

**Review- 2 yearly**

**Date Version Amendments made**

**April 2022 2.1 April 2022 – for review April 2024**

**Extracranial arterial duplex**

**Scanning Protocol for Clinical Vascular Scientists**

**V2.1**

**April 2022**

**Carotid Duplex**

**Referrals:**

Indication for Referral:

* Transient Ischaemic Attack (TIA)
* Amaurosis Fugax
* Carotid Bruit
* Cerebrovascular Event (CVE)
* Follow-up of carotid stenosis
* Post intervention follow up e.g. carotid endarterectomy, stent or bypass
* Trauma in the distribution of the carotid artery e.g. suspected dissection, AVF or pseudoaneurysm
* Pre-operative assessment for high-risk patient e.g. CABG/pre renal Tx
* Pulsatile neck mass
* Evaluation of suspected subclavian steal syndrome

Contraindications and Limits: (contraindications are few however there are some limitations e.g.

* Patients with short muscular necks
* Recent surgery – u/s visualisation may be limited due to oedema, haematoma, dressings etc
* Calcified plaque may cause acoustic shadowing limiting Doppler and b-mode assessment
* Patients who are unable to lie flat due to pre-existing co-morbidities
* Patients who are unable to cooperate due to reduced cognitive function or involuntary movement
* Examinations undertaken portably may be limited due to equipment and room dimensions

Patients will be referred via the following pathways:

* Hospital consultants
* General practitioners
* Acute GP service
* Vascular one stop clinics
* Rapid Access TIA clinics

Request may come in the following format:

* ORDERCOMS via CRIS system
* Telephone or email requests MUST be followed by a written or ORDERCOMS request
* Choose and Book/RMS/ICE

Requests must include:

* Patient name, date of birth, hospital number and/or NHS number
* Referring consultant/GP
* Relevant patient history
* Details of presenting symptoms
* Information required from the investigation

Examination Codes to be used:

* UDCAB and UVTAB

Inpatient referrals:

* Usually seen with 1 working day of receipt of request (unless a specific date has been requested)
* Cardiac patients – surgery MUST be confirmed at SMDT
* Request should include:
  + Ward
  + Name of referrer
  + Bleep or contact number
  + Special considerations i.e. infectious status, O2 requirements
  + Mode of transport

Pre-op Carotid endarterectomy patients:

* Patency check 48 hours prior to surgery – if patient has a further TIA between pre-op scan and surgery a further duplex scan should be performed.

Outpatient referrals appointment times:

* TIA telephone clinic – within 24-48hours
* Stroke referrals - within 2 weeks of receipt of request – unless specified otherwise
* **URGENT** outpatients – should be referred via TIA clinic
* Other referrals – within 4 – 6 weeks

One stop clinics:

* Vascular consultants and Rapid Access TIA clinics on agreed days/sites and times.
  + Results must be made available immediately

**Examination:**

Equipment: Canon Aplio i700, Canon Aplio i 800 or Canon Xario 200

No specific patient preparation is required. Good access to the patient’s neck will be required. The patient will need to maintain the desired head position and not talk during the scan.

Ensure a clean, safe environment for the examination,

The Vascular Scientist undertaking the examination should:

* Introduce themselves
* Confirm patient’s identity (name, DOB, address)
* Explain who has requested the examination, why the examination is being performed, what the procedure involves, expected duration of the test and who receives the report following the examination.
* Obtain verbal consent
* Verify that the requested procedure correlates with the patient’s clinical presentation

Patient Position:

* Position the patient supine or semi-supine on the couch, head slightly hyperextended and rotated slightly away from the side being examined.
* Patient may be scanned in wheelchair if unable to transfer safely

**Scanning:**

* Select the appropriate frequency probe and appropriate preset - the standard examination consists of interrogation bilaterally of the arterial supply to the head. Assess the RIGHT and LEFT carotid territories
* Using B-Mode image throughout the observable length of the Common Carotid Artery (CCA) External Carotid Artery (ECA) and Internal Carotid Artery (ICA) to its most accessible distal extracranial segment using transverse and longitudinal planes.
* The Vertebral Artery (VA) should be identified using B-Mode and interrogated using Colour Doppler to determine the direction of flow. In the presence of reversed or partially reversed flow the subclavian artery should be examined.
* Plaque measurement and classification within the CCA, bifurcation, ICA and ECA using B Mode. Plaque characteristics and length of lesion should be considered.
* Examine the vessels with colour Doppler in transverse and longitudinal planes checking for colour filling defects or areas of increased velocity.
* In longitudinal plane, using spectral Doppler examine the velocities within the vessels. Doppler angle should be </= 60ᵒ. Velocities measured ideally should include:
  + CCA –Peak Systolic Velocity (PSV) and End Diastolic Velocity (EDV) (1 – 2 cm below the bifurcation)
  + ICA – proximal and distal vessel PSV and EDV (at the point of highest velocity)
  + ECA – PSV
* Record patency of the ICA distal to any significant stenosis; observing lumen diameter and quality, extent of plaque and any other anomalies that may be relevant to surgical planning.

The minimum number of images recorded should include:

* CCA – spectral Doppler with velocities
* ICA – spectral Doppler with velocities
* ECA – spectral Doppler with velocities
* Bifurcation – B Mode imaging
* Vertebral Artery – Colour Doppler demonstrating direction of flow
* Additional images as deemed necessary for anatomical identification of plaque, haemodynamically significant lesions or other anatomical anomaly should be recorded
* Subclavian Artery – if examined

**PLEASE NOTE: In some situations, e.g. for more complex or technically difficult cases, these protocols may be altered on an individual basis at the discretion of the Clinical Vascular Scientist who is performing the scan**

**Reporting:**

The report is a recording and interpretation of observations made during the carotid & vertebral arterial duplex examination. It should be written by the person undertaking the examination and viewed as an integral part of the whole examination. (If the examination is performed by a trainee, then the report should be verified by the person supervising the trainee, until such times as the trainee has been authorised to report independently). The report should include:

* Correct patient demographics
* Date of examination
* Examination type
* Status of person reporting the examination
* Which arteries have been assessed recording the presence or absence of disease
* Qualitatively note the nature of the plaque, length, and anatomical position
* Percentage degree of stenosis and calculation method used: If deemed appropriate comment on the actual velocity recorded/justification for altering reporting protocol
* The patency of the vessels distal to any significant stenosis
* Direction of flow within the vertebral arteries and any anomalies associated with bidirectional or reverse flow
* Other pathologies i.e. carotid body tumours, dissections, haematoma, irregular heartbeats etc
* Conclusion of findings including any limitations of the examination such as heavy acoustic shadowing/cardiac pumps etc and recommendation for additional/alternative imaging if deemed necessary by the vascular scientist

For In Patient referrals – record the following in the patients notes using the departmental stamp or written using black ink:

Date, Time, Examination and Sign, Print name/designation with the statement: The report for the above examination is available on CRIS/Maxims

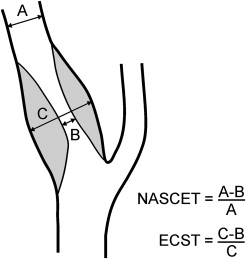
All clinically significant findings should be discussed immediately with the referring clinician/team or on-call Vascular Surgeon of the day.

**Diagnostic Criteria for Carotid Stenosis:**

Carotid stenosis calculations are based primarily on haemodynamic NASCET velocity grading criteria and St.Mary’s Ratio as agreed by the Vascular Studies Unit and Vascular Surgeons/Interventional Radiologists.

|  |  |  |  |
| --- | --- | --- | --- |
| **Percentage Stenosis**  **NASCET** | **Internal Carotid Artery**  **PSV cm/s** | **PSV Ratio**  **ICA PSV /CCA PSV** | **St Mary’s Ratio**  **ICA PSV /CCA EDV** |
| <50 | <125 | <2 | <8 |
| 50-59 | >125 | 2-4 | 8-10 |
| 60-69 |  |  | 11-13 |
| 70-79 | >230 | >4 | 14-21 |
| 80-89 |  |  | 22-29 |
| >90 but < near occlusion | >400 |  | >30 |
| near occlusion | high, low string flow | variable | variable |
| occlusion | no flow | not applicable | Not applicable |

North American Symptomatic Carotid Endarterectomy Trial (NASCET)

**For information: NASCET TO ESCT conversion (% stenosis)**

|  |  |
| --- | --- |
| **NASCET** | **ECST** |
| 30  40 | 65  70 |
| 50 | 75 |
| 60 | 80 |
| 70 | 85 |
| 80  90 | 91  97 |
| Dowman et al, Lancet 1998;351-1372-1373. | |

**Plaque Classification:**

Gray-Weale Plaque Classification:

|  |  |  |
| --- | --- | --- |
| Type 1 | Uniformly echolucent | Associated with core deposits of lipid and intra plaque haemorrhage |
| Type 2 | Predominantly echolucent  >50% of plaque structure |
| Type 3 | Predominantly echogenic  >50% of plaque structure | Largely fibrous and calcified content |
| Type 4 | Uniformly Echogenic |
| Type 5 | Unclassified plaques reflecting with areas of acoustic shadowing | Calcified plaques |

Plaque composition:

* Homogenous: plaque demonstrates a uniform echo pattern
* Heterogenous: plaque demonstrates a mixed random echo pattern
* Vulnerable plaque - unstable plaque with increased risk of rupture and thromboembolic events

Surface Contour:

* Smooth: uninterrupted luminal surface (most echolucent plaques are smooth surfaced)
* Irregular: broken irregular luminal surface (cannot be used as an absolute indicator of ulceration which is usually associated with a crater depth of at least 2mm)
* Ulcerated: erosion of the luminal surface of plaque

**Equipment and Environment Cleaning:**

* Under ALL circumstances equipment should be cleaned according to the Trust Decontamination Policy V1.0 : <http://doclibrary-rcht-intranet.cornwall.nhs.uk/DocumentsLibrary/RoyalCornwallHospitalsTrust/Clinical/InfectionPreventionAndControl/DecontaminationPolicy.pdf>
  + Appendix 3: Summary of methods for decontamination of equipment and environment
  + Appendix 4: A-Z Guide to methods of decontamination of equipment
  + Appendix 5: Procedure for manual cleaning
  + Appendix 6: Decontamination of equipment prior to service or repair

**During a Viral Epidemic/Pandemic please refer to the VSU Covid-19 Cleaning Protocol**

**PPE:**

**Please refer to RCHT Intranet Covid Shelf/Document Library for current guidance on the use of PPE – NB these are subject to change based on government advice.**

Mask Guidance: [**http://doclibrary-rcht-intranet.cornwall.nhs.uk/GET/d10360648**](http://doclibrary-rcht-intranet.cornwall.nhs.uk/GET/d10360648)

PPE and Uniform Guidance: [**http://doclibrary-rcht-intranet.cornwall.nhs.uk/GET/d10360695**](http://doclibrary-rcht-intranet.cornwall.nhs.uk/GET/d10360695)

**Sterile gel should be used in the following settings:**

* If an invasive procedure is likely to be undertaken in the following 24 hours**, including dialysis via a fistula.**
* Where there is contact with or near to non-intact skin (any alteration in skin integrity such as a rash or surgical wound).
* Where the ultrasound examination is near to an indwelling invasive device, such as an intravenous line or suprapubic catheter.
* For examinations on severely immunocompromised individuals (eg. Chemotherapy patients)
* In an intensive-care setting, high-dependency, or equivalent units.

References:

Institute of Physics and Engineering in Medicine/ The Society of Vascular Technology for Britain and Ireland: Vascular Laboratory Practice, Part II, *Cole S.E.A., Walker R.A, Norris R.*

The Society for Vascular Technology of Great Britain and Ireland; Vascular Technology Professional Performance Guidelines, Extracranial Cerebrovascular Duplex Ultrasound Examination. <https://www.svtgbi.org.uk/media/resources/Carotid_PPG_-_new_format.pdf>

Vascular Studies Unit Diagnostic Testing Procedures: *Gazzard V.* [*http://doclibrary-rcht-intranet.cornwall.nhs.uk/GET/d10254458*](http://doclibrary-rcht-intranet.cornwall.nhs.uk/GET/d10254458)

**25 EXAMPLES OF MY CAROTID SCANS**

1. US Doppler carotid artery Both :

RIGHT (PREVIOUS ENDARTERECTOMY)

The carotid arteries are widely patent with no evidence of re-stenosis post endarterectomy.

LEFT

The common carotid artery is patent with normal flow patterns. There is irregular, heterogenous atheroma in the proximal 2cm of the internal carotid artery causing approx. 50-69% stenosis by NASCET velocity criteria (low EDV meaning can't use St Mary's Ratio, but likely the lower end of this scale). Distally the ICA is widely patent. The ECA is patent.

US Doppler vertebral artery Both :

The vertebral arteries are patent with normal antegrade flow at mid-neck level.

CONCLUSION: LEFT 50-69% ICA stenosis.

You may wish to refer to carotid MDT

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1. US Doppler carotid artery Both :

Bilaterally the carotid arteries are widely patent with only minimal disease <25%. No significant stenosis.

US Doppler vertebral artery Both :

The vertebral arteries are patent with normal antegrade flow at mid-neck level.

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1. US Doppler carotid artery Both :

RIGHT

The common carotid artery is patent with normal flow patterns. There is calcified atheroma at the carotid bifurcation/internal carotid artery origin causing approx. 50-59% stenosis by NASCET velocity criteria. This is a short <1cm length of plaque, the ICA is widely patent distally. The ECA is patent.

LEFT

The common carotid artery is patent with normal flow patterns. There is heterogenous, irregular atheroma at the carotid bifurcation/proximal 2cm of the ICA causing approx. 60-69% stenosis by NASCET velocity criteria. Distally the ICA is widely patent. The ECA is also noted to be stenosed.

US Doppler vertebral artery Both :

The vertebral arteries are patent with normal antegrade flow at mid-neck level.

CONCLUSION: RIGHT 50-59% AND LEFT 60-69% ICA STENOSES.

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1. US Doppler carotid artery Both :

Bilaterally the carotid arteries are widely patent with normal flow patterns. There is moderate atheroma in the proximal internal carotid arteries (<50%), causing no significant stenosis.

US Doppler vertebral artery Both :

The vertebral arteries are patent with normal antegrade flow at mid-neck level.

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1. US Doppler carotid artery Both :

Bilaterally the common, internal and external carotid arteries are patent with normal flow patterns. There is minor atheroma in the proximal internal carotid arteries on both sides (<25%). No significant stenosis.

US Doppler vertebral artery Both :

The vertebral arteries are patent with normal antegrade flow.

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1. US Doppler carotid artery Both :

Splayed internal and external carotid arteries noted.

Bilaterally the common, internal and external carotid arteries are widely patent with normal flow patterns and only very minimal atheroma (<15%).

US Doppler vertebral artery Both :

The vertebral arteries are patent with normal antegrade flow.

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1. US Doppler vertebral artery Both :

The vertebral arteries are patent with normal antegrade flow at mid-neck level.

US Doppler carotid artery Both :

RIGHT

The carotid arteries are patent with normal flow patterns. There is minor disease in the internal carotid artery (<25%). No significant stenosis.

LEFT

The common carotid artery is patent with normal flow patterns. There is mostly calcified atheroma in the proximal 19mm of the ICA causing 70-89% stenosis by NASCET velocity criteria (ICA PSV 319cm/s, PSV ratio 4.4). Distally the ICA is widely patent. The ECA is patent.

CONCLUSION: LEFT 70-89% ICA STENOSIS. <25% on the right.

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1. US Doppler carotid artery Both :

RIGHT

The common carotid artery is patent with normal flow patterns. There is irregular, heterogenous atheroma in the proximal ~27mm of the internal carotid artery causing 50-59% stenosis by NASCET velocity criteria. Distally the ICA is widely patent. The ECA is patent.

LEFT

The common carotid artery is patent with normal flow patterns. There is moderate atheroma in the internal carotid artery (<50%). The ECA is patent.

US Doppler vertebral artery Both :

The vertebral arteries are patent with normal antegrade flow at mid-neck level.

CONCLUSION: 50-59% RIGHT ICA STENOSIS.

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1. US Doppler carotid artery Both :

RIGHT

The common carotid artery is patent with normal flow patterns. There is heavily calcified atheroma at the carotid bifurcation/proximal 21mm of the internal carotid artery causing 50-69% stenosis by NASCET velocity criteria (unable to be more specific as obscured and there is disparity in the criteria. ICA PSV 204cm/s). Distally the ICA is widely patent with turbulent flow. The ECA is tightly stenosed.

LEFT

The common carotid artery is patent with normal flow patterns. There is heavily calcified atheroma at the carotid bifurcation/proximal internal carotid artery. the ICA dives deep and is calcified making images poor. It is again approx. 50-69% stenosed (ICA PSV 179cm/s but may be higher). Unable to see distally. The ECA is tightly stenosed.

US Doppler vertebral artery Both :

The vertebral arteries are patent with normal antegrade flow at mid-neck level.

CONCLUSION: BILATERAL 50-69% ICA STENOSES.

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1. US Doppler carotid artery Both :

RIGHT

The common carotid artery is patent with normal flow patterns. High bifurcation and depth of vessels reduces visualisation of the ICA. There is mixed echogenicity plaque within the ICA causing approx. 50% stenosis by NASCET velocity criteria, suggesting an increase since the previous scan. The ECA is patent.

LEFT

The common carotid artery is patent with normal flow patterns. High bifurcation and depth of vessels reduces visualisation of the ICA. There is some disparity in the NASCET velocity criteria, which is what makes it difficult to make direct comparison to previous scans, but today there is approx. 70-79% stenosis of the ICA caused by mixed echogenicity plaque. Poorly seen distally. The ECA is patent.

US Doppler vertebral artery Both :

The vertebral arteries are patent with normal antegrade flow at mid-neck level.

CONCLUSION: RIGHT 50% ICA STENOSIS AND LEFT 70-79% ICA STENOSIS.

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1. US Doppler carotid artery Both :

RIGHT

The common carotid artery is patent with normal flow patterns. There is moderate disease in the internal carotid artery, <50% stenosed. The ECA is patent.

LEFT

The common carotid artery is patent with normal flow patterns. There is heterogenous atheroma in the proximal ICA causing approx. 60-69% stenosis by NASCET velocity criteria. Distally the ICA is widely patent. The ECA is patent.

US Doppler vertebral artery Both :

Normal flow in the right vertebral artery. There is partially bidirectional flow in the left vertebral artery (partial subclavian steal due to the known subclavian artery stenosis).

CONCLUSION: SIGNIFICANT LEFT 60-69% ICA STENOSIS. I note the patient has had a right hemisphere stroke.

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1. US Doppler carotid artery Both :

RIGHT

The common carotid artery is patent with normal flow, apart from low end diastolic flow. There is soft, likely ulcerated plaque in the proximal ~30mm if the internal carotid artery causing approx. 60-69% stenosis by NASCET velocity criteria. Distally the ICA returns to normal just below the jaw. The ECA is patent.

LEFT

The common carotid artery is patent with normal flow, apart from low end diastolic flow. There is moderate, <50% soft plaque in the ICA. The ECA is patent.

US Doppler vertebral artery Both :

The vertebral arteries are patent with normal antegrade flow at mid-neck level.

Asked to scan left subclavian artery, velocities suggest borderline 50% stenosis proximally, causing turbulent biphasic flow distal to this. Distal subclavian not scanned.

CONCLUSION: POTENTIALLY VULNERABLE PLAQUE RIGHT ICA WITH 60-69% STENOSIS.

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1. US Doppler carotid artery Both :

RIGHT

There is highly resistive flow in the common carotid artery suggesting severe distal obstruction. There is bulky, very heavily calcified atheroma at the carotid bifurcation and in the ICA largely obscuring the vessel. The proximal ICA initially looked occluded, but there is flow distal to this calcified segment suggesting severe stenosis, likely a near occlusion (unable to detect high velocities due to calcification but very damped flow proximally and distally). The ICA clears just below the jaw. Could flow patterns also be due to ?additional intracranial disease.

The ECA is stenosed.

LEFT

The common carotid artery is patent with normal flow patterns. There is moderate calcified atheroma at the carotid bifurcation/ICA <50%. The ECA is patent.

US Doppler vertebral artery Both :

The right vertebral artery is patent with turbulent flow suggesting significant stenosis. Fairly kinked vessel between vertebrae. The patient also had a very painful right shoulder with pins and needles in his arm.

The left vertebral artery has REVERSED flow. Left subclavian artery therefore scanned which has damped flow suggesting severe stenosis/occlusion at its origin.

CONCLUSION: LIKELY NEAR OCCLUSION OF RIGHT ICA. LEFT SUBCLAVIAN STEAL.

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1. US Doppler carotid artery Both :

Bilaterally the carotid arteries are widely patent with normal flow patterns and no notable atheroma or abnormality detected.

US Doppler vertebral artery Both :

The vertebral arteries are patent with normal antegrade flow at mid-neck level.

The patient was seen in the TIA clinic following this examination.

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1. US Doppler carotid artery Both :

Bilaterally the carotid arteries are patent with normal flow patterns and only minimal atheroma (<15%). No significant stenosis or abnormality detected.

US Doppler vertebral artery Both :

The vertebral arteries are patent with normal antegrade flow at mid-neck level.

The patient was seen in the TIA clinic following this examination.

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1. US Doppler carotid artery Both :

Bilaterally the carotid arteries are patent with normal flow patterns and only minimal atheroma (<15%). No significant stenosis or abnormality detected.

US Doppler vertebral artery Both :

The vertebral arteries are patent with normal antegrade flow at mid-neck level.

The patient was seen in the TIA clinic following this examination.

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1. US Doppler carotid artery Both :

Deep set vessels

Bilaterally the carotid arteries are patent with normal flow patterns with only minor disease at the carotid bifurcations (<25%). No significant stenosis.

US Doppler vertebral artery Both :

The vertebral arteries are patent with normal antegrade flow at mid-neck level.

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1. US Doppler carotid artery Both :

RIGHT

The common carotid artery is patent with normal flow patterns. There is moderate atheroma in the proximal internal carotid artery <50% stenosed. The ECA is patent.

LEFT

The common carotid artery is patent with normal flow patterns. There is minor atheroma in the proximal internal carotid artery <25% stenosed. The ECA is patent.

US Doppler vertebral artery Both :

The vertebral arteries are patent with normal antegrade flow at mid-neck level.

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1. US Doppler carotid artery Both :

RIGHT

The common carotid artery is patent with normal flow patterns. There is moderate, soft atheroma at the origin of the internal carotid artery (<50%). Distally the ICA is widely patent. The ECA is patent.

LEFT

The common carotid artery is patent with normal flow patterns and moderate soft atheroma mid-distally <50%. There is moderate, soft atheroma at the carotid bifurcation, then very high resistance, pre-occlusive flow in the proximal-mid internal carotid artery. The internal carotid artery then completely occludes just below the jaw approx 23mm distal to its origin. It is approx. 3mm diameter here. The ECA is patent with moderate stenosis.

US Doppler vertebral artery Both :

The vertebral arteries are patent with normal antegrade flow at mid-neck level.

CONCLUSION: COMPLETELY OCCLUDED DISTAL INTERNAL CAROTID ARTERY.

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1. US Doppler carotid artery Both :

Bilaterally the carotid arteries are patent with normal flow patterns and only minor atheroma (<25%). No significant stenosis.

US Doppler vertebral artery Both :

The vertebral arteries are patent with normal antegrade flow at mid-neck level.

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1. US Doppler carotid artery Both :

Abnormal damped waveforms throughout likely cardiac cause. Bilaterally only very minimal atheroma of the carotid arteries <15%. No significant stenosis.

US Doppler vertebral artery Both :

The vertebral arteries are patent with normal antegrade flow at mid-neck level.

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1. US Doppler carotid artery Both :

On the right there is only minimal atheroma of the carotid arteries (<15%). On the left there is moderate atheroma at the origin of the internal carotid artery (<50%). No significant stenosis.

US Doppler vertebral artery Both :

The vertebral arteries are patent with normal antegrade flow at mid-neck level.

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1. RIGHT

The common carotid artery is patent with high resistance flow. There is heavily calcified atheroma at the carotid bifurcation/internal carotid artery (ICA) origin ~2cm in length, causing a likely >90% stenosis (PSV ratio 6). Distally the ICA is patent with damped turbulent flow (but not poor). The ECA is patent and stenosed.

LEFT

The common carotid artery is patent. Mild-moderate atheroma noted proximally. There is heavily calcified atheroma at the carotid bifurcation/ICA origin ~24mm in length causing >90% stenosis (PSV ratio 5). Distally the ICA is patent with damped turbulent flow (but not poor). The ECA is patent.

US Doppler vertebral artery Both :

The vertebral arteries are patent with normal antegrade flow at mid-neck level.

CONCLUSION: BILATERAL TIGHT >90% INTERNAL CAROTID ARTERY STENOSES.

You may wish to get advice from the vascular surgeons.

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1. US Doppler carotid artery Both :

RIGHT

The common carotid artery is patent with normal flow patterns. There is heterogenous atheroma in the proximal internal carotid artery causing approx. 50-59% stenosis by NASCET velocity criteria. The atheroma extends approx. 18mm in length. The ECA is patent.

LEFT

The common carotid artery is patent with normal flow patterns. There is moderate atheroma in the ICA (<50%). No significant stenosis. The ECA is noted to be stenosed.

US Doppler vertebral artery Both :

The vertebral arteries are patent with normal antegrade flow at mid-neck level.

CONCLUSION: RIGHT 50-59% ICA STENOSIS.

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1. US Doppler carotid artery Both :

RIGHT

There is turbulent flow in the common carotid artery ?cause. Moderate atheroma seen at its' origin, difficult to measure but unlikely significantly stenosed. There is also turbulent flow in the brachiocephalic trunk, and the subclavian artery with likely >50% stenosis of the subclavian artery origin. ?further central stenosis or cardiac cause of turbulence (ie. aortic stenosis, I cannot access any previous cardiac imaging). There is a borderline 50% stenosis of the proximal internal carotid artery (poor views).

LEFT

There is turbulent and slightly damped flow in the common carotid artery and subclavian artery, ?cardiac cause or disease more proximally beyond the limit of ultrasound. No significantly raised velocities in the subclavian artery to suggest significant stenosis. No significant internal carotid disease.

US Doppler vertebral artery Both :

The right vertebral artery is patent with normal antegrade flow. Damped flow in the left vertebral artery suggests significant disease of this vessel.

CONCLUSION: TURBULENT FLOW BILATERALLY, ?CAUSE. RIGHT SUBCLAVIAN ARTERY AND INTERNAL CAROTID ARTERY STENOSIS.

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