

Endovascular Therapy of Critical Upper Limb Ischaemia, Performed Two Months after Thromb-Embolic Occlusion of Axillary to Brachial Artery

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Rec date: Feb 13, 2014; Acc date: Apr 17, 2014; Pub date: Apr 24, 2014

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Abstract

Thrombo-embolic occlusion of the arterial circulation of upper limb, if not optimally treated by surgical or endovascular approach, can cause ischaemic damage of muscles, potentially leading to gangrene and subsequent loss of affected limb.

68 yrs old female, reported to a local hospital with severe pain and pallor of the right arm. Clinical examination and Duplex revealed total loss of arterial circulation from axilla to palm. ECG showed previously unknown Atrial Fibrillation. Angiogram performed via femoral approach confirmed occlusion of axillary artery at the level of neck of humerus. Medical management with anticoagulation and analgesic was provided and discharged under Warfarin on the 7th day, reported to have improved clinically.

She was seen at tertiary center 2 months later with continuing pain, swollen palm and immobile fingers but no gangrene. Interventional procedure was performed using radial artery approach. The entire occluded segment extending from axillary to mid brachial level was reconstructed by balloon dilatation followed by deployment of self-expanding stents, restoring circulation up to the palm.

Clinical follow up till nine months after procedure showed optimum improvement with good return of muscle power. Duplex showed well patent stented segment. Due to Atrial Fibrillation, she was now under treatment with Dabigatran along with Clopidogrel and Cilostazol.

Keywords: Embolic Occlusion; Upper limb ischaemia; Endovascular Intervention

Case Report

A 68 years old female patient, hypertensive, non-diabetic, under medical treatment for clinically diagnosed Ischaemic Heart disease, had sudden onset acute pain in the right arm with development of pallor of the arm and absence of radial pulse detected by her husband.

On hospitalization (district level), previously undiagnosed atrial fibrillation was detected on ECG, and no pulse was available distal to the axillary artery. Arterial Doppler examination confirmed thrombotic occlusion of the axillary artery at the level of neck of humerus. Clinical diagnosis was thrombo-embolic occlusion of right axillary artery following development of atrial fibrillation of unknown duration.

As per the discharge report from the district hospital, she was treated in intensive care unit with Morphine, Heparin (low molecular), Clopidogrel and Aspirin. The next morning an angiogram was performed from right femoral artery, confirming the clinical diagnosis in addition to a highly tortuous double U-turn subclavian artery (Figure 1). She was continued on medical management only and discharged after 7 days under Warfarin, reporting significantly improved condition of the arm.

Two months after discharge from the district hospital, the patient reported to the vascular department to our tertiary cardio-vascular center with continuing pain and swelling of the palm, and all fingers flexed with loss of function. Clinically, no pulse could be detected below the axillary artery, with the whole forearm pale and edematous, but no gangrenous changes were noted. Duplex confirmed subtotal occlusion of the axillary artery, and proximal two thirds of the brachial artery full of scattered organized thrombi, leaving a few streams of blood flow.

Following discussion with our vascular surgeons, an endovascular intervention was decided upon. After explaining the situation, consent was obtained from the patient and her spouse.

Procedure

After stopping Warfarin, she was kept on dual anti-platelet drugs (Clopidogrel and Cilostazol) and Low Molecular Heparin. Angiography was performed from right femoral artery showing take off of both common carotids and right subclavian artery from brachiocephalic trunk. Double U-turn of proximal segment of subclavian artery was observed (Figure 1). Sub-totally stenosed axillary artery at the level of neck of humerus was observed, followed by stream of dye flowing through diffusely narrowed proximal two third of the brachial artery, with series of fixed filling defects indicating presence of organized thrombi (Figure 2 and 3).

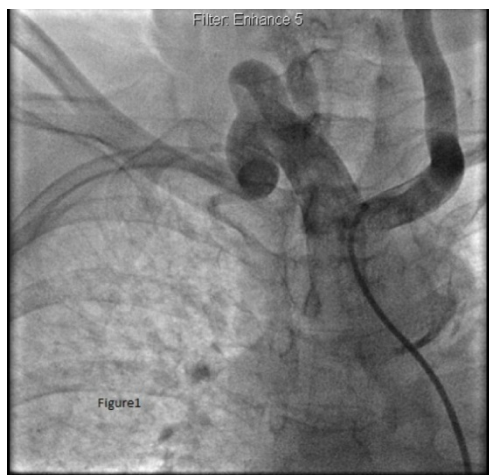


Figure 1: Double U-turn of proximal segment of subclavian artery was observed



Figure 3: Sub-totally stenosed axillary artery at the level of neck of humerus was observed, followed by stream of dye flowing through diffusely narrowed proximal two third of the brachial artery, with series of fixed filling defects indicating presence of organized thrombi



Figure 2: Sub-totally stenosed axillary artery at the level of neck of humerus was observed, followed by stream of dye flowing through diffusely narrowed proximal two third of the brachial artery, with series of fixed filling defects indicating presence of organized thrombi

Thrombolysis and Atherectomy (under embolic protection device) would have been the treatment of choice in the early hours or days when she reported herself at the district hospital, when the process of thrombo-embolization was fresh. She came to the tertiary center two months after the acute episode when the thrombi were organized and fixed to the intima of the vessel. The possibility of a successful thrombectomy procedure at this stage was considered doubtful. On the other hand there was a high likelihood of intimal injury of the affected artery. Thrombolysis, two months after the acute episode had no role.

As difficulty had been experienced in manipulating the diagnostic catheter from the arch of aorta to the subclavian artery and beyond during angiography, we decided to take entry from the right radial artery for the interventional procedure

Although clinically not palpable, the radial artery could be easily accessed by assessing the anatomical landmark with the 6F Cordis radial kit having a puncture needle of 22 size. After placing the tip of a 6F guiding catheter of multipurpose type (Figure 4), the diseased segment could be navigated and crossed with a 0.014 inch Whisper coronary guide wire, and the tip was parked in the ascending aorta. A 4x15 mm coronary angioplasty balloon was now railed over the wire and the diseased segment was carefully dilated step by step to create adequate lumen for the passage of stent (Figure 5 and 6).



Figure 4: After placing the tip of a 6F guiding catheter of multipurpose type



Figure 5: A 4x 15 mm coronary angioplasty balloon was now railed over the wire and the diseased segment was carefully dilated step by step to create adequate lumen for the passage of stent

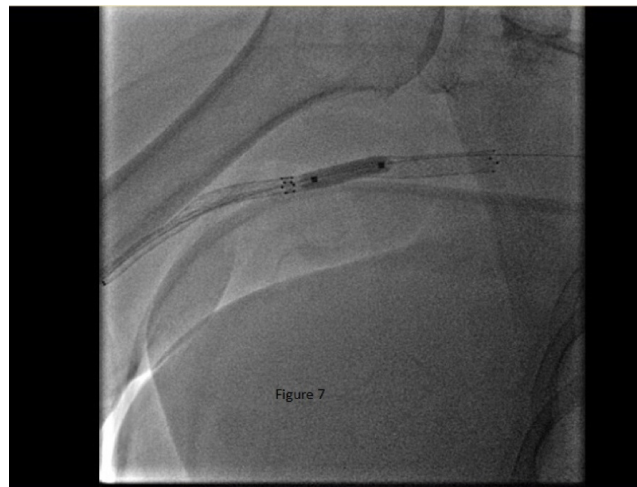


Figure 7: Two self-expanding stents of 6 mm size were deployed, duly overlapped covering healthy segments beyond the target on both ends, and post dilatation of the stents was performed

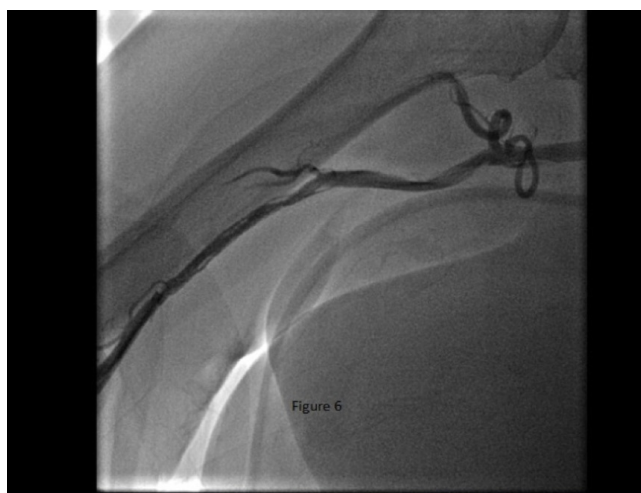


Figure 6: A 4x 15 mm coronary angioplasty balloon was now railed over the wire and the diseased segment was carefully dilated step by step to create adequate lumen for the passage of stent

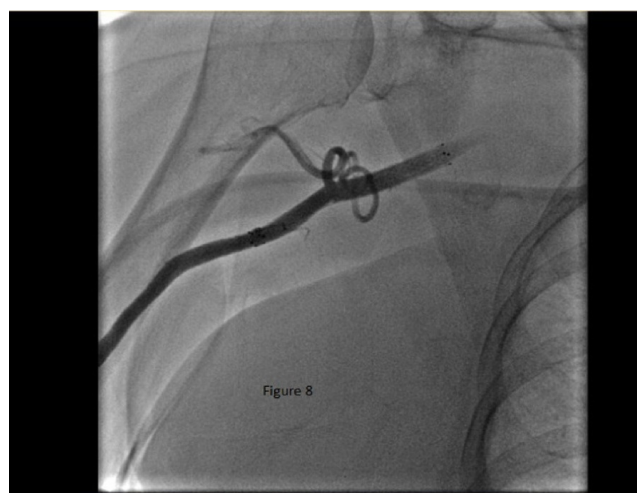


Figure 8: Following angiogram showed optimum restoration of lumen with TIMI III distal flow

Two self-expanding stents of 6mm size were deployed, duly overlapped covering healthy segments beyond the target on both ends, and post dilatation of the stents was performed (Figure 7). Care was taken during deployment of proximal stent to avoid any kink while adducting the axillary joint. Following angiogram showed optimum restoration of lumen with TIMI III distal flow (Figure 8).

Both brachial and ulnar pulses were immediately palpable with good volume. However the radial pulse was only faintly palpable after removal of sheath, done immediately at the end of procedure, though pulse were well palpable at anatomical snuff box.

A total of 5000 IU Heparin was given during the procedure. Oral anti-coagulant treatment for persistent atrial fibrillation was started on the 2nd day with Dabigatran (Pradaxa) 150 mg twice daily. On the 5th day after procedure she was discharged from the hospital without any visible improvement of the condition of the palm and the fingers, though excellent brachial and ulnar pulsed were present with no difference in brachial pressure between the two arms.

Monthly clinical follow up showed steady improvement with disappearance of pain and edema, and progress in movement of fingers. Check up at the end of 9 months only distal phalanges were still partially flexed with restricted movement, but an optimal grip is restored. Dabigatran has now been reduced to 110 mg twice daily following reports of recent publication [1]. Dual antiplatelet are planned to be continued for one year. Arterial Duplex examinations

performed at 3 and 9 months showed optimum flow in the stented segment, whole of ulnar artery and the palmer arch. Flow in distal radial artery was poor but not absent, which was clinically not palpable even after 9 months after revascularization

Discussion

The district hospital with limited resources, where the patient was initially admitted, had no cardiovascular interventionist and dedicated vascular surgeon. However considering the anatomy of arch of aorta and subclavian artery, placing an embolic protection device distal to the occlusion would have required an interventionist with vast experience followed by combination of therapy of thrombolytic and GPIIB-IIIa to get the early optimum result. The recently published method of Markiewicz, Dave, Colbi et al. [2] performing thrombolysis and atherectomy under emboli protection device could have been considered in this case, had she been transferred to a tertiary center while it was in acute or sub-acute stage. After a gap of two months, when the thrombi were already organized and adherent to the intima, possibility of success in application of their technique was considered remote.

The chances of success of thrombolytic treatment in this case in acute condition could also be questioned considering the history of atrial fibrillation, with clots of unknown age from the left atrium causing the initial occlusion followed by local formation of thrombi due to stagnation of blood flow.

Surgical embolectomy by Fogerty catheter [3] could not be done due to absence of expertise, though this technique is not free from morbidity and mortality including cerebral complications, cardiac failure, local complications, and re-occlusion. Around 2% cases had to face limb amputation. Licht et al. [4] used this technique in upper limb arteries and reported the need for re-embolectomy and limb amputation in certain cases. Mortality was reported in up to 9% of patients due to cardiovascular and cerebrovascular complications.

The patient had no record of referral to a tertiary center for earlier revascularization in her discharge report from the district hospital. By the time she presented herself at our hospital, pharmacological treatment for revascularization no longer had a role. The choice lay between a surgical bypass and an endovascular reconstruction. The vascular surgery team hesitated to perform a bypass surgery in this region on an elderly patient with history of coronary artery disease and atrial fibrillation

According to the literature approximately 4% of all operations performed by a vascular surgeon are for upper extremity ischemia [5]. Hudorovic et al. [5] reported in situ cephalic vein bypass from axillary to brachial artery in 16 cases between 2002-2006, all of which were incidentally caused by trauma incurred during endovascular intervention and stenting of the brachial artery via femoral approach, out of a total of 95 such cases. Whether they had used balloon expandable stents, which are more likely to injure the otherwise delicate brachial artery, has not been mentioned.

Considering the critical state of the arm, which was likely to develop gangrene if continued with medical management only, we took the decision for an endovascular intervention. Since technical difficulties were anticipated in navigating hardware via the highly tortuous subclavian artery, intervention via radial arterial route was chosen. Our team has over two decades of experience in trans-radial intervention.

A group of US surgeons have mentioned that the need to bypass the brachial artery is rare, and they have reported 13 bypasses in a period of 10 yrs [6].

Though warned from reported data of 16.8% major complications (dissection to laceration) converting to surgery, our procedure was smooth and short with optimum angiographic result. Also clinical follow up with Duplex up to 9 months showed vascular patency and steady clinical improvement. Clinically faintly palpable distal radial artery even after 9 months of procedure indicates sheath induced injury, though it was removed immediately after the procedure. Presence of normal pulse in ulnar artery and at anatomical snuff box indicates optimum circulation in palm, which is supported by clinical improvement.

Her past reports showed that INR had not been properly maintained, and Prothrombin Time was not regularly checked. In order to avoid frequent blood tests to settle the dose of Warfarin, anticoagulation treatment was now switched off Dabigatran, 150 mg twice daily. As per recommendation of recent publications the dose of Dabigatran was reduced to 110 mg twice daily during checkup after 9 months [1,7]. No further embolic complications were reported.

References

1. Southworth MR, Reichman ME, Unger EF (2013) Dabigatran and postmarketing reports of bleeding. *N Engl J Med* 368: 1272-1274.
2. Markiewicz R J, Dave R, Colby Shwan (2013) Clear way RX- Directed Combination Thrombolytic and GPIIb/IIIa therapy embolic protection device in acute upper extremity occlusion. *Vascular Disease Management* 7.
3. Hernandez-Richter T, Angele MK, Helmberger T, Jauch KW, Lauterjung L, et al. (2001) Acute ischemia of the upper extremity: long-term results following thromboembolectomy with the Fogarty catheter. *Langenbecks Arch Surg* 386: 261-266.
4. Licht PB, Balezantis T, Wolff B, Baudier JF, Røder OC (2004) Long-term outcome following thromboembolectomy in the upper extremity. *Eur J VascEndovascSurg* 28: 508-512.
5. Hudorovic N, Lovricevic I, Ahel Z (2010) In situ cephalic vein bypasses from axillary to the brachial artery after catheterization injuries. *Interact CardiovascThoracSurg* 11: 103-105.
6. Jain KM, Simoni EJ, Munn JS, Madson DL Jr (1996) Long-term follow-up of bypasses to the brachial artery across the shoulder joint. *Am J Surg* 172: 127-129.
7. Connolly SJ, Ezekowitz MD, Yusuf S, Eikelboom J, Oldgren J, et al. (2009) Dabigatran versus warfarin in patients with atrial fibrillation. *N Engl J Med* 361: 1139-1151.