

CASE REPORTS

Innominate artery saddle embolus: A pitfall for retrograde brachial embolectomy

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Embolus occlusion represents a frequent cause of acute upper extremity ischemia.^{1,2} Most upper extremity emboli are of cardiac origin¹⁻⁵ and typically produce acute arterial occlusion at or distal to the brachial artery.^{1,3-6} Clinical history and physical examination adequately identify the approximate site of occlusion⁴⁻⁷ in most patients so that retrograde brachial artery balloon catheter embolectomy without preoperative angiography has become the current therapeutic standard.

This article details our experience with the evaluation and treatment of acute upper extremity occlusion resulting from what we believe to be the first reported case of innominate saddle embolus. In particular, we describe the potential morbidity for retrograde embolectomy in this setting and the technical considerations for successful treatment of this uncommon clinical problem.

CASE REPORT

A 78-year-old woman had a 2-hour history of right arm pain, paralysis, and associated paresthesia. She had no significant medical history and no history of trauma. Her physical examination was notable for a regular cardiac rhythm, bilateral carotid bruits, absent right brachial, radial, and ulnar pulses, and the presence of a right axillary arterial signal by Doppler scanning. In addition, the patient had decreased sensation and decreased motor function of her right hand but no evidence of microemboli. The patient was presumed to have an upper extremity arterial embolus and within 3 hours underwent brachial artery

exploration under local anesthesia with an antecubital approach. A balloon embolectomy catheter was passed distally without retrieval of thrombus. The distance between the arteriotomy and innominate bifurcation was estimated to be 30 cm based on external landmarks (Fig. 1). The catheter was passed proximally from the brachial arteriotomy to this point without retrieval of thrombus or restoration of pulsatile flow. The procedure was terminated, and the patient received heparin; some improvement in capillary refill and functional status was seen. The next day an innominate arteriogram was obtained that revealed a large embolus at the level of the innominate artery bifurcation with maintenance of flow through the common carotid artery (Fig. 2). At the recommendation of a medical consultant the patient underwent an evaluation of her cardiac status and received anticoagulation until the evaluation was completed. Circulatory status of the limb was monitored continuously during this period.

Four days later an innominate arterial embolectomy was performed with the patient under general anesthesia by a transverse supraclavicular incision. After control of the subclavian and carotid arteries was obtained, a large amount of thromboembolic material was removed by separate longitudinally oriented carotid and subclavian arteriotomies. Fogarty catheter embolectomy of the distal subclavian and proximal innominate arteries was then performed. After appropriate flushing was performed, arteriotomies were closed, and flow was restored.

After surgery the patient had improved Doppler signals in the radial and ulnar arteries. She noted immediate improvement in the paresthesias of her right upper extremity and improved motor function. Because echocardiographic studies had revealed left atrial thrombus, she has been receiving oral anticoagulants without evidence of subsequent embolic events. During a 5-year follow-up period she retained a good right radial pulse and had no motor or sensory dysfunction of her right upper extremity.

DISCUSSION

Before the development of the Fogarty balloon embolectomy catheter, upper extremity arterial emboli were treated with nonoperative management,

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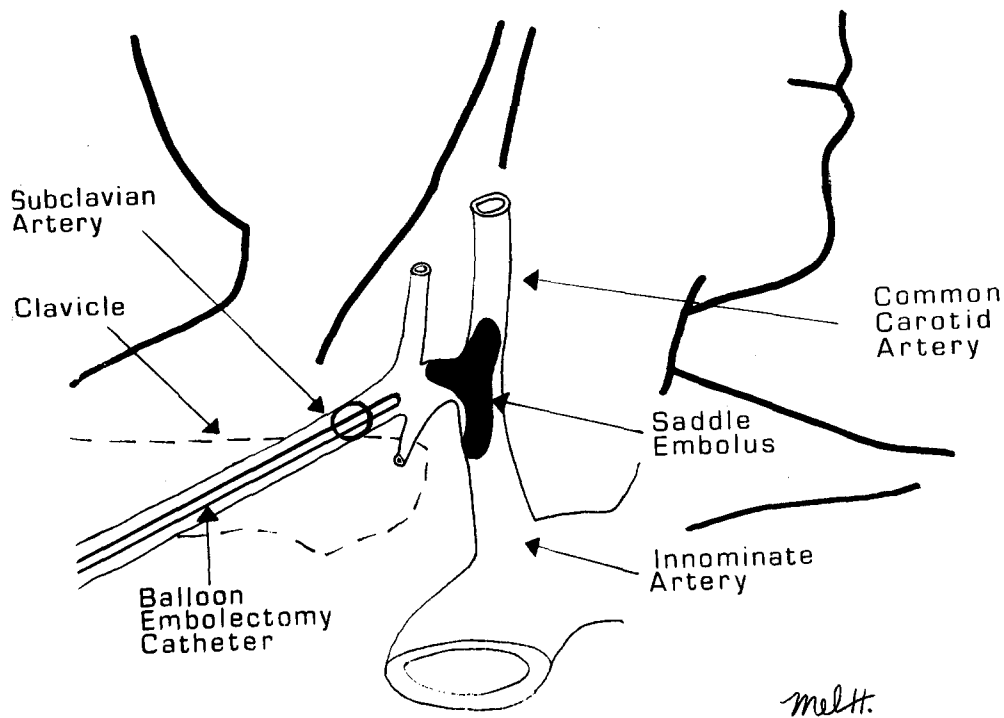


Fig. 1. Point of maximal retrograde passage of embolectomy catheter to avoid dislodging innominate saddle embolus into cerebral circulation. Distance may be estimated from external landmarks.

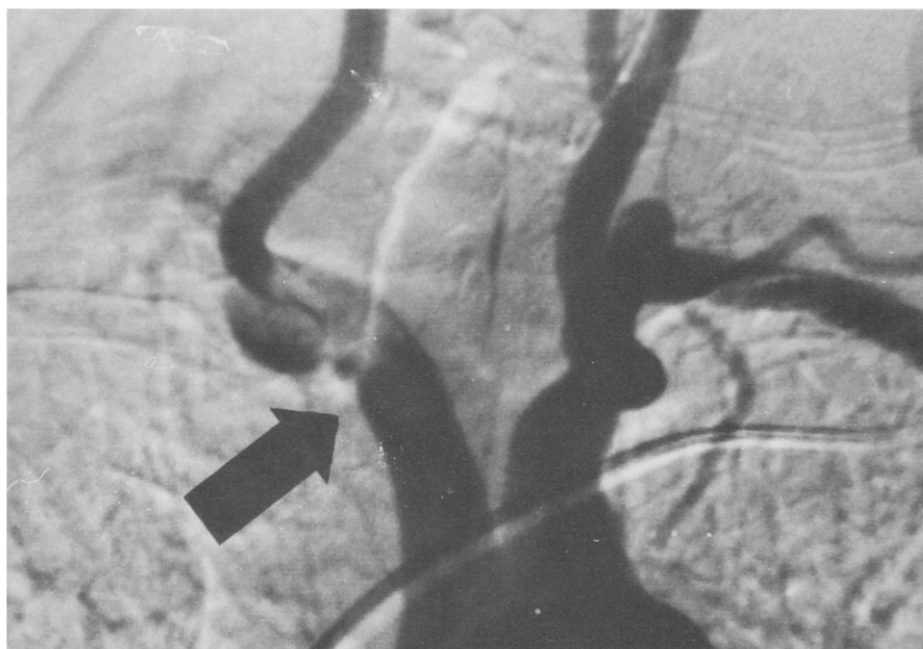


Fig. 2. Filling defect (*arrow*) that corresponds to innominate saddle embolus on digital subtraction angiogram.

arteriectomy, or limited embolectomy.⁸ After the introduction of this device in 1963, balloon catheter embolectomy emerged as the treatment of choice.⁹ The procedure involves exposure of the brachial artery in either the upper arm or the antecubital fossa with subsequent retrograde or antegrade passage of the catheter. This approach works well for the vast majority of upper extremity emboli, which are usually located at or distal to the axillary artery.^{1-4,10}

Proximal entrapment of emboli of cardiac origin in the subclavian or innominate arteries is quite unusual. Based on a Medline computerized search of the English language literature over the past 20 years, saddle embolus of the innominate artery as we have encountered and described has not been previously reported. Of particular interest is the fact that the patient did not have any significant hemispheric neurologic symptoms despite acute reduction in ipsilateral common carotid artery flow. We believe that this finding was due to adequate collateral compensation through the circle of Willis and external carotid artery similar to the situation in arterosclerotic occlusion of the common carotid proximal to its bifurcation.

Innominate artery saddle embolus presents a potential pitfall to balloon catheter embolectomies, because retrograde passage of the catheter could dislodge a portion of the embolus into the distal cerebral circulation and precipitate a right hemispheric neurologic deficit. As described in this article it is therefore critical to identify the distance between the brachial arteriotomy and the innominate bifurcation. This distance can be approximated by placing the tip of the catheter slightly lateral to the clavicular insertion of the sternocleidomastoid muscle. If passage of the Fogarty catheter to this distance does not restore flow, the procedure should be terminated, the patient should receive systemic heparin, and an arteriogram of the aortic arch vessels should be obtained.

The method of exposure of the innominate bifur-

cation is influenced by the angiographically defined location and extent of the innominate embolus. We elected to approach the innominate bifurcation with a supraclavicular approach based on the arteriographic finding of an innominate bifurcation located above the clavicle caused by tortuosity and elongation. An alternative exposure with a median sternotomy may be considered when thrombotic material extends proximally or when there is associated occlusive disease in the proximal innominate artery. Obviously special care must be taken not to dislodge the embolic material into the cerebral circulation during the dissection. Likewise careful flushing is necessary to minimize the chance of neurologic complications.

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