Vascular Technology Professional Performance Guidelines

Endovascular Aneurysm Repair (EVAR) Duplex Ultrasound Examination

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 detect expansion of the residual aneurysm sac, the presence of endoleaks, and the patency of the graft.

Common Indications:
Common indications for the performance of this examination include:

- Initial post-EVAR assessment (~48 hours)
- Routine EVAR surveillance
- Post surgical intervention follow-up e.g. post limb extension or angioplasty
- Patency and functionality of crossover graft and fenestrations
- False aneurysm/fluid collection(s) at access site(s)

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

- Obesity
- Dressings, open wounds etc.
- Patient unable to lie flat
- Bowel gas when examining the abdominal area
- Patients who are unable to cooperate due to reduced cognitive functions e.g. patients with dementia and through involuntary movements
- Patient discomfort
- Acoustic shadowing from certain graft types.

Equipment:
Duplex Doppler ultrasound machine with broadband imaging frequencies of 2.5MHz and greater, with both linear and curvilinear transducers available. Doppler frequencies of at least 3.0MHz 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 a specified level by qualified personnel. Review of in-service equipment should typically be undertaken four to six years after installation[1].

The 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[23]. The examination room should be temperature controlled with adjustable lighting levels suitable for the examination[3].

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
- explain why the examination is being performed
- give an explanation of the procedure and it's duration – consideration should be made to the age and mental status of the patient
- obtain verbal consent for the examination
- obtain a pertinent medical history from the patient and/or notes
    - Verify that the requested procedure correlates with the patient's clinical situation
    - Previous extent of aneurysmal dilatation
    - Type of device e.g. bifurcating, aorto-uni-iliac with crossover graft, fenestrated
    - History of previous treatment e.g. angioplasty or embolisation
    - Results of other relevant diagnostics & previous vascular studies

Patient Preparation:
The examination may be successful without the patient fasting, but images may be improved by asking the patient to consume clear fluids only for 4-6 hours before the examination. Caution should be exercised when altering the diet of diabetic patients.

Examination:
The patient is asked to remove their clothing to expose the abdomen. The patient is examined supine.
The patient's dignity and privacy should be maintained at all times. Due to the intimate nature of the examination it may be considered necessary to offer a chaperone[4].

During the examination the patient's mental and physical status should be monitored and modifications made to the examination accordingly.

The following techniques should be used to evaluate the aorto-iliac system and their stented component:

- B-mode should be used to image the EVAR graft, its position and location, the size of the residual aneurysm sac and echogenicity of its contents.

- Spectral Doppler should be used to determine: waveforms within the main body and each limb of the graft; assessing for any twisting, kinking or deformity of the graft; direction of flow, stenotic flow and absence of flow
- Colour Doppler should be used to assess for the presence/absence of flow within the stent graft limbs and aid position of spectral Doppler when quantifying stenoses. Examine the residual aneurysm sac in both transverse and longitudinal planes to assess for the presence/absence of flow within the residual aneurysm sac.

General Considerations: Colour Doppler parameters must be set using the most sensitive settings to detect slow flow within the aneurysm sac; some centres may consider the use of contrast enhanced ultrasound to aid visualisation of low flow endoleaks[5].

Evaluation of the following arteries should be included:

- Aorta
- Common iliac artery (CIA)
- External iliac artery (EIA)
- Common femoral artery (CFA)
- Crossover graft if applicable

Reporting:
The report is a recording and interpretation of observations made during the EVAR duplex ultrasound examination; it should be written by the CVS undertaking the examination and viewed as an integral part of the whole examination[5].
The report should include correct patient demographics; date of examination; examination type and the name and status of the CVS.

The report should include:

- Presence/absence of endoleak(s), including location and endoleak type:[6]

Endoleak Type:	Description:
Type Ia Ib	Proximal (a) or distal (b) limb attachment leak
Type II	Lumbar or IMA vessel involvement
Type III	Graft fabric tear or modular limb connection failure
Type IV	Sac increase due to graft porosity
Type V	Sac increase due to endotension

- Residual aneurysm sac diameter and the method of measuring aneurysm diameter should be documented e.g. anterior-posterior outer wall – outer wall etc[7]
- Patency of stent/limb(s) with flow quality, including crossover graft if applicable
- Any other incidental findings, e.g. false aneurysm, haematoma, arterio-venous fistula, intimal flaps, dissection etc.
- Any limitations e.g. difficult examination due to body habitus, bowel gas, calcification etc.
- An appropriate number of annotated images that represent the entire ultrasound examination - in accordance with local protocols and SVT Image Storage Guidelines[8]

Referral of critical ultrasound results should be made to the referring consultant or appropriate medical/surgical team (as per local protocol) prior to the patient being discharged, so that treatment plans can be enforced or expedited accordingly.

RESOURCES:

Society for Vascular Ultrasound Vascular Technology Professional Performance Guidelines Abdominal Aortoiliac Duplex Evaluation 2011 www.svunet.org

American Institute of Ultrasound in Medicine Practice Guideline for the Performance of Diagnostic and Screening Ultrasound Examinations of the Abdominal Aorta in Adults 2010 www.aium.org

Sandford RM, Bown MJ, Fishwick G et al. Duplex Ultrasound Scanning is Reliable in the Detection of Endoleak Following Endovascular Aneurysm Repair. Eur J Vasc Endovasc Surg 2006; Jul 25

McLafferty RB, McCrary BS, Mattos MA et al. The Use of Colour-flow Duplex Scan for the Detection of Endoleaks. J Vasc Surg 2002;36:100-4

Wolf YG, Johnson BL, Hill BB et al. Duplex Ultrasound Scanning Versus Computed Tomographic Angiography for the Postoperative Evaluation of Endovascular Abdominal Aortic Aneurysm Repair. J Vasc Surg 2000;32:1142-8

REFERENCES:

[1] Standards for Ultrasound Equipment Royal College of Radiologists, February 2005 www.rcr.ac.uk

[2] Guidelines for Professional Working Standards Ultrasound Practice United Kingdom Association of Sonographers (UKAS) October 2008 www.sor.org/learning/document-library

[3] The Causes of Musculoskeletal Injury Amongst Sonographers in the UK Society of Radiographers, June 2002 www.sor.org/learning/document-library

[4] Society for Vascular Technology Professional Standards Committee Chaperone Guidelines April 2012 www.svtgbi.org.uk

[5] The EFSUMB Guidelines and Recommendations on the Clinical Practice of Contrast Enhanced Ultrasound (CEUS): Update 2011 on non-hepatic applications www.icus-society.org

[6]Chapter 11 Duplex assessment of Aneurysms and Endovascular Repair; Vascular Ultrasound How, Why and When Third Edition Edited by Abigail Thrush & Tim Hartshorne

[7] Vascular Technology Professional Performance Guidelines Abdominal Aorto-Iliac Duplex Ultrasound Examination 2013 www.svtgbi.org.uk

[8] Society for Vascular Technology Professional Standards Committee Image Storage Guideline April 2012 www.svtgbi.org.uk

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