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Endovascular Management of Two Uncommon Cases of Acute Upper Limb Ischemia in Young

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Abstract

Acute upper limb ischemia accounts for less than 5% of all cases of limb ischemia. The etiology in young individuals are usually traumatic. Other non-traumatic causes are rarely seen and here we present two such cases in young, presenting with acute upper limb ischemia. The choice between a surgical or a minimally invasive endovascular approach remains unclear. Endovascular approach to management, although based on expertise, offers good post procedural outcome, comparable to post-surgical outcomes. Here we present two cases of thrombotic occlusion of the upper extremity following trauma and arterial thoracic outlet syndrome respectively managed successfully with endovascular approach.

Keywords

- upper limb ischemia
- peripheral angioplasty
- cervical rib
- post-traumatic brachial artery thrombosis
- in-graft stenosis

Learning Objective

The treatment approach to limb ischemia is slowly shifting to toward minimally invasive endovascular approach with high technical success and better limb outcomes. Acute upper limb ischemia in young, although uncommon, should warrant evaluation for feasibility of an endovascular approach for better long-term outcomes.

Introduction

Upper limb arterial ischemia is much less common than lower limb ischemia. It accounts for less than 5% of all cases of limb ischemia.[1] Of the various etiologies, embolism is the most common cause of upper limb ischemia. Thrombotic cause for an acute limb ischemia is commonly attributed to atherosclerosis or less commonly secondary to trauma. In young patients, however, other causes such as trauma and non-traumatic causes such as embolism secondary to cardiac disease or cervical rib should be kept in mind. Other rare cause includes thrombosis due to hypercoagulable state.

The most common location in the upper extremity for an embolic occlusion is at the brachial artery just proximal to the bifurcation of radial and ulnar arteries.[2] However, the origin of the left subclavian artery is the most common occlusive site due to atherosclerosis. Although CT angiography remains the diagnostic modality of choice,[3] the choice of approach to management of open versus endovascular remains unclear.

Traumatic vascular injuries causing acute limb ischemia are uncommon and they carry a higher morbidity often requiring surgical intervention and limb salvage with poor functional outcomes. The different types of vascular injuries

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noted following blunt force trauma amenable to endovascular approach were dissection, pseudoaneurysm, arteriovenous fistula, and expanding hematoma.

Arterial thoracic outlet syndrome is another uncommon cause of vascular insult to the upper extremity. Cervical ribs account for less than 1% in population and are found in majority in women.[4] Symptoms arise due to compression of the subclavian artery or due to emboli arising from stenosis or pseudoaneurysm. They can also cause damage to intimal layer followed by thrombosis, distal embolism or post stenotic dilatation.[5] This causes claudication, tingling, numbness, pallor, and pulselessness of the distal limb. Treatment option includes surgical excision of rib and repair of the artery.

Here we present two cases of thrombotic occlusion of the upper extremity following trauma and arterial thoracic outlet syndrome, respectively, managed successfully with endovascular approach.

Case 1

A 28-year-old male patient with no known co-morbidities came to emergency department with history of fall on outstretched hand with anterior dislocation of left shoulder. It was managed with closed reduction. All his laboratory routine tests were within normal limits. On day 3 following conservative management, he complained of pain and numbness in the left upper limb. He had feeble distal pulses (left radial) but there was no discoloration of the extremity.

On CT-angiogram of the left upper limb, he was found to have a long segment thrombosis of left brachial artery with reformation distally (►**Fig. 1**). Peripheral angiogram done by right femoral arterial access (►**Fig. 2**) was suggestive of occlusion of left brachial artery with thrombus (►**Video 1**) with dissection of the artery at the site of possible impact of humeral head. Peripheral angioplasty with the self-expanding stent Everflex EV3 (Medtronic, USA) 6.0 × 60 mm) was done ►**Video 2** with a good post procedural flow (►**Fig. 3**). He was discharged on antiplatelet drugs and statins. He was on single antiplatelet drug (aspirin 150 mg), statin (atorvastatin 40 mg), and oral anticoagulation (warfarin) with INR target 2 to 3 for 6 months. Follow-up arterial Doppler at 6 months was suggestive of patent stent with triphasic flow in the distal arteries. He was switched to single antiplatelet drug (aspirin 75 mg) and moderate intensity statin (atorvastatin 20 mg) as maintenance.

Case 2

A 21-year-old male patient, with no known comorbidities came with right upper limb pain, tingling and numbness since 1 week. On examination of the right upper limb, it was cold, edematous with absent brachial, radial, and ulnar pulses. X-ray neck showed a right cervical rib (►**Fig. 4**). Other routine investigations were normal. His right upper limb CT angiogram (►**Fig. 5**) showed compression of the subclavian artery between the clavicle and the incomplete cervical rib with arterial dissection. It also showed a long segment

Fig. 1 CT angiography of left upper limb of Case 1 showing long segment thrombosis of left brachial artery.

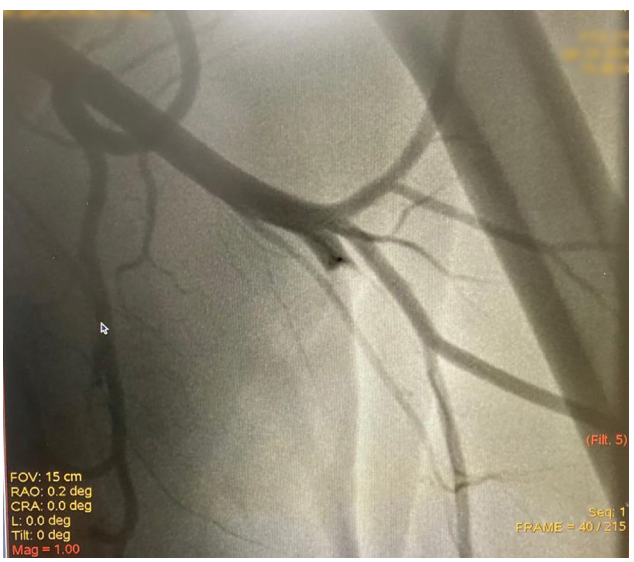

Fig. 2 Peripheral angiogram of Case 1 showing left brachial artery occlusion.

hypodense filling defect of brachial artery, suggestive of complete thrombotic occlusion extending distally to the right radial and ulnar arteries. He underwent peripheral

Fig. 3 Peripheral angiography of Case 1 showing good post procedural flow of left brachial artery.

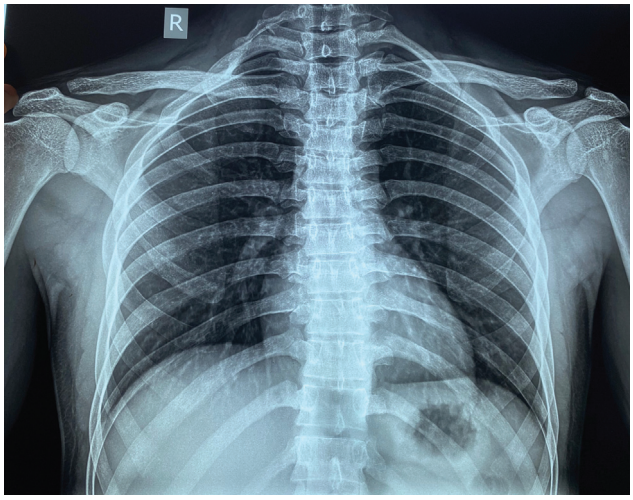

Fig. 4 Chest X-ray of Case 2 showing cervical rib.

angiogram that showed complete thrombotic occlusion of the right proximal brachial artery with no filling of distal vessels or any collateral flow in the distal arm. Peripheral balloon angioplasty was done (►**Fig. 6**) followed by intra-arterial thrombolysis with streptokinase. Post procedure the right radial and ulnar pulses were felt feebly, right upper limb was warm. He was treated with oral anticoagulants (acenocoumarol) and aspirin.

On follow up 2 months later, he was found to have feeble right ulnar pulse. On elevating the right arm for more than 1 minute, patient would experience pain in right hand and forearm. On examination, radial pulse disappeared on abduction and hyperabduction of the right arm. Subsequently, he was planned for corrective surgery and underwent right cervical rib excision and right scalenectomy. Intraoperatively subclavian artery aneurysm was identified, which was ex-

Fig. 5 CT angiogram of the right upper limb of Case 2 showing occlusion of the subclavian artery.

Fig. 6 Peripheral balloon angioplasty of Case 2.

cised and reconstructed with a poly-tetra-fluoro-ethylene (PTFE) graft. Post procedure, peripheral pulses were well felt and he was discharged on oral anticoagulation and aspirin.

One year post surgery, he came with right upper limb claudication and reduced distal pulses. Repeat CT-angiogram

Fig. 7 CT angiogram of Case 2 after 1 year showing stenosis of the right subclavian artery vascular graft.

(►**Fig. 7**) showed stenosis of the right subclavian artery vascular graft causing total luminal occlusion with reformation of distal subclavian (by collaterals) with normal caliber of the right axillary and brachial branches. He underwent peripheral angiography (►**Fig. 8**) and peripheral angioplasty to right subclavian artery (PTFE graft) with self-expanding stent Everflex (Medtronic, USA) 7.0 × 120 mm. A good post procedure flow was established in the artery (►**Fig. 9**).

Discussion

Poly trauma with hemodynamic instability at presentation usually favors an open vascular repair along with supportive management. With the availability of full-body CT scan, the delineation of minor vascular injuries that require surgical or endovascular approach is possible. In a study conducted by

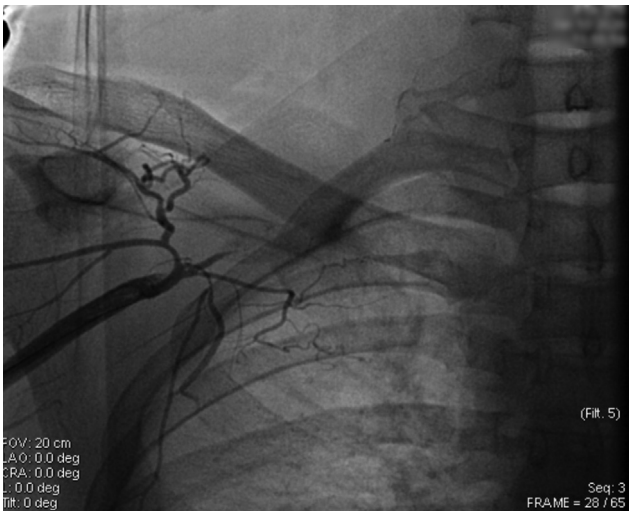

Fig. 8 Peripheral angiogram of Case 2 showing occlusion of right subclavian artery.

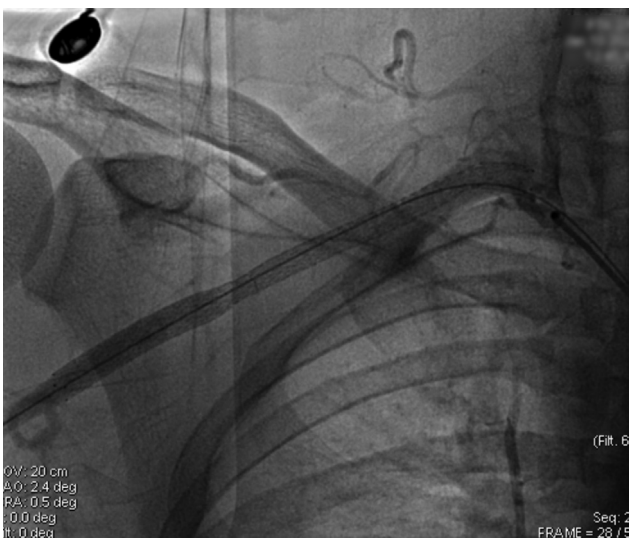

Fig. 9 Peripheral angiography of Case 2 showing good post procedural flow of right subclavian artery.

Desai et al[6] analyzing endovascular repair in traumatic vascular injury, patients were selected for this minimally invasive approach if there was no pulsatile bleeding from wound and was suitable for stent-graft repair. There was a 100% technical success reported with a 92% limb salvage rate at 45 days. Another study conducted by Ganapathy et al[7] reported a higher limb salvage rate by endovascular approach compared with open repair. In our patient, the 6-month follow-up Doppler showed a patent stent with good flow. Percutaneous approach in an emergency setting can minimize major complications and provide a fast resolution of the acute ischemia in the limb.

Pseudoaneurysm of the subclavian artery as seen in our case was secondary to thoracic outlet syndrome. It was found to be a frequent type of aneurysm by one meta-analysis by Maskanakis et al[8] where endovascular repair was found to be technically feasible. The primary approach in our patient was open surgical repair with a PTFE graft. Graft occlusion or stenosis is a common complication, one which presented in our case 1 year post

surgery. Endovascular approach with a self-expanding stent placement was done successfully. This approach celebrates a high technical success, up to 85% in a study by Cheun et al.[9]

Although bypass surgery compared with endovascular techniques were not found to affect long-term mortality by the meta-analysis conducted by Dabrh et al,[10] balloon angioplasty is now recommended for critical limb ischemia for those who did not have an autogenous vein conduit available as per the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines (2011).

Conclusion

The treatment approach to limb ischemia is slowly shifting toward minimally invasive endovascular approach with high technical success and better limb outcomes. Acute upper limb ischemia in young, although uncommon, should warrant evaluation for feasibility of an endovascular approach for better long-term outcomes.

Video 1

Stent deployment in Case 1. Online content including video sequences viewable at: https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0042-1758528.

Video 2

Thrombotic lesion in Case 1. Online content including video sequences viewable at: https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0042-1758528.

Note

This paper is not under consideration elsewhere. None of the paper's content has been published previously. All authors have read and approved the manuscript.

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Conflict of Interest

None declared.

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