Acute Palmar Digital Artery Occlusion Treated Using Endoscopic Ablation of the Thoracic Sympathetic Ganglia: Report of a Case

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Acute occlusion of the digital arteries frequently causes painful infarction requiring digital amputation. We describe a 55-year-old male patient who presented with acute onset of digital ischemia with impending gangrene on the right hand. Because angiography revealed bypass surgery was not feasible, he underwent thoracoscopic sympathectomy (TS) one week after onset of the symptom, which resulted in rapid pain resolution. He was diagnosed, thereafter, with malignant rheumatoid arthritis and methotrexate was administered. Postoperative angiography revealed that the occluded digital artery had become recanalized. Timely TS is therefore a treatment of choice for acute digital ischemia.

Key words: thoracoscopic sympathectomy, digital arterial occlusion, gangrene, rheumatoid arthritis

INTRODUCTION

Digital arterial occlusion due to vasculitis frequently leads to severe digital ischemia including ulcer or gangrene. It is rarely amenable to revascularization with the few other treatment options. The recent development of video-assisted thoracic surgery has rendered thoracoscopic sympathectomy (TS) safe and minimally invasive. Although the application of TS is still controversial for treating ischemic hand generally, it is a good therapeutic option for a subset of patients with digital arterial occlusion. Considering that acute thrombosis causes hyperactive tone of surrounding arterioles and critical vasospasm leading to gangrene, this minimally invasive procedure can effectively limit gangrene among patients who have acute digital arterial occlusion. We describe a patient with acute digital arterial occlusion due to vasculitis that was successfully treated with immediate TS.

CASE REPORT

A 55-year-old man presented with sudden onset of pain at the third and fourth digits of the right hand. His fingers had been stiff for over several months, without experienced Raynaud’s symptom. A physical examination revealed pale and cold third and fourth digits with pulsation at both the right radial and ulnar arteries. He had a history of hypertension and pulmonary embolism, but had received no medication. He had quitted smoking at the time of pulmonary embolism 7 years previously. Laboratory studies including coagulation activities including protein C, protein S and antithrombin III were unremarkable. His cardiac work-up was normal and an embolic source was ruled out. Angiography revealed occlusion of his third digital artery with a lack of collateral vessels and diseased digital arteries even in patent parts. The digital ischemia worsened despite anti-platelet therapy (Sarpogrelate). Because he was not amenable to bypass surgery, he was admitted to hospital for anti-coagulation with heparin and thoracoscopic sympathectomy (TS) 6 days after symptom onset.

TS proceeded under general anesthesia delivered by
intubation with a double-lumen endotracheal tube. A 26-Fr continuous flow resectoscope (Olympus, Tokyo, Japan) was introduced at the third intercostal rib along with an anterior axillary line. The sympathetic ganglia were ablated at the level of T2 and T3. He resumed oral anti-platelet medication (Sarpograte) on the next day of TS.

This ablation resulted in an immediate improvement in pain and coldness. A physical examination revealed pulsation at the third finger became palpable 7 days after the procedure. His postoperative course was uneventful except that a small scratch at the third finger developed necrotic (Fig. 2). However, necrotic tissue was removed spontaneously and the third finger was cured without further treatment two months after the ablation (Fig. 3A). Meanwhile, he was diagnosed with rheumatoid arthritis, requiring methotrexate administration. Angiography 35 days after TS, the third digit became necrotic after a small scratch.

Fig. 1  Gross appearance and angiography of the right hand before TS.
A: Ischemia of the third and forth digits. Note severe cyanosis of the third finger.
B: Angiography revealed that his third to fifth digital artery was occluded.

Fig. 2  After TS, the third digit became necrotic after a small scratch.
after the ablation of the thoracic sympathetic ganglia confirmed recanalization of the occluded digital artery (Fig. 3B). Seven months later, the patient remained symptom-free without recurrence of digital ischemia.

**DISCUSSION**

Digital ischemia of the fingers is caused by many conditions including atherosclerosis, arteritis (thromboangitis obliterance: TAO, vasculitis of collagen disease) and trauma. Arteritis usually involves the distal of midpalm artery and surgical revascularization is rarely feasible for this condition. Although vasodilators including prostanoids have been the first line of treatment, they sometimes cause systemic vasodilatory side effects. Moreover, they may increase blood flow just around but not at the severe ischemic area. Therefore, in practice, severe digital ischemia often results in digital amputation. Cervico-thoracic sympathectomy has been a treatment of choice with controversy. However, anatomical variation of sympathetic nerves at this area limits effectiveness with major complication including pneumothorax. However, the advent of thoracic sympathectomy using video assisted thoracoscopy has made this procedure safe and minimal invasive. Some
investigators especially have reported that thoracoscopic sympathectomy (TS) is useful for patients with severe digital ischemia caused by TAO,\(^2\) or Raynaud's phenomenon.\(^3\)

Acute thrombosis influences both local thrombotic and thrombolytic activity, which are mainly regulated by tissue plasminogen activator (tPA) and its inhibitor, plasminogen activator inhibitor-1 (PAI-1).\(^5\) Otowa et al. demonstrated that hyperactivity of sympathetic nerve system increased PAI-1 activity under hypovolemic state.\(^6\) Considering that PAI-1 is negative regulator for thrombolysis, shutdown of sympathetic activity influences the thrombosis-thrombolysis balance and may shift to thrombolytic state in the occluded artery. Moreover, recent study demonstrated that sympathetic vasoconstriction persisted and restrained muscle blood flow under hypoxia.\(^7\) Therefore, immediate ablation of the thoracic sympathetic ganglia may be effective for patients with acute digital arterial occlusion. Considering this evidence, immediate TS for shutdown of sympathetic nerves might be first choice for patients with acute digital arterial thrombosis who have Raynaud's phenomena. Anyway, we think that immediate shutdown of sympathetic vasoconstriction might be effective to our patient.

Matsumoto et al. reported a high recurrence rate among patients with Raynaud's phenomenon after TS despite initial healing. In fact, 88% of patients with active collagen disease have ischemic symptoms including pain within 6 months of TS.\(^3\) Our patient developed digital arteritis and acute thrombosis caused by malignant rheumatoid arthritis. Pain relief was immediate after the ablation of sympathetic ganglia and he remained free of ischemic symptom for 7 months, with no signs of Raynaud's phenomenon. He, however, describes compensatory sweating in the left arm.

In conclusion, timely TS may permit optimal control and maximum tissue salvage for patients with severe digital ischemia of the fingers.

**References**