THE SOCIETY FOR VASCULAR TECHNOLOGY OF GREAT BRITAIN AND IRELAND

Vascular Technology Professional Performance Guidelines

Giant Cell Arteritis Duplex Ultrasound Examination

Introduction

This guideline was prepared by the Professional Standards Committee (PSC) of the Society for Vascular Technology (SVT) as a template to aid the clinical vascular scientist/vascular sonographer and other interested parties. This guideline maybe used in part or in its entirety with suitable additions made by local policy implementers.

Suggestions for improvement of this guideline are welcome and should be sent to the Chair of the PSC – see www.svtgbi.org.uk for current Chair details.

Purpose

Duplex ultrasound examination is used to assess the temporal and axillary arteries for the presence of inflammation suggesting possible Giant Cell arteritis (GCA) [sometimes called temporal arteritis as the temporal arteries are often inflamed]. Diagnosis of GCA is usually done by temporal artery biopsy. Temporal artery biopsy is painful and invasive, can sometimes be inconclusive and may miss so called “skip lesions” leading to a false negative test[1,2] . Biopsy of the temporal artery is currently considered the gold standard in the diagnostics of GCA. Nonetheless, the likelihood of getting a positive biopsy reduces significantly two weeks after the initiation of corticosteroids[3]. Ultrasound is low cost and non-invasive and can lead to a positive diagnosis of GCA by detecting the presence of wall oedema, throughout the length of the vessel, thereby overcoming the problem of skip lesions, and potentially reducing the need for biopsy [4,5]. With highly trained individuals, ultrasound has been shown to have high sensitivity (88%) and high specificity (96%) for the detection of GCA [6].

Common Indications

Common indications for the performance of this examination include:

- Visual disturbance

- Throbbing headache (usually temples)
- Sudden permanent loss of vision in one eye.
- Tenderness of the scalp or over the temporal arteries
- Jaw claudication

Contraindications and Limitations

Contraindications for duplex ultrasound assessment are unlikely; however, some limitations exist and may include the following:

- Very small vessels are very difficult to image (typically temporal arteries are less than 2mm) and can be compressed with too much probe pressure.
- Very tortuous vessels.
- The Temporal arteries usually pass beyond the hairline, which can make imaging difficult. Copious amounts of gel may be needed in order to image the vessels.

Equipment:

Duplex ultrasound machine with imaging frequencies of 12MHz and greater with a linear transducer. Doppler frequencies of at least 6MHz should be available, with colour Doppler capability.

Compliance with the Medical Devices Directive is necessary. Electrical safety testing is required annually, with regular maintenance and quality assurance testing to specified level by qualified personnel. Review of in-service equipment should typically be undertaken four to six years after installation[7].

Examination couch should be height adjustable preferably electrical. The CVS's chair should provide good lumbar support, be height adjustable and allow for the CVS to move close to the examination couch [8,9]. The examination room should be temperature controlled with adjustable lighting levels suitable for examination.

Explanation of examination and patient history:

The CVS undertaking the examination should:

- Introduce themselves
- Confirm the patient's identity e.g. full name and date of birth
- Obtain verbal consent for the examination
- Give an explanation of the procedure and it's duration – consideration should be made to the age and mental status of the patient
- Obtain a pertinent relevant medical history from the patient and/or notes
- Presence of risk factors
    - Age - Average disease onset is ~ 70, but it rarely affects individuals younger than 50.
    - Gender – Women are two times more likely to develop GCA
    - Polymyalgia rheumatica - People with polymyalgia rheumatica have stiffness and aching in the neck, shoulders and hips. About 15 percent of people with polymyalgia rheumatica also have giant cell arteritis.
    - Results of other relevant diagnostics & previous vascular studies

Examination:

The examination would usually be bilateral and should include the temporal arteries and if normal in appearance the axillary arteries, as ultrasound of the axillary arteries increases diagnostic yield in the detection of GCA[10]. The patient is asked to remove their clothing to expose the axilla and tie back their hair to expose the temporal arteries. The patient is examined supine with the arm raised above the head when scanning the axilla. The head can be turned to one side for examining the temporal arteries. The patient's dignity and privacy should be maintained at all times.

For Duplex assessments of the axilla arteries, a linear probe with a Grey scale frequency of at least 10MHz and a colour Doppler frequency of >6MHz should be used.
For the Temporal artery branches a linear high frequency, preferably ≥ 15MHz, ideally a linear or hockey stick probe is recommended.

The following appropriate techniques should be used:
B-mode should be used to image the artery and assess for wall inflammation (or "Halo sign" - a dark (hypoechoic) area around the vessel lumen probably due to arterial wall oedema[11]. The Temporal Artery wall thickness (halo) should be present in two planes and be circumferential[12]. Inflammation can cause occlusion, stenosis or may not be flow limiting. (Figure 1).

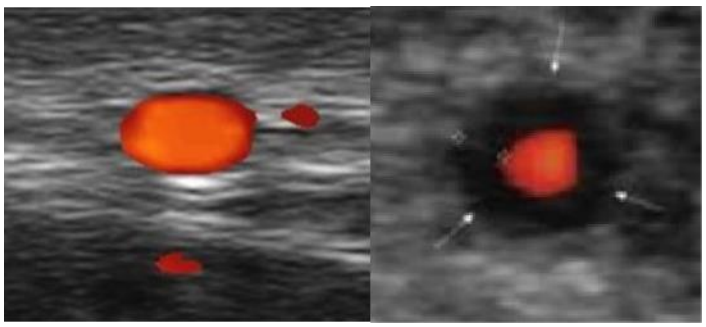

Figure 1 Left: Normal Temporal Artery, Right: Wall thickness (halo) which can be measured around the lumen.

The Halo thickness for

- The temporal artery wall thickness should be >0.3mm, moreover, a wall thickness (halo) of 0.7mm or greater can predict a positive biopsy result.
- The axillary artery a wall thickness of < 1mm is normal, 1.0-1.5mm equivocal, but >1.5mm a sign of definite vasculitis

Spectral Doppler should be used to determine direction of flow, stenotic flow (usual V1:V2 velocity criteria applies for significant stenosis)[13] and absence of flow.

Colour Doppler should be used to assess for the presence/absence of flow and aid the position of spectral Doppler when quantifying stenosis. Care should be taken when setting the colour gain, as gain too high may lead to masking of the halo.

The waveform within a temporal artery is usually high resistance with low diastolic flow (the common temporal artery is a branch of the ECA and has a similar waveform).

In addition to halo determination, the artery should also be assessed using the compression technique (Figure 2)[14].

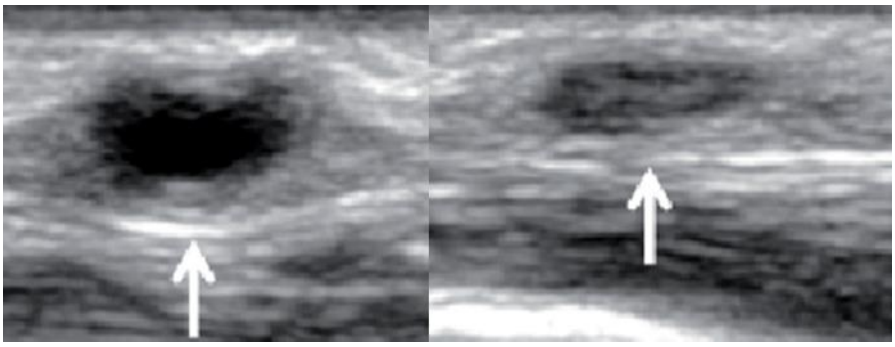

Figure 2 Left: Arterial lumen with inflamed wall, Right: Compressed artery the thickening is still visible.

Evaluation of the following arteries should be included:

- Common Temporal artery
- Parietal Temporal artery
- Frontal Temporal artery
- Axillary Artery (A halo can often present within the axillary artery[10].

Treatment with steroids and implications for the ultrasound examination:

The timing of the examination must be considered when performing ultrasound for temporal arteritis. It is desirable to perform this examination before starting steroid therapy[15]. In diverse studies, the halo sign seems to disappear within a period of 2 days to 6 months after the start of treatment with corticosteroids[15,16]. In addition, the halo sign reappears in GCA patients suffering a flare[3]. Nevertheless, the Halo sign has been said to rarely disappear before 2 months and can persist for up to 7 months in patients in remission and under steroid treatment[17]. It has been suggested that patients with a smaller number of affected branches require less time for halo disappearance[3].

Considering that current guidelines are very clear about the importance of starting high-dose steroids immediately on suspicion of TA (symptoms can be very severe, including permanent sight loss if left untreated), ultrasound must be performed urgently (preferably within 48 hours) rather than delaying steroids while this examination is being arranged[15]. With the literature unclear on how quickly the halo sign may disappear with steroid treatment, caution must be observed when using ultrasound for diagnosis in patients treated with steroids. Rapid access to both ultrasound and biopsy on the day of presentation would be optimum for diagnosis.

Ensure appropriate efficient referral of critical ultrasound results to the referring consultant are made prior to the patient being discharged so treatment plans can be enforced or expedited accordingly.

Reporting:

The report is a recording and interpretation of observations made during the duplex ultrasound examination; it should be written by the CVS undertaking the examination and viewed as an integral part of the whole examination.

The report should include correct patient demographics; date of examination; examination type and the name and status of the CVS.

The report should include:

- Which arteries have been assessed commenting on the presence/absence of flow
- The presence or absence of any wall inflammation/halo sign.
- The presence or absence of any compression sign.
- The presence or absence of any occlusions/stenosis.
- Any limitations.
- An appropriate number of annotated images that represent the entire ultrasound examination - in accordance with local protocols and SVT Image Storage Guidelines.

General considerations

Measurement technique should ensure accuracy is optimised. As appropriate to the clinical scenario, this may require:

- Optimal adjustment to scale, gain and cursor placement for velocity measurements
- Selection of an appropriate probe including knowledge of probe resolution (axial/lateral) for linear measurements.
- Ensuring reported linear measurements are consistent with the level of accuracy/resolution possible, including the use of rounding where appropriate.
- Optimised technique for volume flow measurements, applying knowledge of all sources of error and ensuring reported measurements do not imply a level of accuracy which is not possible.

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