

February 2012

CAROTID ARTERY DOPPLER ULTRASOUND

Vascular disease is common worldwide, and Ministry of Health figures show cerebrovascular disease was the third leading cause of death in New Zealand in 2008, after cancer and ischaemic heart disease ⁽¹⁾.

Atherosclerotic plaques consist of a lipid core and a covering fibrous cap. This can result in compromise to the circulation of the affected artery by direct luminal narrowing, or the plaque can undergo disruption with formation and propagation of thrombi/emboli ⁽²⁾.

Modulation of risk factors such as hyperlipidaemia, hypertension, diabetes mellitus and smoking is key to the management of atherosclerosis, but in the treatment of carotid disease, imaging also has a role to play.

Treatment of asymptomatic significant carotid stenoses by carotid endarterectomy (CEA) causes some risk of perioperative stroke or death, but a large randomized study (ACST-1) showed that allocation to the immediate CEA group almost halved the non-perioperative stroke rate over the next 10 years ⁽³⁾.

Carotid duplex ultrasound combines gray scale imaging to quantify the extent and nature of intimal hyperplasia and atherosclerotic plaque formation with colour and pulsed wave Doppler evaluation of blood flow to allow for estimation of degree of stenosis. It is a well validated technique for non-invasive evaluation of atherosclerotic disease of the carotid artery ^(4,5).



Fig. 1a Normal carotid bifurcation

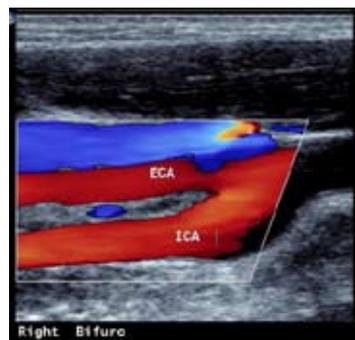


Fig. 1b Normal colour Doppler image with homogeneous non-turbulent flow

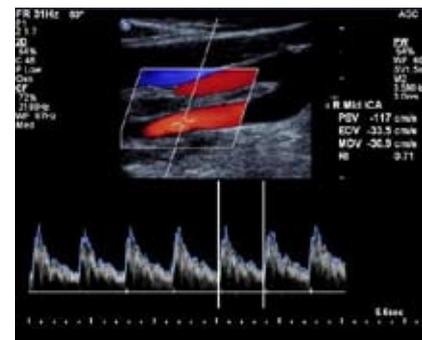


Fig. 1c Normal pulsed wave Doppler wave form

Being non-invasive, and not using ionizing radiation, means it is a safe test for evaluation of carotid artery atherosclerosis, and can be repeated. It is useful for evaluation of patients with carotid bruit, 'funny turns' which may be neurological, those with recent TIA/stroke, and those at highrisk of vascular disease.

Haemodynamically significant stenoses are those greater than 50% diameter loss, with the threshold for surgical intervention in asymptomatic individuals dependent on surgical risk and life expectancy. Those patients who are suitable for consideration of CEA (depending on comorbidities) may be referred to a vascular surgeon for evaluation and ongoing monitoring.



Fig. 2a Calcified atherosclerotic plaque



Fig. 2b Resultant turbulent flow through the stenosis (different colours representing different velocity flow)

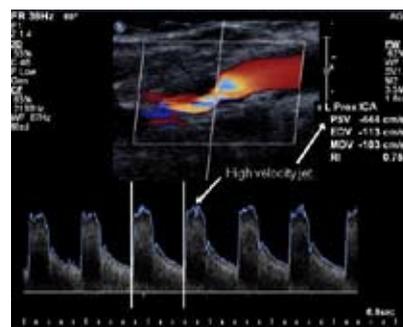


Fig. 2c Pulsed wave Doppler through stenosis (increased velocity flow due to narrowing of the lumen)

A suggested regime for surveillance in asymptomatic patients is as follows:

- >50% stenosis and candidate for CEA – 6 – 12 month scanning
- <50% stenosis with visible plaque – 1 -2 year screening
- Normal duplex, but high risk – 3 – 5 year scanning

In all cases, duplex should be compared with previous studies, and combined with clinical evaluation (⁴)

We have 5 experienced vascular sonographers who can perform carotid ultrasound at any of our branches across Auckland.

Brigid Connor

References

1. Ministry of Health. 2011. Mortality and Demographic Data 2008. Wellington: Ministry of Health.
2. Cotran R, Kumar V, Collins T. Robbins Pathologic Basis of Disease 6th ed, Saunders 1999
3. Halliday A, Harrison M et al. 10-year stroke prevention after successful carotid endarterectomy for asymptomatic stenosis (ACST-1): a multicentre randomised trial. The Lancet 2010; 376: 1074-84
4. Grant EG, Benson CB et al. Carotid Artery Stenosis: Gray-Scale and Doppler US Diagnosis – Society of Radiologists in Ultrasound Consensus Conference. Radiology 2003; 229: 340-346
5. Sabeti S, Schillinger M et al. Quantification of Internal Carotid Artery Stenosis with Duplex US: Comparative Analysis of Different Flow Velocity Criteria. Radiology 2004; 232: 431-439

3 Tesla MRI on the NORTH SHORE !

As we celebrate 75 years in practice, Auckland Radiology Group is proud to announce the installation of a new Siemens Magnetom SKYRA 3Tesla MRI scanner at The Northern Clinic, 212 Wairau Rd., Glenfield. This is the first 3T MRI ever situated north of the Harbour Bridge. This fast, top-of the line, short, wide-bore scanner, which is to commence operation in March, offers unprecedented patient comfort, accurate quick high resolution imaging, consistency and efficiency. It will be particularly welcomed for neurological, musculoskeletal, head & neck and pelvic imaging applications, especially for detailed imaging of small structures. This allows fast, accurate non-invasive presurgical diagnostic assessment, conveniently accessible for the people of the North Shore. Patients will feel less claustrophobic and more comfortable in this scanner because of its wide bore.

ARG values our reputation as Auckland's top sports imaging experts. We also possess subspecialty expertise in neurological, gynaecological and general MR imaging. As our second MRI scanner at the Northern Clinic, the new SKYRA 3T adds an exciting new dimension to our existing GE 1.5T MRI service .

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