnormality and ensures that the sonography report will be clinically relevant. This point is balanced by the use of skin markers by experienced MRI operators. Such skin markers guide the reporting radiologists to the source of pain as this may not be identified within the field of view of the MRI images if this was not done.

What About Doppler Sonography?

Colour Doppler, power Doppler and spectral Doppler sonography are important complements to gray-scale sonography[7]. This is because they provide physiologic information about blood flow that would otherwise not be shown with plain radiography imaging, MRI and CT scan. This helps to increase confidence about the status or nature of a patient's pathology and abnormalities as subtle blood flow patterns to the organ or area of pain are evaluated[8].

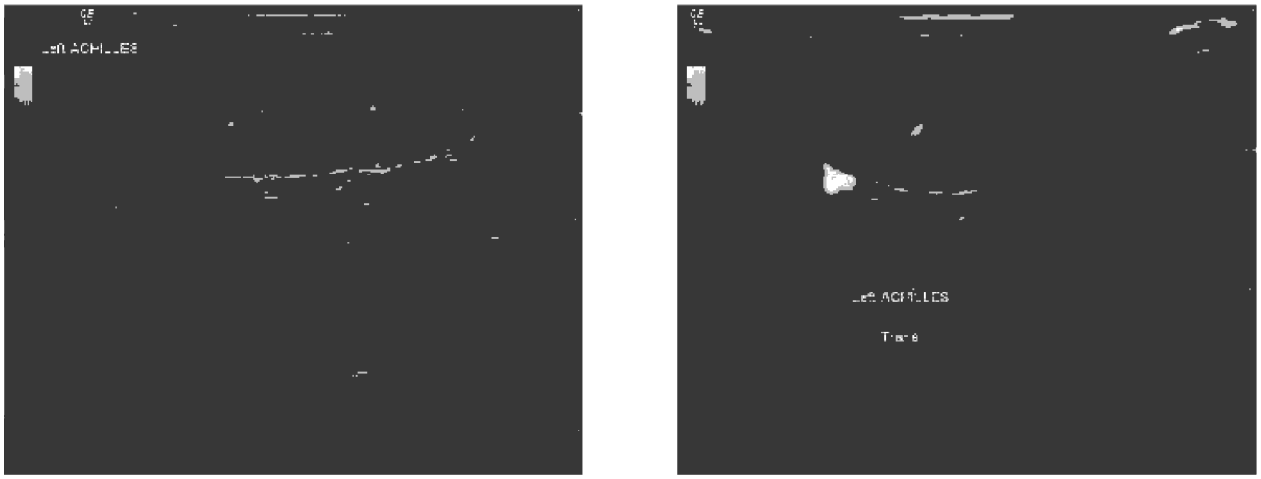

Fig 4. Blood flow indicating neovascularisation of the Achilles tendon in a patient with Achilles tendinopathy

Although hyperaemia can also be detected on contrast-enhanced CT scan and MRI, sonography provides a better resolution of small blood vessels and can differentiate arterial vessels from venous vessels. Doppler sonography is useful in characterizing superficial vascular malformations and soft tissue masses that are hypoechoic and simulate cysts on grey scale sonography, and the presence of internal Doppler flow can confirm their solid nature. Available research shows that characterising rheumatoid and inflammatory arthritis with Doppler sonography has been well documented to be effective in the management of such conditions[9]. The presence of septation and fibrins in soft tissue pathologies such as postoperative collections, baker's cysts, parameniscal cysts, paralabral cysts, and ganglion cysts are best investigated using MSK ultrasound. These and many other cystic collections are clearly differentiated with their internal consistency better visualised to be indicative of abscesses, blood or clear fluids. The quality of the images obtained on ultrasound may sometimes be of better quality than either the T2-weighted or T1-weighted pre and post contrast enhanced MRI images[10].

CONCLUSION

With the advantages of MSK ultrasound discussed above, it is necessary that our radiographer and radiologist ultrasound practitioners in Nigeria and other Sub-Saharan Africa countries embrace it so that patients in this

part of the world can reap its benefits like others in the UK, Europe and North America. This is mindful of the established fact that plain radiography imaging, MRI and CT scan are the current imaging reference standard for a wide range of musculoskeletal disorders in our native environment. Besides it could serve as an important complementary if not an alternative technique to these other imaging modalities.

REFERENCES

1. Nazarian L. N. The Top Ten Reasons Musculoskeletal Ultrasound is an Important Complementary or Alternative to MRI. AJR 2008; 190: 1621-1626.

2. Kijowski R, DeSmet AA. The role of ultrasound in the evaluation of sports medicine injuries of the upper extremity. Clinical Sports Med. 2006; 25:569-590.

3. Brenchley J, Walker A, Sloan JP, Hassan TB, Venables H. Evaluation of focussed assessment with sonography in trauma (FAST) by UK emergency physicians. Emerg Med J 2006; 23:446-448.

4. Sofka CM, Adler RS. Sonographic Evaluation of shoulder arthroplasty. AJR 2003; 180:1117-1120.

5. Kane D, Balint PV, Sturrock RD. Ultrasonography is superior to clinical examination in the detection and localization of knee joint effusion in rheumatoid arthritis. J Rheumatol 2003; 30:966-971.

6. McShane JM, Nazarian LM, Harwood MI. US-guided percuteneous needle tenotomy for treatment of common extensor tendinosis in the elbow. J Ultra Med 2006; 25:1281-1289.

7. Joines MM, Motamedi K, Seeger L, DiFiori JP, Musculoskeletal interventional ultrasound. Semin Musculoskeletal Radiol 2007; 11:192-198.

8. Bangard C, Paszek J, Berg, et al., 2007. MR imaging of claustrophobic patients in an open 1.0T scanner: motion artefacts and patient acceptability compared with closed bore magnets. Eur J Radiology 2007; 64: 152-157.

9. Reiter M, Ulreich N, Dirisamer A, Tscholakoff D, Bucek RA. Colour Doppler and power Doppler sonography in symptomatic Achilles tendon disease. Int J sports Med 2004; 25:301-305.

10. D'Agostino MA, Mailefert JF, Sais-Nahal R, Breban M, Ravaud P, Dougados M. Detection of small joint synovitis by ultrasonography: the learning curve of rheumatologists. Ann Rheum Dis 2004; 63:1284-1287.