

Bypass Graft/stent Surveillance Duplex Protocol

Referral sources

Patients who have had a bypass graft, stent or a recent angioplasty to either of these are automatically placed on a surveillance protocol. If patients fall outside this category, then they can be referred as per the arterial duplex protocol.

Clinical indications

As per arterial duplex protocol.

Surveillance schedule

6 weeks, 3 months, 6 months, 12 months and 18 months post-op.

At every interval, appointment to be a one-stop with patient receiving scan and consultation, unless otherwise requested.

If either surgical or radiological intervention takes place the clock resets and above surveillance protocol starts again.

Examination

This is largely as per the lower limb arterial duplex protocol.

In the case of stents, particular attention should be paid to the stented portion of the vessel, especially proximal and distal ends of the stent where stenoses are most likely to form. A section of native vessel above and below the stent should be visualised to assess inflow and outflow.

In the case of grafts, inflow and outflow within native vessels should be assessed, and the graft followed along its course, again with particular attention to the proximal and distal anastomoses as these are the most likely areas for stenoses to form. It is important to also check for any potential issues associated with the graft or around it such as seroma, aneurysms and kinking or entrapment.

Sometimes, flow can persist in the native vessel which has been bypassed. This should be noted, especially if the bypass has been created to exclude an aneurysm and flow is causing the aneurysm to continue being patent.

Resting ABPI's should be performed following duplex assessment.

- 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.

GRADING DISEASE

The main criterion used to grade severity of a narrowing is the PSV ratio, the ratio of Vs to Vp (from SVT guidance):

A PSV ratio of greater than 2 is used to define a stenosis that is causing a greater than 50% reduction in the diameter of the artery.

A PSV ratio of greater than 3 is used to define a stenosis that is causing a 50- 75% reduction in the diameter of the artery.

A PSV ratio of greater than 4 is used to define a stenosis that is causing a > 75% reduction in the diameter of the artery.

Multiphasic waveforms are representative of normal flow, whereas monophasic/damped waveforms usually represent diseased flow.

Loss of reverse flow and spectral broadening should be recorded as monophasic flow.

No flow identified on colour, power or spectral traces indicates total occlusion.

POPLITEAL ARTERY ENTRAPMENT SYNDROME (PAES)

Popliteal Artery Entrapment Syndrome (PAES) results from the abnormal course of the popliteal artery in relation to the medial head of the Gastrocnemius or other muscles. This may lead to claudication symptoms, embolisation and ischaemia, but often with no apparent reduction in foot pulses at rest. Symptoms arise from the intermittent entrapment of the artery from extrinsic compression during exercise

Measure PSV in the popliteal artery and TP-trunk and proximal ATA with the foot at rest followed by dorsiflexion, plantarflexion or any other position that induces symptoms. Although the measurements may be taken with the patient in the prone position with feet over hanging the couch to allow full flexion movement, it is often easier with the patient standing and on tip toes whilst supporting themselves on the edge of a couch. Use colour Doppler and B-mode imaging to look for regions of compression and use spectral Doppler to look for velocity changes. It is important to assess the arteries under some degree of forced provocation as the majority of PAES occurs with sustained holding of $\geq 70\%$ of maximal plantarflexion force. This dynamic loading can be achieved by the sonographer or assistant applying counterforce at the foot during plantarflexion, by patient pushing foot against a wall or other resistance, or by using patient standing induced force techniques. If the test is negative, the patient can try similar exertion that provokes symptoms, and immediately

Images

Minimum images to be taken:

- Images of at least the origin of each vessel, plus proximal and distal graft anastomoses, including colour Doppler and spectral waveforms.
- Images of any pathology, including spectral waveforms demonstrating degree of stenosis if applicable (including documentation of Vs and Vp).

Reporting

As per arterial assessments but including:

- Position of stent or graft
- Type of graft if clear e.g. PTFE / vein / in-situ vein
- Location of any stenosis or occlusion, including velocities for significant stenoses.
- Any problems with these such as kinking / entrapment, seroma; false or true aneurysm etc.
- If there is significant duplex abnormality, significant change in symptoms or significant drop in ABPI's, then this should be highlighted in the report.
- An urgent referral to Vascular should be made if there is significant change in symptoms with the presence of significant duplex abnormality.
- If a significant stenosis is seen in absence of change in symptoms or a significant change in symptoms in absence of significant duplex findings, results should be reviewed at MDT.
- If there is significant reduction in flow within the graft with monophasic waveforms, this should be flagged as potentially pre-occlusive. Flow of <40cm/s is generally considered to indicate significant risk of occlusion.

Grading disease

Grading criteria as for arterial protocol can be used throughout a stent or a graft:

Strandness criteria - The PSV ratio (a ratio of peak systolic velocity at the site of the disturbance or narrowing, to the peak systolic velocity at a normal area of the artery just proximal to the narrowing) is used to grade the severity of the narrowing:

A PSV ratio of greater than 2 is generally used to define a stenosis that is causing a greater than 50% reduction in the diameter of the artery.

A PSV ratio of greater than 3 is generally used to define a stenosis that is causing a greater than 75% reduction in the diameter of the artery.

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