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# A Retrospective Analysis Of Referral Pattern From General Practitioners For Musculoskeletal Ultrasound To A Tertiary Centre

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## Abstract

Referrals from general practitioners form a significant workload on an ultrasound department and the waiting list for these examinations is often significant. There are no specific guidelines in available literature for referral for musculoskeletal ultrasound by general practitioners.

## Aim

This study aims to evaluate the pattern of general practitioner referrals for musculoskeletal ultrasound, and if the examination resulted in change in patient management. Based on this evaluation, possible guidelines for future referrals are suggested.

## Materials and methods

A retrospective analysis of primary care referrals for musculoskeletal ultrasound across the University Hospitals of Leicester was carried out over a period of two years (01/01/2004 to 31/12/2005). The requests and results were retrieved from the radiology information system (CRIS). The sample size for this study was 112 examinations. The requests were classified according to region imaged (shoulder, elbow, wrist/hand, knee, ankle and lumps), and analyzed for the presence of clinical details, prior imaging, findings of the ultrasound examination and further specialist referral, if suggested.

## Results

Majority of the requests (>95%) were legible and mentioned appropriate clinical details.

The most frequent referrals were for ultrasound of the shoulder (36%) and lumps/bumps (29%). Overall, 76.8% (86/112) ultrasound examinations showed positive findings, and specialist referral was suggested in 28.6% (32/112).

## Conclusion

Musculoskeletal ultrasound proved to be a useful examination and affected further management in this group of patients. The role of plain radiographs in chronic shoulder pain and specific indications in other regions is emphasized. Guidelines are suggested for referral of patients for musculoskeletal ultrasound by primary care physicians.

## INTRODUCTION

Ultrasound has emerged as a useful imaging technique for evaluating soft tissue and joint related abnormalities. Technical improvements in ultrasonography which include compound linear array technology, improved computer processing and power Doppler, have led to widespread use of this modality in a variety of disease conditions relating to the musculoskeletal system. Primary care physicians have open access to musculoskeletal ultrasound in many centers. There are, however, no specific guidelines for referral for musculoskeletal ultrasound by general practitioners in available literature. This study aims to evaluate the referral pattern from general practitioners for musculoskeletal ultrasound and suggest possible referral guidelines.

## MATERIALS AND METHODS

A retrospective analysis of primary care referrals for musculoskeletal ultrasound across the University Hospitals of Leicester, over a period of two years (01/01/2005 to 31/12/2006) was carried out. The request forms were retrieved from the radiology information system (CRIS). All examinations were carried

out by specialist consultant radiologists. A total of 112 requests were grouped according to the region imaged (shoulder, elbow, wrist/hand, knee, ankle and lumps/bumps), and analyzed for the presence of clinical details and legibility, any relevant prior imaging like plain radiographs, findings of the ultrasound examination and further specialist referral, if suggested. The aim was to ascertain if the requests were appropriate and resulted in change in management of the patient.

## RESULTS

A total of 112 requests from general practitioners were examined from 01/01/2005 to 31/10/2006 and sonographic findings were reviewed. The study group included 63 females and 49 males, ranging from 16 to 81 years of age. Reports were grouped into shoulder (41), lumps and bumps (31), wrist and hand (17), knee (8), ankle (12) and elbow (3). Majority of the requests (>95%) were legible and mentioned appropriate clinical details. Overall, 76.8% (86/112) ultrasound (US) examinations showed positive findings. Specialist referral was suggested in 28.6% (32/112) of the examinations. The request was

considered inappropriate in 2.7% (3/112) of cases. These included two patients with previous history of injury and a patient with suspected thoracic outlet syndrome - none had prior plain films, ultrasound was thought to be an inappropriate first line investigation.

The most frequently requested examination was ultrasound of the shoulder in 41(36%) cases. Majority of these, 63% were for suspected rotator cuff pathology, 20% for non specific shoulder pain and 17% referrals were for evaluation of lumps in the region of the shoulder. All 3 patients with suspected acute tear showed large tear of the supraspinatus at US. In patients suspected with chronic cuff tear/shoulder pain, in 8(29.6%) US showed complete or partial tendon rupture, 7(26.7%) showed supraspinatus tendinopathy with calcification, 1(3.7%) proximal biceps myotendinous disruption, and 12(44.4%) showed no significant abnormality. Plain radiograph of the shoulder was done in 2 patients with suspected chronic rotator cuff tear, but in none of the patients with suspected acute cuff tear. The remaining 7(17.1%) requests for lumps in the shoulder region showed a ganglion cyst associated with osteoarthritis of the acromio-clavicular joint, large subacromial bursa with complete cuff tear, capsular prominence with sterno-clavicular joint osteoarthritis, and two suspected lipomas.

The next major fraction of 31(29.2%) referrals was for lumps and bumps at various locations. Of these examinations, 52% were lipomas, 1(3.2%) each showed suspected sarcoma, multiple abscesses, foreign body and fat necrosis. No lump was seen in 32% of examinations. One patient with suspected thoracic outlet syndrome had ultrasound as a first line examination to exclude a fibrous band, this was considered an inappropriate request.

Ultrasound of the hand/wrist was requested in 17(16%) patients. The clinical diagnosis

was swelling in the region of wrist/fingers in 9, tenosynovitis in 4, pain interphalangeal joint/ thumb/wrist in 3, and suspected foreign body in 1 patient. 82% of these examinations detected an abnormality (2 ganglia, 1 tenosynovitis, 1 lipoma, 1 hypertrophied muscle, 1 tendonitis, one indeterminate mass dorsal to extensor tendons and 2 were normal). These requests were thought to be appropriate. Two requests were for pain with previous history of injury - one showed non union of scaphoid and the other was a normal examination. Neither of these had previous plain films, and ultrasound was thought to be inappropriate as a first line investigation in these patients.

Ultrasound of the ankle was requested in 12(10.7%) patients; 5(41.7%) for achilles tendinopathy, 4(33.3%) for heel/ankle pain, 1(8.3%) suspected foreign body and 2(16.7%) were for lumps in the foot. One examination for achilles tendon showed tendinopathy, for heel pain showed plantar fasciitis, hind foot pain showed tibialis posterior tenosynovitis, suspected foreign body showed post traumatic plantar fibromatosis and swellings in the region of the foot were found to be a lipoma and ganglion in one patient each.

Three (3%) referrals for US of elbow were for lumps in the cubital fossa. One showed a pseudoaneurysm of the ulnar artery, one was calcific tendinopathy of the triceps, and the third was normal. Eight (7%) referrals for US of the knee were also for lumps around the knee. The findings at US included a meniscal cyst, subcutaneous neurogenic tumour (both were referred for MRI) and lipomas.

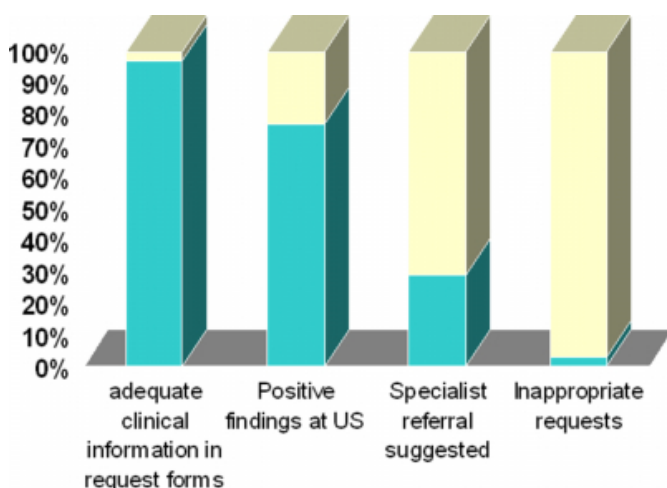
## **DISCUSSION**

During the period of this study (2005/2006), the average waiting time for a routine outpatient musculoskeletal ultrasound was 18-27weeks across the University Hospitals of Leicester. In the absence of specific guidelines for referral by general practitioners, this study was undertaken to evaluate the referral pattern of

general practitioners, and to find out if these examinations resulted in any change in patient management. 76.8% of US examinations showed positive findings and specialist hospital referral was suggested in 28.6% of patients (fig1).

**Figure 1**

Figure 1: Summary of general practitioner request pattern for musculoskeletal ultrasound



Ultrasound proved to be a useful intermediate screening modality between the primary care physicians and hospital specialists, reducing hospital referrals by more than 70%.

The present analysis is on a sample of 112 referrals for musculoskeletal US over 2 years to a tertiary hospital in the UK. The examinations included shoulder, lumps, wrist/hand, knee, ankle and elbow. However, majority of the referrals (62.5%) were for shoulders and lumps at various locations. The number of referrals for elbow, ankle and knee were relatively small. Studies with larger numbers in these subgroups would be more representative. The referrals were from general practitioners which included those with specialist interest in musculoskeletal disorders. This factor may influence the results of this study. This study also does not follow up further clinical course of the referred patients. This would need to be addressed in order to formulate formal guidelines. This is a limitation of this study, and larger studies will be needed to

address this.

## SHOULDER

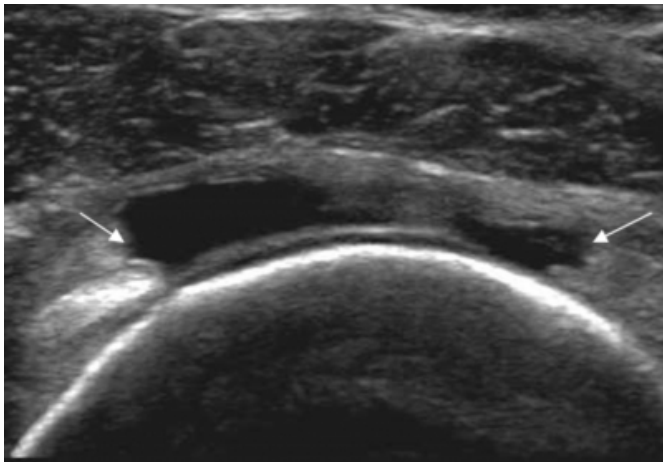
In the shoulder, ultrasound is widely used to diagnose and characterize rotator cuff and biceps tendon pathology. Ultrasonography is highly accurate in detecting full thickness rotator cuff tears, characterizing their size and extent and visualizing dislocations of the biceps tendon with an overall accuracy of 96 percent (sensitivity of 100%, specificity 85% for full thickness tears with arthroscopy as gold standard) <sup>2</sup>. It is less sensitive in detecting partial thickness rotator cuff tears. Non-rotator cuff abnormalities are also amenable to US examination, including instability of the biceps tendon, glenohumeral joint, and acromioclavicular joint, arthropathies and bursitis (inflammatory diseases, degenerative and infiltrative disorders, infections), nerve entrapment syndromes, and space-occupying lesions <sup>3</sup>. Many of these conditions can mimic rotator cuff tears; US can help redirect the diagnosis in these conditions.

Some causes of impingement may be apparent on radiographs, which should be considered if a patient shows no improvement after two to three months of conservative therapy for presumed impingement syndrome <sup>4,5</sup>. Degenerative changes at the acromioclavicular (AC) joint, curved or hooked acromion, AC spurring and a thickened coracoacromial ligament, sclerosis and osteophyte formation at the inferior aspect of the acromion and sclerosis or cyst formation at the site of supraspinatus tendon insertion into the greater tuberosity raise the suspicion of impingement and chronic rotator cuff tears. Following appropriate plain radiographs, high-resolution US should be the first-line imaging modality in the assessment of rotator cuff as well as non-rotator cuff disorders of the shoulder.

In our study, overall 75.6% shoulder US examinations revealed positive findings (fig 2,3).

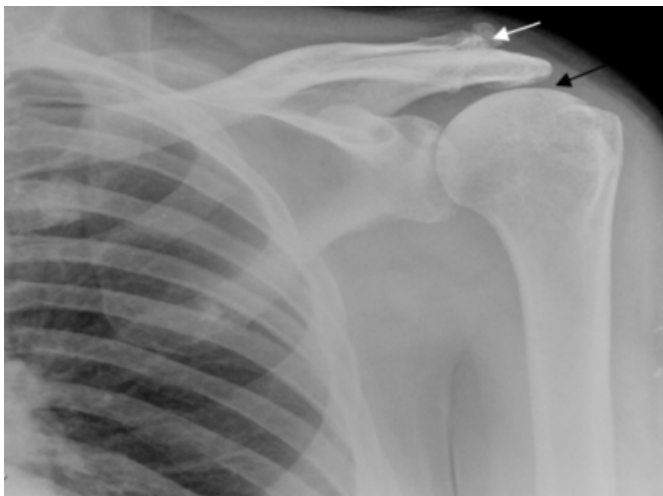
**Figure 2**

Figure 2: Ultrasound image of the rotator cuff showing full thickness supraspinatus tear (arrows)



**Figure 3**

Figure 3: Plain radiograph of the shoulder (antero-posterior view) in the same patient showing reduced subacromial space (black arrow) and acromioclavicular joint osteoarthritis (white arrow).



All patients with suspected acute rotator cuff tear showed a complete tear at US, 74% referrals for chronic cuff tear/shoulder pain showed positive findings at US, and 85.7% of referrals for lumps in shoulder region were positive at ultrasound. Specialist referral was suggested in 39% (16/41) of examinations.

Conditions appropriate for referral for a shoulder ultrasound include suspected rotator cuff pathology, investigation of unexplained, undiagnosed shoulder pain lasting more than 3 months (with no features to suggest infection or malignancy) and lumps related to the shoulder, without any aggressive

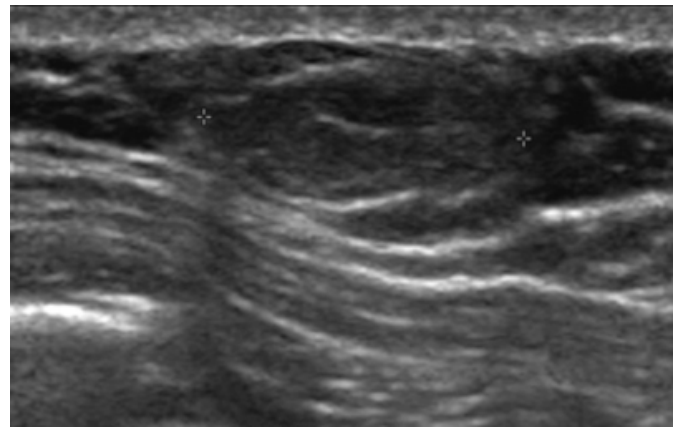
features.

## LUMPS

Referrals for US of lumps and bumps at various locations were the second most common after shoulder referrals. 74.2% (23/31) referrals showed positive findings at the ultrasound examination, majority (52%) of these were lipomas (fig 4).

**Figure 4**

Figure 4: Subcutaneous encapsulated lipoma (between calipers) with no vascularity on Doppler.



Specialist referral was suggested for 9.7% (3/31) patients. Ultrasound in one patient with suspected thoracic outlet syndrome without prior plain radiographs was considered inappropriate.

For primary care physicians, US has a definite role in confirmation of existence of a mass lesion. It is not uncommon that palpable lumps simply represent asymmetry of subcutaneous fat or palpable normal anatomical structures. The role of ultrasound in characterizing mass lesions is more limited to differentiating cystic from solid lumps. Ultrasound is accurate in assessment of periarticular and peritendinous soft-tissue mass lesions, and is regarded as the investigation of choice for confirming the presence of ganglia. Solid mass lesions, particularly those deep to the investing fascia, generally need referral to a soft-tissue tumour surgeon and then further investigation with MRI.

A large fraction of subcutaneous solid lesions represent lipomas. Ultrasound can confirm the presence of these lesions, and as they are isoechoic to subcutaneous fat, a diagnosis of

lipoma can be suggested, although a specific diagnosis is not usually possible. On the other hand MRI can readily diagnose lipomas and separate those with features more likely to correlate with atypical histology/liposarcoma. Subcutaneous lipomas being fairly common, MRI of these lesions is not considered necessary in most cases. MRI is reserved for subcutaneous lesions that are large or changing in size, or otherwise of concern. This is usually a clinical decision.

Based on these factors, specialist referral and not ultrasound, is appropriate with further MRI, if a lump is larger than 5 cm, irrespective of depth and location; if it is located in the thigh, irrespective of depth and size; or is deep to the investing fascia, irrespective of location and size<sup>8,9</sup>. Lumps with aggressive clinical features need hospital referral in the first instance.

## **OTHER JOINTS**

Ultrasound proved a useful examination in the wrist, hand, ankle and knee. 82.4% (14/17) referrals for US of the hand/wrist showed positive findings, and further specialist referral was suggested in 41.2% (7/17) patients. Two requests in patients with previous injury had no prior plain radiographs done, one of which showed a scaphoid fracture on US (Fig 5a,b). These requests were considered inappropriate.

### **Figure 5**

Figure 5a: Right scaphoid fracture suspected at ultrasound in a patient with history of previous injury (5a), confirmed with plain radiographs (5b).



Ultrasound is a useful modality for investigating many structures of the hand, wrist, ankle and knee. It is best used when the problem is well localized and when the clinical question is relatively specific<sup>10</sup>. Patients with diffuse symptoms and poorly defined clinical questions are

generally best evaluated with MRI. Conditions appropriate for US include suspected synovitis, tendinopathy, tenosynovitis and lumps around the joints.

Tenosynovitis refers to inflammation of the tendon sheath and can be caused due to inflammatory conditions like rheumatoid arthritis as well as gout which is a cause of crystalline tenosynovitis. De Quervain disease and trigger digit are two of the more common types of idiopathic tenosynovitis. Tenosynovitis can be diagnosed at US when there is fluid distending the tendon sheath, which may be thickened and may show increased vascularity in active inflammation.

The most common cause for palpable lumps in the hand is ganglion cysts. They present with localised pain (small ganglia) or a palpable lump (large ganglia). The sensitivity of US in detection of ganglia is comparable to magnetic resonance imaging, about 90% in the wrist. False negatives are usually caused by small ganglia<sup>11</sup>. In addition to diagnosis, ultrasound can be used to guide aspiration and steroid injections into the ganglia. In the vast majority of cases, this produces symptomatic relief<sup>12</sup>.

Ultrasound is useful in evaluation of the Achilles tendon. A wide range of pathologies from mild peritendonitis to full-thickness tendon rupture can be diagnosed<sup>13</sup>.

Ultrasound can also be used to differentiate full-thickness tear from partial-thickness tear or tendinosis of the Achilles tendon with 92% accuracy<sup>14</sup>. Undetectable tendon at the site of injury, tendon retraction and posterior acoustic shadowing at the ends of the torn tendon are characteristics that can be used to aid in the sonographic diagnosis of a full-thickness tear of the Achilles tendon.

## **CONCLUSION**

Musculoskeletal ultrasound proved to be a useful examination and affected further management in this group of patients. The role of plain radiographs in chronic shoulder pain and specific indications in other regions is emphasized. Possible guidelines are suggested for referral of patients for musculoskeletal ultrasound by primary care physicians (Table 1).

**Figure 6**

Table 1: Suggested guidance for primary care referral for musculoskeletal ultrasound

Shoulder	Suspected rotator cuff pathology.
	Investigation of unexplained, undiagnosed shoulder pain lasting more than 3 months (with no features to suggest infection or malignancy).
	Lumps related to the shoulder joint (with no aggressive features).
Wrist/hand/ ankle/knee	Suspected synovitis, tendinopathy, tenosynovitis and lumps around the joints are appropriate for referral for ultrasound.
	When there is history of previous injury or suspected foreign body, plain radiographs should be done as a first line investigation.
Lumps/bumps	For subcutaneous solid lesions, ultrasound is able to confirm their presence, a specific diagnosis is not usually possible. MRI is reserved for subcutaneous lesions that are large or changing in size <sup>(3)</sup>
	Specialist referral suggested, with further MRI, if lump is – (a) larger than 5 cm, irrespective of depth and location, (b) located in the thigh, irrespective of depth and size, or (c) Deep to the investing fascia, irrespective of location and size <sup>(4,5)</sup>
	Ultrasound is appropriate for non specific lumps (foreign body, ganglion, bursitis and others).
	Lumps with aggressive clinical features need hospital referral in the first instance.

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