

A 73-year-old man presented with recurrent vertigo and diplopia occurring during manual work. On admission, a physical examination found no neurological deficits but the volume of his left radial pulse was diminished, and a loud bruit was detected over the left subclavicular region. His blood pressure was 160/78 mm Hg in the right arm and 134/65 mm Hg in the left arm. Hallpike test was negative. A typical attack of vertigo and diplopia could be provoked by making the patient exercise the left arm strenuously, and would settle after a few minutes' rest, lying down.

Colour-coded Doppler ultrasonography showed a reversed flow in the left vertebral artery (VA) throughout systole (Fig 1). A markedly elevated peak systolic velocity of 320 cm/sec, with turbulent flow, was detected close to the origin of the left subclavian artery. A digital subtraction angiogram confirmed a high-grade stenosis at the proximal left subclavian artery (Fig 2). The left VA was concealed in the left subclavian artery angiogram but could be outlined by retrograde filling of contrast from the right VA (Fig 3). After angioplasty of the left subclavian artery stenosis, the left VA 'reappeared' (Fig 4) in the left subclavian artery angiogram as blood flow resumed antegrade. At the 24-month follow-up, the patient remained asymptomatic.

## Discussion

Subclavian steal occurs when a subclavian artery stenosis proximal to the vertebral origin causes retrograde flow in the ipsilateral VA. Most stenoses are due to atherosclerosis. Dissection, Takayasu

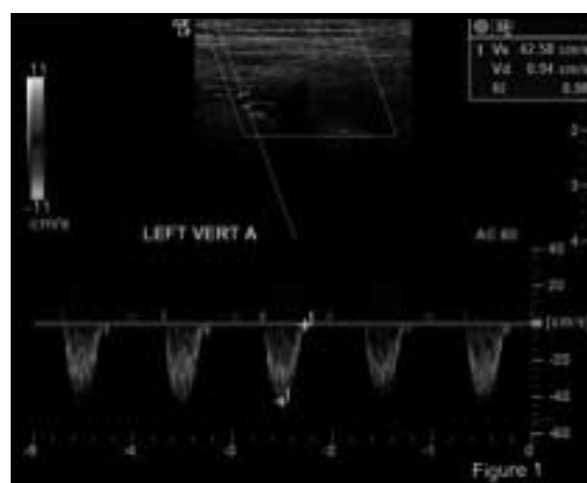


FIG 1. Doppler ultrasound examination showing a pan-systolic flow reversal in the left vertebral artery (peak systolic velocity, -42.58 cm/sec)

The antegrade flow in the diastolic phase was minimal

arteritis, and external compression on the subclavian artery are rare causes. Patients are usually asymptomatic in the early phase of subclavian steal as collateral flow from the opposite VA and/or carotid circulation may compensate for the steal. When collateral compensation fails (eg due to hypoplasia of the contralateral VA, or absence of the posterior communicating artery) and the subclavian stenosis becomes critical, intermittent arm claudication and symptoms of vertebrobasilar insufficiency, typically vertigo, diplopia, ataxia or syncope, may appear.

Colour-coded Doppler or transcranial Doppler

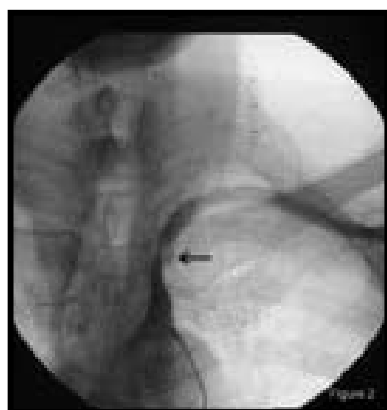


FIG 2. Catheter angiogram showing a high-grade stenosis in the proximal left subclavian artery (arrow). The left vertebral artery was concealed

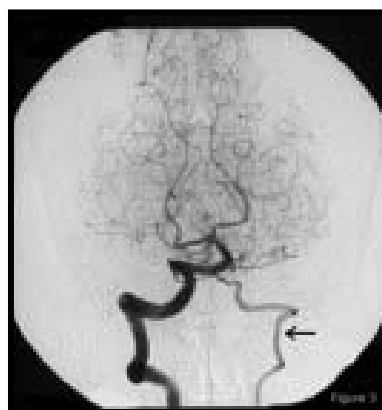


FIG 3. Delineation of the left vertebral artery (arrow) by retrograde filling of contrast from the right vertebral artery

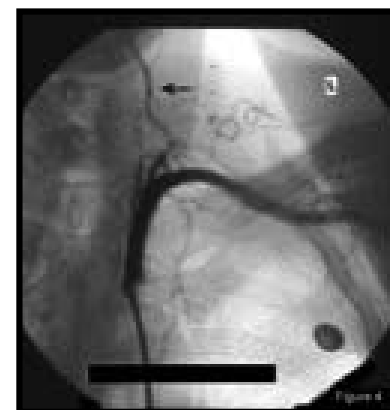


FIG 4. Antegrade flow resumed after angioplasty and the left vertebral artery (arrow) 'reappeared' in the post-stent subclavian artery angiogram

ultrasonography is a useful bed-side screening test for subclavian steal.<sup>1</sup> The severity can be graded based on the vertebral Doppler spectral patterns: grade I, antegrade flow with diminished peak systolic velocity; grade II, alternating flow—antegrade flow in the diastolic phase and retrograde flow in the systolic phase; and grade III, completely retrograde flow. A transcranial Doppler ultrasound may also be used to examine the flow patterns of the distal VA and basilar artery. Reactive hyperaemia brought on by exercising the ischaemic arm is used during the ultrasound examination to uncover any occult steal. Retrograde vertebral flow is sometimes associated with a proximal VA steno-occlusion without true subclavian steal, hence, patients with retrograde vertebral flow on ultrasound examination may need to have computed tomography or magnetic resonance angiograms for clarification. These angiograms can define the severity of the culprit stenosis, and reveal the adjacent vascular anatomy and any concurrent distal stenosis, information needed for formulating

an appropriate treatment.

Traditionally, carotid-subclavian bypass has had a high technical success rate in patients with isolated atherosclerotic subclavian stenosis.<sup>2</sup> Yet, treatment using the endovascular method is currently gaining in popularity as a comparable clinical outcome can now be achieved using a minimally invasive approach under local anaesthesia.<sup>3,4</sup>

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## References

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