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Innominate Artery Angioplasty

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Several recent reports [1–7] have discussed the potential use of percutaneous transluminal angioplasty (PTA) for treatment of stenotic lesions of the brachiocephalic vessels. We report a case of successful angioplasty in a patient with innominate artery stenosis associated with reversal of blood flow in the right vertebral artery (right subclavian steal). The risk of cerebral embolization was reduced by temporary occlusion of the origin of the right common carotid artery with a second balloon catheter.

Case Report

A 55-year-old man was seen at another hospital with the sudden onset of a right hemiparesis. Over the next 4 days, he improved such that he was able to walk and use his right arm, though it remained weak. He was then transferred to our institution, where neurologic examination showed a residual mild right hemiparesis. The right common carotid artery pulse was diminished, and a bruit was heard over the right side of the neck.

Angiography demonstrated a severe (95%) stenosis of a short segment of the proximal innominate artery (fig. 1A). Reversal of blood flow down the right vertebral artery was demonstrated (right subclavian steal) (fig. 1B). The origins of both vertebral arteries were slightly stenotic, particularly on the left. Moderate (50%) stenosis of the origin of the left internal carotid artery with ulceration was also demonstrated. Intracranially, the right middle cerebral artery was supplied mainly from the left anterior circulation by the anterior communicating artery.

Nine days after admission, PTA of the stenotic segment of the innominate artery was performed. Twenty-four hours before the procedure, the patient was begun on aspirin. To prevent embolization of the right carotid artery territory, before introduction of the angioplasty catheter into the stenotic segment of the innominate artery, the origin of the right common carotid artery was occluded with a balloon attached to a 5 French polyehtylene catheter (Medi-Tech OV/5/2/100) (fig. 1C) introduced through the right femoral artery. Thereafter, this catheter was perfused continuously with heparinized saline. A test occlusion of the right common carotid artery was carried out with no neurologic sequelae for 15 min. Using a 6.5 French polyethylene catheter introduced through the left femoral artery, an exchange wire was anchored in the right axillary artery (fig. 1C). An angioplasty catheter with a balloon 4 cm long and 8 mm in inflatable diameter (Medi-Tech DC/8-4/75) was passed through the stenotic area. The balloon was inflated and deflated several times (fig. 1C) and then pulled back from the innominate artery. The balloon occluding the origin of the right common carotid artery was then deflated and withdrawn as well. The procedure was terminated after a final aortic arch injection (fig. 1D). The next day the patient reported increased strength of his right arm and hand; this was confirmed on examination.

Discussion

Transluminal angioplasty of the brachiocephalic arteries has been performed rarely. Several recent reports [1–7] have demonstrated that, in well selected patients, PTA of the brachiocephalic vessels is a better choice than vascular surgery.

Transluminal angioplasty carries a risk of peripheral embolization [8]. While structures supplied by most peripheral vessels can tolerate small emboli, the brain is markedly less tolerant, especially to emboli composed of cholesterol material, which forms the bulk of stenotic arterial lesions. In several recent reports describing the use of PTA in brachiocephalic arteries [1–7], cerebral embolization was not shown to have occurred. This, most likely, can be attributed to the expertise of the angiographers and very careful selection of patients, as stressed by Motarjeme et al. [3, 4]. The stenotic lesions of the internal carotid arteries treated by PTA, as reported by Hasso et al. [2], Belan et al. [6], and Mullan et al. [7], were not of arteriosclerotic origin. Patients selected for vertebral artery PTA had concentric, nonulcerated stenoses of the origins of the involved vessels [3]. Reports of the use of PTA for treatment of stenosis of the proximal parts of the subclavian artery describe procedures done only on the left, with apparently all patients having a subclavian steal [1, 4]. In all except one case of PTA on the external carotid artery, as reported by Vitek and Morawetz [5], the internal carotid artery was occluded, and the procedure was performed in preparation for superficial temporal–middle cerebral artery anastomoses. Cases of transluminal angioplasty of the left common carotid artery [4, 9] were intraoperative procedures.

An alternative approach for placement of the occluding balloon would have been through the axillary artery. Unfortunately, the axillary artery was imperceptible and, therefore,

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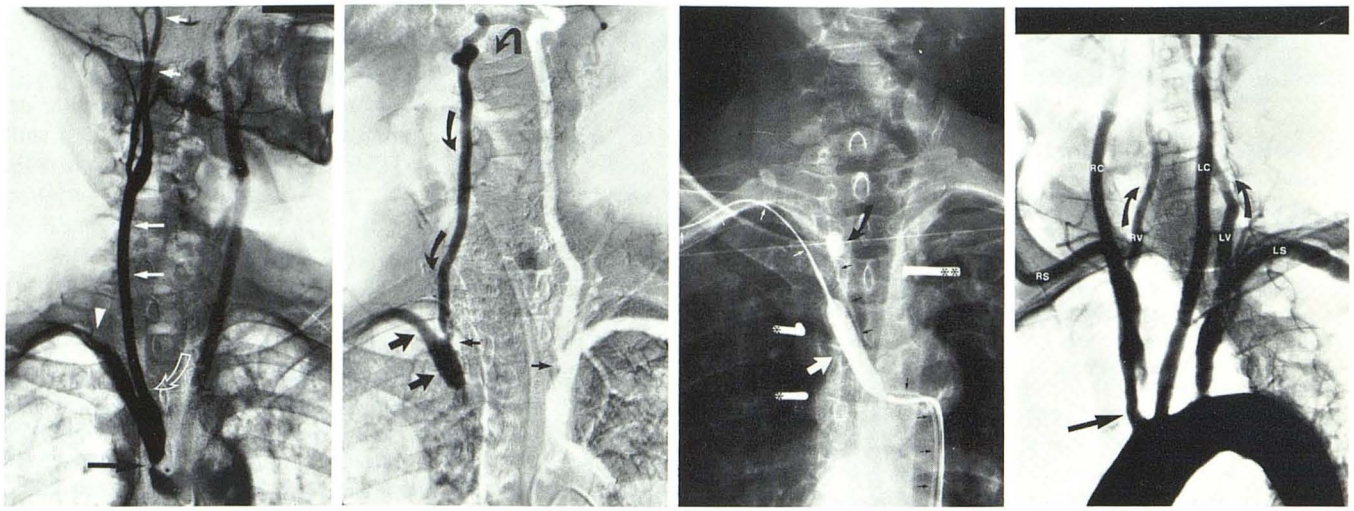

Fig. 1.—**A**, Innominate artery angiogram. There is 95% stenosis of innominate artery (*black arrow*). Good filling of right common (*long white arrows*) and internal (*short white arrows*) carotid arteries. Origin of right vertebral artery (*arrowhead*). Origin of right common carotid (*open arrow*), the position for placement of occlusion balloon. **B**, Left subclavian artery angiogram. Right subclavian steal with retrograde flow through right vertebral artery (*curved arrows*). Good filling of right subclavian artery (*large straight arrows*). Origin of both vertebral arteries is stenosed (*small straight arrows*). **C**, Balloon placement. Angioplasty balloon (*large white arrow*) is inflated in stenotic innominate artery marked by two lead markers (*single asterisks*). Anchor guide wire (*small white arrows*) is in right subclavian. Occlusion balloon (*curved arrow*) is inflated in origin of right common carotid artery (lead marker with *two asterisks*). Occlusion balloon catheter (*straight black arrows*). **D**, Aortic angiogram after PTA. Level of previous stenosis of innominate artery (*straight arrow*). Normal flow through both vertebral arteries (*curved arrows*). RS = right subclavian artery; RC = right carotid artery; RV = right vertebral artery; LC = left carotid artery; LV = left vertebral artery; LS = left subclavian artery.

the prograde transinnominate approach was chosen, even though there were some attendant risks of embolization.

Though our experience is limited to one case, we believe that temporary occlusion of a vessel distal to a stenotic lesion being treated by PTA represents a reasonable method of reducing the risk of embolization. Possibly, this technique will extend the usefulness of PTA in brachiocephalic vessels. Further experience with this technique is necessary.

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