

The Synapse

The Medical Professionals' Network

M E D I C A L I M A G I N G

Ultrasound Evaluation of the Shoulder

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High-resolution real-time ultrasound US has been shown to be a successful imaging modality for both rotator cuff and non-rotator cuff disorders. Advances in technology have substantially improved US image quality, producing spatial resolution the may exceed that obtained with magnetic resonance imaging. Also, US is inexpensive, fast, and offers dynamic capabilities for examining the patient in multiple scanning planes and specific arm positions or during movements. Ultrasound also allows one to focus the examination on the precise region of maximum discomfort as indicated by the patient.

The rotator cuff consists of four muscles and their tendons: subscapularis, supraspinatus, infraspinatus, and teres minor. Non-rotator cuff structures include the long head of biceps tendon, the subdeltoid bursa and the acromio-clavicular joint.

All rotator cuff tendons are readily visualised with ultrasound (Figures 1-3). The tendon of



Figure 1. The subscapularis tendon (arrows) demonstrates an internal fibrillar pattern and lies below the deltoid muscle anterior to the shoulder joint.



Figure 2. Supraspinatus tendon is seen as an echogenic band superior to the humeral head, with a convex upper surface; it tapers toward the greater tuberosity. The arrow indicates a hypoechoic area due to tendon anisotropy.

the long head of the biceps is also well visualized within the bicipital groove (Figures 4 & 5).

Rotator cuff abnormalities represent a spectrum ranging from tendinosis to massive tear. Tendinosis is tendon degeneration without clinical or histologic signs of inflammatory response, and on ultrasound the tendon shows a diffuse heterogeneous hypoechoogenicity (Figure 6).



Figure 3. The infraspinatus tendon (arrows) lies posterior and inferior to the supraspinatus tendon on the posterior aspect of the humeral head. Double arrows outline the glenoid labrum.



Figure 4. Biceps tendon, longitudinal view (arrows) is seen as an echogenic structure with an internal fibrillar pattern.

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Editor's Word

Welcome to another interesting issue of The Synapse Magazine, which actually marks its sixth anniversary. Apart from the regular contributions on radiology and avian influenza, you will find articles on **The Pharmacy of Your Choice** scheme by Mary Ann Sant Fournier, Part I of **Unravelling the Tangle of Genetic Testing** by Dr Chris Scerri and the second and last part of the article discussing the controversial topic – **Data Protection Act**, presented by Professor Pierre Mallia. You will also find articles by Dr Edgar Pullicino on **Treating Gastro-oesophageal reflux disease with sense** and by Dr Charmaine Gauci discussing the **450 daily cases of Infectious Intestinal Disease in Malta**. Furthermore, as part of the series of contributions on stress management, we proudly present the first **Letter from Your clinical psychologist**.

In this issue we get to meet Dr Victor Calvagna, who is often seen on our local media representing the Puttinu Cares Support Group.

Wilfred Galea

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Figure 5. Biceps tendon in transverse view (BT) lies below the coraco-humeral ligament (CHL, arrows) and between the supraspinatus (SS) and subscapularis (SSC) tendons.



Figure 6. Supraspinatus tendonitis appears as heterogeneous echogenicity without any focal area representative of a tear.



Figure 7. Complete tear of the supraspinatus tendon with retraction; note that there is no supraspinatus tendon between the deltoid muscle and humeral head.



Figure 8. A full-thickness tear is seen in the supraspinatus tendon involving the anterior aspect of the tendon. The defect fills with anechoic joint fluid.

With a full thickness tear of the supraspinatus tendon, the tendon is absent on longitudinal view and the deltoid muscle lies in contact with the humeral head (Figure 7). A full thickness tear may only involve part of the tendon, where the tendon defect fills with joint fluid (Figure 8).

A partial-thickness supraspinatus tendon tear may lie either on the articular or the bursal surface of the tendon. An articular-side partial-thickness tear appears as a distinct hypoechoic or mixed hyper-hypoechoic defect of the articular surface (Figure 9). A bursal-side partial-thickness tear produces flattening of the bursal surface, with loss of the superior convexity of the tendon (Figure 10).

Secondary US signs of a tendon tear are surface irregularity of the greater tuberosity (Figure 10) and the presence of fluid in the joint and the bursae (Figure 12). Essential information for the orthopaedic surgeon includes characterization of the tear, the dimensions and location of the tear, and the amount of tendon retraction on the longitudinal view.



Figure 9. Supraspinatus tendon, longitudinal view shows an articular-side partial-thickness tear as a distinct hypoechoic defect (arrow) at the tendon's articular surface.



Figure 10. Supraspinatus tendon articular side partial thickness tear may present as cortical bone irregularity (arrows) at the greater tuberosity. (S = supraspinatus, I = infraspinatus.)



Figure 11. Greater tuberosity, transverse view. A massive fluid collection (FL) is seen in the subdeltoid bursa.

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Figure 12. Subscapularis tendonitis with calcification (arrows).

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Calcific tendinitis is a common disorder caused by deposition of calcium hydroxyapatite crystals in various shoulder tendons. The cause is considered to be dystrophic, and all tendons can be affected, although the most common site is within the supraspinatus tendon near its insertion (Figure 12).

Long head of biceps tendonosis is seen as thickening of the tendon within the bicipital groove (Figure 13). A long head of biceps tear results in an empty bicipital groove due to tendon retraction (Figure 14).

High-resolution US has been shown to be an efficient imaging modality for the assessment of a wide spectrum of rotator cuff and non-rotator cuff disorders. It is fast and



Figure 13. LHBT, transverse view. The biceps tendon is enlarged with an inhomogeneous echotexture in keeping with tendinosis.

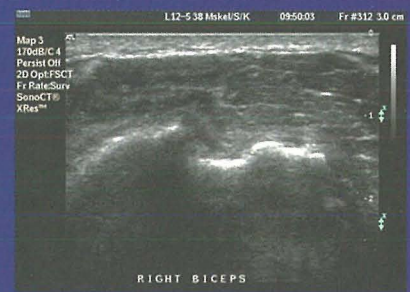


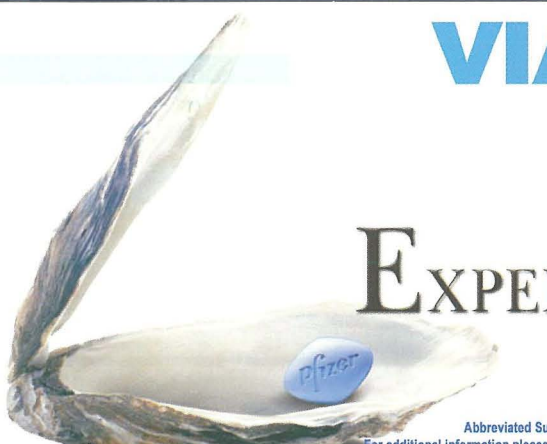
Figure 14. LHBT, transverse view. Chronic rupture results in absence of the tendon from the bicipital groove.

inexpensive and allows dynamic assessment of the joint. It may also be used to guide interventional procedures.

The above short review serves as a pictorial demonstration of the most common disorders in the rotator cuff and surrounding tendons as shown on ultrasound. Ultrasound has become a very valuable tool in the assessment of musculo-skeletal disorders. Further musculo-skeletal applications of ultrasound will be discussed in coming articles.

Acknowledgement: The author would like to thank Dr Martin Borg suggesting the theme of the above article. Further suggestions for future articles from other colleagues would be greatly appreciated. ☐

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VIAGRA 25 mg, 50 mg & 100 mg film-coated tablets. Each tablet contains 25 mg, 50 mg or 100 mg of sildenafil, as the citrate. VIAGRA tablets also contain lactose. The 25 mg tablets are blue film-coated, rounded diamond-shaped tablets, marked "PFIZER" on one side and "VGR 25" on the other. The 50 mg tablets are blue film-coated, rounded diamond-shaped tablets, marked "PFIZER" on one side and "VGR 50" on the other. The 100 mg tablets are blue film-coated, rounded diamond-shaped tablets, marked "PFIZER" on one side and "VGR 100" on the other. INDICATIONS Treatment of men with erectile dysfunction, which is the inability to achieve or maintain a penile erection sufficient for satisfactory sexual performance. In order for VIAGRA to be effective, sexual stimulation is required. POSOLOGY AND METHOD OF ADMINISTRATION For oral use. Use in adults: The recommended dose is 50 mg taken as needed approximately one hour before sexual activity. Based on efficacy and toleration, the dose may be increased to 100 mg or decreased to 25 mg. The maximum recommended dose is 100 mg. The maximum recommended dosing frequency is once per day. If VIAGRA is taken with food, the onset of activity may be delayed compared to the fasted state. Use in the elderly: Dosage adjustments are not required in elderly patients. Use in patients with impaired renal function: The dosing recommendations described in 'Use in adults' apply to patients with mild to moderate renal impairment (creatinine clearance = 30 - 50 ml/min). Since sildenafil clearance is reduced in patients with severe renal impairment (creatinine clearance < 30 ml/min) a 25 mg dose should be considered. Based on efficacy and toleration, the dose may be increased to 50 mg and 100 mg. Use in patients with impaired hepatic function: Since sildenafil clearance is reduced in patients with hepatic impairment (e.g. cirrhosis) a 25 mg dose should be considered. Use in children: VIAGRA is not indicated for individuals below 18 years of age. There is no relevant indication for use in children. Use in patients using other medicines: With the exception of nitrate for which co-administration with sildenafil is not advised a starting dose of 25 mg should be considered in patients receiving concomitant treatment with CYP3A4 inhibitors. In order to minimise the potential for developing postural hypotension, patients should be stable on alpha-blocker therapy prior to initiating sildenafil treatment. In addition, initiation of sildenafil at a dose of 25 mg should be considered. CONTRAINDICATIONS Hypersensitivity to the active substance or to any of the excipients. Consistent with its known effects on the nitric oxide/cyclic guanosine monophosphate (cGMP) pathway, sildenafil was shown to potentiate the hypotensive effects of nitrates, and its co-administration with nitric oxide donors (such as amyl nitrite) or nitrates in any form is therefore contraindicated. Agents for the treatment of erectile dysfunction, including sildenafil, should not be used in men for whom sexual activity is inadvisable (e.g. patients with severe cardiovascular disorders such as unstable angina or severe cardiac failure). VIAGRA is contraindicated in patients who have loss of vision in one eye because of non-arteritic anterior ischaemic optic neuropathy (NAION), regardless of whether this episode was in connection or not with previous PDE5 inhibitor exposure. The safety of sildenafil has not been studied in the following sub-groups of patients and its use is therefore contraindicated: severe hepatic impairment, hypotension (blood pressure < 90/50 mmHg), recent history of stroke or myocardial infarction and known hereditary degenerative retinal disorders such as retinitis pigmentosa (a minority of these patients have genetic disorders of retinal phosphodiesterases). WARNINGS AND PRECAUTIONS A medical history and physical examination should be undertaken to diagnose erectile dysfunction and determine potential underlying causes, before pharmacological treatment is considered. Prior to initiating any treatment for erectile dysfunction, physicians should consider the cardiovascular status of their patients, since there is a degree of cardiac risk associated with sexual activity. Sildenafil has vasodilator properties, resulting in mild and transient decreases in blood pressure. Prior to prescribing sildenafil, physicians should carefully consider whether their patients with certain underlying conditions could be adversely affected by such vasodilatory effects, especially in combination with sexual activity. Patients with increased susceptibility to vasodilators include those with left ventricular outflow obstruction (e.g. aortic stenosis, hypertrophic obstructive cardiomyopathy), or those with the rare syndrome of multiple system atrophy manifesting as severely impaired autonomic control of blood pressure. VIAGRA potentiates the hypotensive effect of nitrates. Serious cardiovascular events, including myocardial infarction, unstable angina, sudden cardiac death, ventricular arrhythmia, cerebrovascular haemorrhage, transient ischaemic attack, hypertension and hypotension have been reported post-marketing in temporal association with the use of VIAGRA. Most, but not all, of these patients had pre-existing cardiovascular risk factors. Many events were reported to occur during or shortly after sexual intercourse and a few were reported to occur shortly after the use of VIAGRA without sexual activity. It is not possible to determine whether these events are related directly to these factors or to other factors. Agents for the treatment of erectile dysfunction, including sildenafil, should be used with caution in patients with anatomical deformation of the penis (such as angulation, cavernosal fibrosis or Peyronie's disease), or in patients who have conditions which may predispose them to priapism (such as sickle cell anaemia, multiple myeloma or leukaemia). The safety and efficacy of combinations of sildenafil with other treatments for erectile dysfunction have not been studied. Therefore the use of such combinations is not recommended. Visual defects and cases of non-arteritic anterior ischaemic optic neuropathy have been reported in connection with the intake of sildenafil and other PDE5 inhibitors. The patient should be advised that in case of sudden visual defect, he should stop taking VIAGRA and consult a physician immediately. Co-administration of sildenafil with nitroglycerin is not advised. Caution is advised when sildenafil is administered to patients taking an alpha-blocker, as the combination may lead to symptomatic hypotension in a few susceptible individuals. This is most likely to occur within 4 hours post sildenafil dosing. In order to minimise the potential for developing postural hypotension, patients should be haemodynamically stable on alpha-blocker therapy prior to initiating sildenafil treatment. Initiation of sildenafil at a dose of 25 mg should be considered. In addition, physicians should advise patients what to do in the event of postural hypotensive symptoms. Studies with human platelets indicate that sildenafil potentiates the antiaggregatory effect of sodium nitroprusside in vitro. There is no safety information on the administration of sildenafil to patients with bleeding disorders or active peptic ulceration. Therefore sildenafil should be administered to these patients only after careful benefit-risk assessment. The film coating of the VIAGRA tablet contains lactose. VIAGRA should not be administered to men with rare hereditary problems of galactose intolerance, Lapp lactase deficiency or glucose-galactose malabsorption. VIAGRA is not indicated for use by women. UNDESIRABLE EFFECTS Very common (> 1/10): Headache, Flushing, Common (> 1/100 and < 1/10): Dizziness, Altered vision (increased perception of light, blurred vision), Chromatopsia (mild and transient, predominantly colour fringe to vision), Palpitation, Nasal congestion, Dyspepsia. There were reports of muscle aches when sildenafil was administered more frequently than the recommended dosing regimen. In postmarketing surveillance the following adverse events have been uncommonly (> 1/1000 and < 1/100) or rarely (< 1/10,000 and > 1/100,000) reported: Hypersensitivity reactions, eye pain, red eyes, bloodshot eyes, tachycardia, ventricular arrhythmia, myocardial infarction, unstable angina, sudden cardiac death, hypertension, epistaxis, syncope, cerebrovascular haemorrhage, transient ischaemic attack, vomiting, skin rash, prolonged erection, priapism. In postmarketing surveillance, adverse events that have been reported with an unknown frequency in patients taking VIAGRA include: Eye disorders: Non-arteritic anterior ischaemic optic neuropathy (NAION), retinal vascular occlusion, visual field defect. SUPPLY CLASSIFICATION POM

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