THE SOCIETY FOR VASCULAR TECHNOLOGY OF GREAT BRITAIN AND IRELAND

PHYSIOLOGICAL MEASUREMENT SERVICE SPECIFICATIONS

Vascular Technology

Arterial Duplex - lower limb, upper limb, assessment of bypass graft/stent patency

This investigation uses ultrasound to image and assess flow in the major arteries of the lower or upper limbs. An ultrasound probe is used to scan the legs or arms to assess the location, extent and type of any occlusive or aneurysmal disease of the major arteries. For the lower limbs, the arteries can be scanned from the aorta in the abdomen down to ankle and where appropriate onto the foot. For the arms, the arteries can be scanned from the neck down to the wrist and where appropriate into the hand. Arterial disease is less common in the arms than in the legs. This test is also used for surveillance following interventions such as a bypass graft or stent. It is used to identify the location, extent and severity of arterial disease in order to facilitate clinical or surgical management decisions. Patients who experience pain in the legs on walking (claudication), in arms on movement or have pain in the limbs at rest and/or ulceration may require this investigation. Note: For leg assessments the measurement of ankle brachial pressure index (ABPI) is a good indicator of whether disease is present or not and its severity. This is often carried out prior to a duplex examination. Where ABPI have not been already been measured, they will often be done at the same time as the duplex investigation.

1. PATIENT PATHWAY

An Arterial Duplex assessment is a major diagnostic test in the pathway of patients with suspected lower or upper limb arterial disease, and particularly where any intervention may be needed. It is used in surveillance programs to follow up patients who have had an intervention such as a bypass graft or stent.

Guidance is given to implementation of duplex in the National Institute for Clinical Excellence (NICE) publication' lower limb peripheral arterial disease diagnosis and management cg147' 2012[1] and Vascular Society Great Britain and Ireland document The Provision of Services for Patients with Vascular Disease 2015[2].

2. REFERRAL

Clinical Indications

These include:

- Investigation or follow-up of patients with claudication or ischaemic symptoms e.g. rest pain and/or arterial ulceration
- Assessment of patients with known arterial disease
- Pre-procedure assessment for planning of intervention
- Follow-up to determine technical adequacy of intervention i.e. post angioplasty and/or stent placement
- Follow-up of bypass grafts to detect intrinsic stenosis or progression of disease, which may threaten graft patency
- Evaluation of aneurysm, pseudoaneurysm, arterial-venous fistula
- Evaluation of arterial trauma

Further guidance is given in the Society for Vascular Ultrasound (SVU) professional performance guidelines for vascular technology 'Upper extremity arterial duplex evaluation'[3] 'Abdominal aorto-iliac arterial duplex evaluation'[4] and 'Lower extremity arterial duplex evaluation'[5]

Contra indications

Scans may be limited due to high body mass index (BMI) and in the presence of ulcers, wounds, bandaging or casts.

3. EQUIPMENT

Specification

A high resolution imaging ultrasound duplex scanner which has colour, power and pulsed Doppler modalities is required. A midrange (covering nominal frequencies of 4-7MHz) linear array transducer (probe) should be available for scanning the leg below the groin and for scanning the arm. A lower frequency transducer (covering nominal frequencies of 2.5–4MHz) should be available for scanning the aorto-iliac segment. A high-frequency linear array transducer (covering frequencies above 7MHz) may be useful for scanning the forearm arteries.

There should be facilities to record images/measurements[6]. The Royal College of Radiologists (RCR) has more detailed technical standards for ultrasound equipment[7].

It should be noted that a range of relatively low cost portable scanners is now available, not all of which will suitable for vascular work.

It is important that the duplex scanner is of ergonomic design as explained in the health and safety section to minimise the risk of operator work related musculoskeletal disorders[8].

Maintenance

Equipment should be regularly safety-tested and regularly maintained in accordance with the manufacturer's recommendations. Further information is available from the British Medical Ultrasound Society (BMUS): 'Extending the provision of ultrasound services in the UK'[9].

Quality Assurance (QA) and Calibration

QA procedures should be in place to ensure a consistent and acceptable level of performance of all modalities of the duplex scanner. Such procedures are likely to be set up with involvement from Medical Physics Departments or service engineers as they require specialist skills and will require both imaging and flow phantoms.

Detailed guidance on the QA of the imaging modality of duplex scanning is contained in the Institute of Physics and Engineering in Medicine (IPEM) Quality Assurance of Ultrasound Imaging Systems report 102[10]. The IPEM report 70 Testing of Doppler

Ultrasound Equipment, contains extensive information relating to performance testing of the pulsed and colour Doppler modalities of duplex scanners[11].
Further general guidance is available in 'Guidelines for Professional working standards: Ultrasound practice'[12].

Set up procedures
An appropriate probe should be selected. All duplex control settings should be set to defaults appropriate for peripheral arterial investigation. Equipment manufacturers will normally provide appropriate default peripheral arterial settings.

Infection control
There are no nationally agreed standards for vascular ultrasound scanning but local infection control policies should be in place. BMUS[9] advises that users should refer to manufacturer's instructions for the cleaning and disinfection of probes and transducers and general care of equipment. It should be noted that ultrasound probes can be damaged by some cleaning agents and so manufacturer's specifications should always be followed. Sterile ultrasound gel and sheaths should be available and used in appropriate cases.

Accessory equipment
Examination couches and scanning stools/chairs must be of an appropriate safety standard and ergonomic design to prevent injury, particular consideration should be given to reducing the risk of operator work related musculoskeletal disorders[8].

4. PATIENT

Information and consent
There is no legal requirement that written patient consent be obtained prior to an arterial duplex examination. However, patients should be fully informed about the nature and conduct of the examination so that they can give verbal consent. It is desirable that this information is provided in written format and is given prior to their attendance[13]. This information should also be verbally explained to the patient when they attend for the investigation. Examples of additional patient information to include can be found at the RCR http://www.rcr.ac.uk/docs/patients/worddocs/CRPLG_US.doc
The Circulation Foundation produces leaflets which provide further information to patients: www.circulationfoundation.org.uk.

Clinical history
The referral for the investigation should contain relevant clinical history. But this information should be verified and clarified for any discrepancies

This should include any symptoms or history of lower or upper extremity arterial disease and details of any previous interventions e.g. angioplasty, stent insertion or bypass graft. The nature and duration of symptoms should be established; and relevant risk factors established e.g. hypertension [3 5].

Preparation
No specific preparation is required for scanning the leg arteries below the groin[5] or for scanning the arteries of the arm[3]. Access will be required to the patient's legs or arms. Scanning may be difficult in patients with leg ulcers or open wounds or high BMI. Sterile dressings or cling film will allow imaging over these sites. Bowel gas often makes imaging of the aorta and iliac segment[5] (the arteries in the abdomen which supply the legs) difficult. Some centres use advanced preparation, such as fasting for 6 hours prior to the scan, in

order to improve imaging of these vessels. Particular care should be taken with any advice given to diabetic patients prior to a scan appointment.

5. ENVIRONMENT

A private room (or curtained off area in a larger multiscan bay unit) is required to carry out the scan which should be darkened, with no natural light entry, and preferably dimmer switch lighting.
Air conditioning may be required due to heat production from the scanning equipment. The ultrasound manufacturer should supply appropriate guidance on air conditioning requirements.
Further general guidance on the environment is given in the documents:
Extending the provision of ultrasound services in the UK[9] and Guidelines for professional ultrasound practice[12].
On occasion, assessment for lower or upper limb arterial disease may also need to be carried out in other localities e.g. in theatre, theatre recovery or at the patient's bedside. These scans may be somewhat limited due to poor environmental conditions.

6. PROCEEDURE, INTERPRETATION and REPORT

For detailed information on PROCEEDURE, INTERPRETATION and REPORT please refer to Lower and Upper Limb Arterial Duplex Assessment Ultrasound Professional Performance guidelines https://www.svtgbi.org.uk/professional-issues/

7. WORKFORCE

It is well recognised that ultrasound diagnosis is highly operator-dependent; it is essential the workforce has the appropriate knowledge and competence. This is achieved by ensuring the workforce has followed recognised education and training routes. This applies to both medically and non-medically qualified individuals.

Education and training requirements

All staff performing and reporting investigations should have successfully completed one of the following education and training routes:

(i) Full SVT accreditation (Accredited Vascular Scientist)
http://www.svtgbi.org.uk/education

(ii) Post graduate qualification in ultrasound imaging from a Consortium for Accreditation of Sonographic Education (CASE) accredited course, with successful completion of a vascular module that included clinical competence in arterial duplex scanning. A list of CASE accredited courses can be found at http://www.case-uk.org/

(iii) Medical staff should have successfully followed the RCR recommendations for training in vascular scanning to level 2 competence in peripheral extremity arteries BFCR(17)3 https://www.rcr.ac.uk/publication/ultrasound-training-recommendations-medical-and-surgical-specialties-third-edition

(iv) Completion of the NHS Scientist Training Programme specialising in Vascular Science and statutory registration as a Clinical Scientist with the Health and Care Professions Council (HCPC.) http://www.nshcs.hee.nhs.uk/join-programme/nhs-scientist-training-programme

It is recommended that staff perform local competencies and are involved in audit (both results and peer audit https://www.bmus.org/static/uploads/resources/Peer_Review_Audit_Tool_wFYQwtA.pdf) to maintain high standards.

Regulation

It is important both staff and employers are aware that although ultrasonography is not currently a regulated profession, there is a move towards future statutory regulation of all healthcare science groups. Current statutory or voluntary registration includes:

(i) Registered on the SVT Voluntary Register
(ii) UK Registered Physicians on the General Medical Council (GMC) Specialist Register http://www.gmc-uk.org/doctors/register/LRMP.asp
(iii) Registered Clinical Scientist with Health and Care Professions Council (HCPC) http://www.hpc-uk.org/check/
(iv) Registered on the Public Voluntary Register of Sonographers held by the Society and College of Radiographers (SCoR.) https://www.sor.org/practice/ultrasound/register-sonographers

Maintaining competence

It is important scanning competence is maintained by all personnel performing these investigations, either by performing a minimum number of scans per year, or through a CPD scheme. Criteria for ensuring continuing competence are set by professional bodies.

Continuing Professional Development (CPD)

Staff must undertake CPD to keep abreast of current techniques and developments, and to renew or extend their skills.

I. SVT accredited sonographers must maintain their accreditation by meeting the CPD requirements of the SVT: https://www.svtgbi.org.uk/education/maintaining-avs-registration/

II. Staff with a post graduate qualification in ultrasound imaging should meet the CPD requirements for SCoR registration: http://www.sor.org/learning/document-library/continuing-professional-development-professional-and-regulatory-requirements

III. Medical staff should follow the requirements required for maintaining their skills, as well as the need to include ultrasound in their ongoing CME: https://www.rcr.ac.uk/clinical-radiology/cpd-scheme

IV. Clinical Scientists maintain registration with CPD through the HCPC. http://www.hpc-uk.org/registrants/cpd/standards/

8. AUDIT, SAFETY & QA

Safety

The provider should be aware of the guidelines for the safe use of ultrasound equipment produced by the Safety Group of BMUS[14]. In particular, they should be aware of ultrasound safety precautions related to vascular scanning. All staff should be aware of local safety rules and resuscitation procedures.

Sonographers are at risk of work related musculoskeletal disorders. To minimise this risk the scanner and its control panel, the examination couch and scanning stool must be of appropriate safety standard and ergonomic design.

The published document by the Society of Radiographers (SCoR) 'Prevention of Work Related Musculoskeletal Disorders in Sonography'[8] gives clear guidance on this issue as well as 'Guidelines for Professional Working Standards Ultrasound Practice'[12]

QA and Audit

There are no specific requirements, but a mechanism of audit/quality control to ensure patients continue to receive high level of diagnostic accuracy should be in place.

QA and audit programs should cover:

- Equipment performance
- Patient service
- Quality of investigation

The BMUS document[9] and UKAS Guidelines[12] also give guidance. Equipment QA is covered in section 3 of this document.

Websites:

www.rcr.ac.uk
www.bmus.org
www.svtgbi.org.uk
www.svunet.org
www.case-uk.org
www.ipem.ac.uk
www.hpc-uk.org
www.rcplondon.ac.uk
www.vascularsociety.org.uk
www.circulationfoundation.org.uk
www.sor.org
www.nice.org.uk

References:

[1]NICE guideline Lower Limb Arterial Disease Diagnosis and Management: https://www.nice.org.uk/guidance/cg147

[2]Vascular Society Great Britain and Ireland The Provision of Services for Patients with Vascular Disease 2015 https://www.vascularsociety.org.uk/_userfiles/pages/files/Resources/POVS%202015%20Final%20version.pdf

[3]Society for Vascular Ultrasound Professional Performance Guidelines; Upper extremity arterial duplex evaluation http://www.svunet.org/svunet/practicemanagementmain/professionalperformanceguidelines

[4]Society for Vascular Ultrasound Professional Performance Guidelines; Abdominal aortoiliac arterial duplex evaluation. http://www.svunet.org/svunet/practicemanagementmain/professionalperformanceguidelines

[5]Society for Vascular Ultrasound Professional Guidelines; Lower extremity arterial duplex evaluation. http://www.svunet.org/svunet/practicemanagementmain/professionalperformanceguidelines

[6]SVT Guidance on Image Storage and use, for the vascular ultrasound scans 2012 https://www.svtgbi.org.uk/professional-issues/
[7]Standards for the Provision of an Ultrasound service Royal College of Radiologists 2005 www.rcr.ac.uk/docs/radiology/pdf/StandardsforUltrasoundEquipmentJan2005.pdf pages 15-17
[8]Prevention of Work Related Musculoskeletal Disorders in Sonography - Society of Radiographers 2014 https://www.sor.org/sites/default/files/document-versions/sor_industrystandards_prevention_musculoskeletal.pdf
[9]Extending the provision of ultrasound services in the UK' BMUS 2003 https://www.bmus.org/static/uploads/resources/EXTENDING_THE_PROVISION_OF_ULTRASOUND_SERVICES_IN_THE_UK.pdf
[10]Quality Assurance of Ultrasound Imaging Systems' IPEM report 102 2010
[11]Testing of Doppler Ultrasound Equipment' IPEM report 70 1994
[12] Society and College of Radiographers and British Medical Ultrasound Society: Guidelines for professional ultrasound practice 2016 https://www.sor.org/learning/document-library
[13]Improving Quality in Physiological Sciences (IQIPS) Standards and Criteria http://www.iqips.org.uk/documents/new/IQIPS%20Standards%20and%20Criteria.pdf
[14]BMUS safety statements https://www.bmus.org/policies-statements-guidelines/safety-statements/

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