

# Ischemia of the Thumb: A Rare Case of Emboli to the Princeps Pollicis Artery

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## Abstract

Acute digital ischemia is relatively rare due to collateral blood supply to the hand from ulnar and radial arteries. We present a case of thumb ischemia secondary to embolic occlusion of the princeps pollicis artery, a branch of the radial artery, with concomitant atherosclerotic occlusion of the ipsilateral subclavian artery. This case highlights the importance of thorough investigation for systemic causes of distal upper extremity ischemia.

**Keywords:** Digital ischemia • Ulnar artery • Radial artery • Princeps pollicis artery • Thromboembolism

## Introduction

Upper extremity thromboembolic events are rare but very important because of the increased risk of amputation and disability [1]. Radial artery involvement is even rarer because upper extremity thrombotic events typically involve the ulnar artery and its distal branches, sparing the radial artery [1]. This is likely due to an ulnar artery dominant vascular supply to the hand. The ulnar artery forms the superficial palmar arch, whereas the radial artery forms the deep palmar arch. These arches communicate and provide collateral blood supply to the hand. The digital arteries arise from the superficial palmar arch supplying the fingers [2]. The princeps pollicis artery branches from the deep palmar arch formed mainly by the radial artery, to supply the thumb [2]. Therefore, there must be significant occlusion and involvement to cause symptoms of ischemia in the hand. A finding of digital ischemia can also indicate the silent existence of systemic risk factors and therefore warrant extensive systemic examination. This case emphasizes the need to consider risk factors and comorbidities that may predispose patients with digital ischemia to developing atherosclerosis such as dyslipidemia, hypertension etc. We present a case of embolic occlusion of the princeps pollicis that led to the discovery of atherosclerosis of the subclavian artery.

## Case Report

A 61-year-old male presented to our institution with right thumb pain. He noticed his right thumb turned blue the previous morning and had remained blue until the current presentation. The patient stated that his right thumb feels cold, and there was no change in the discoloration even when he tried rubbing his hands together. There is also positive history of associated numbness of the affected thumb. There is positive history of a similar episode 2 weeks ago with spontaneous recovery. He denied recent trauma to the area/ upper extremity, or use of any dye or paint. He worked as a lawyer, drank 1-3 glasses of wine each night. He is a past smoker but denied any illicit drug use, including cocaine. He weight-trained and ran 3-5 days a week. He had a past medical history

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of hypertension, hyperlipidemia, right bundle branch block, Gastroesophageal Reflux Disorder (GERD), and basal cell carcinoma confirmed by biopsy. He had no past medical history of Raynaud's phenomenon. His medications included: Aspirin, Losartan, hydrochlorothiazide, Atorvastatin, and Omeprazole. He has no history of hyper-coagulability state or prolonged immobility periods. Physical examination demonstrated cold right thumb with cyanosis distal to the Distal Interphalangeal (DIP) joint over volar aspect. The right thumb had slightly diminished sensation to light touch compared to the left thumb. Both radial pulses were 2+ and equal bilaterally. There was no sign of erythema or lymphangitis. Left thumb was normal. Hand and wrist had full Range Of Motion (ROM) and strength bilaterally. Cardiovascular exam revealed a faint left sided carotid bruit. Diagnostic tests including Electrocardiogram (ECG), C-reactive protein, and complete blood count were all unremarkable. Doppler ultrasound of the right thumb confirmed the presence of a thrombus in the princeps pollicis artery with 80% blockage. A CT angiogram identified a plaque with local protrusion (approximately 55%) into the lumen of the right subclavian artery compared with adjacent intima media thickness. The lesion in the right subclavian artery was not treated as the surgeon ruled that the risk of surgical intervention outweighed the benefits. Therefore, Clopidogrel (Plavix) in addition to Aspirin was initiated. The patient experienced full resolution of thumb discoloration over the next few days and experienced no complications or recurrence at follow up visits.

## Discussion

This was a case of acute digital ischemia from a previously undiagnosed/ unknown emboli source. Atherosclerosis is the accumulation of lipid rich plaques in blood vessels and is one of the leading causes of morbidity, mortality and loss of quality of life globally [2]. These plaques cause narrowing of the affected blood vessels and in some cases may rupture or get eroded, leading to the dissemination of embolic plaques into systemic circulation [2]. Subsequently, the embolic plaques can then cause ischemia at distal end organs if they cause significant narrowing of smaller arteries [3,4]. Major vessels affected include carotid and coronary circulation with associated risk of developing strokes and myocardial infarction with plaque rupture and distal emboli [4-6]. It could also result in peripheral arterial disease, commonly affecting the lower extremities [7]. Atherosclerosis of the subclavian artery is less common and often asymptomatic. Lucci et al. found a 27% prevalence of right subclavian artery atherosclerosis [7]. Patients were likely to be women, older than 54 years and with at least 1 risk factor for atherosclerosis [7]. Clinical features depend on the organ/vessels affected but atherosclerosis may go undiagnosed until they rupture and cause distal ischemia. Risk factors for atherosclerosis include obesity, dyslipidemia, hypertension and sedentary lifestyle [8,9]. Along with a good history and physical exam to rule out other

atraumatic and traumatic causes of acute digital ischemia, patients can be further worked up with Doppler ultrasound and CT angiogram. Notably, our patient had significant risk factors for developing atherosclerosis such as older age, hypertension and dyslipidemia. Therefore, there should be a high suspicion index for atheroemboli in patients who have significant risk factors for atherosclerosis when they present with distal organ ischemia.

There is paucity of published literature on subclavian artery atherosclerotic plaques leading to distal emboli formation in the hand. Seinturier et al. described a similar case in patient involved amateur sports who presented with acute digital ischemia [10]. Further work up led to the discovery of a posterior circumflex artery aneurysm that had developed on an atherosclerotic plaque. In such cases, repetitive overhead actions can compress lead to compression of the plaque by the humeral head and cause embolization. Similar cases have also been described in baseball and volleyball players [11,12]. However, unlike our case, the patient described by Seinturier et al. had an uneventful medical history. In addition, Leclere et al. described 17 cases of acute digital ischemia from various etiologies such as ulnar aneurysm (11 cases), atrial fibrillation (5 cases) and thoracic outlet syndrome (1 case). Most published literature indicate that radial artery thrombosis usually arises from trauma or manipulation to the vessel such as iatrogenic arterial cannulation, Nicolau syndrome (inadvertent arterial injection from intramuscular injection), subclavian artery balloon angioplasty, extrinsic compression of the radial artery (e.g. during bench pressing) [13-15]. Local factors such as corticosteroid injection for trigger thumb, hypothenar hammer syndrome from repetitive mechanical stress (like playing drums) may contribute [16,17]. Radial/digital artery thrombosis may also occur in systemic diseases such as infective endocarditis, systemic sclerosis, Takayasu arteritis [18-21]. Paradoxical thrombolism has also been reported due to patent foramen ovale [22,23]. Treatment modalities often involve medical therapy such as anti-platelet drugs e.g. clopidogrel, aspirin [6]. In severe acute digital ischemia with imminent risk of finger loss, microsurgical dissection of the digital collateral arteries with reconstruction may be needed emergently to restore blood flow to the affected finger [9,24].

Our patient was treated with medications after the assessed surgical risk of subclavian artherectomy. This case is important because presentations like this, even though rare, could indicate a rather sinister diagnosis that could be fatal if missed. Upper extremity ischemia from atherosclerotic plaque thrombosis is rare. Therefore, any symptom of acute digital ischemia must be investigated promptly to identify systemic causes. Furthermore, this case demonstrates that other locations apart from carotid and coronary should be investigated for atherosclerotic plaques with a presentation of acute digital ischemia. This is particularly important because subclavian arteries are not common imaged and this diagnosis could be easily missed. Limitation of this study is that it involves one patient. So, results are difficult to generalize. Also, since the patient did not undergo any surgical intervention, it was difficult to characterize or compare the biochemical component of the subclavian atherosclerosis to the embolic plaque found in the princeps pollicis to confirm a common origin.

## Conclusion

Subclavian atherosclerosis leading to acute digital ischemia is a rare clinical phenomenon. However, the presence of risk factors such as dyslipidemia, hypertension should increase suspicion for an atheroembolus from the subclavian and patients should be additionally investigated for this to prevent finger amputation and mortality.

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