

Surgical Treatment of Digital Ischemia Occurred after Radial Artery Catheterization

Permanent ischemic injury of the hand after radial artery cannulation is rare, but several cases of thromboembolism after the cannulation leading to amputation of affected limb or digits have been reported. A 48-yr-old man undergoing spine surgery showed normal modified Allen's test and had no preoperative vascular disease. We inserted 20-G radial artery catheter for the continuous monitoring of the blood flow and serial blood sampling. There was no specific event during the operation and the catheter was removed immediately after the operation. The signs and symptoms of the circulatory impairment of the radial artery developed four days after the operation and aggravated thereafter. Through the angiographic study, we found the total occlusion of the radial artery and some of its branches. After an emergent surgical exploration of the radial artery for removal of the thrombus and vein graft for the defect of the artery on the 8th postoperative day, the ischemic signs and symptoms disappeared and the radial pulse was restored.

Key Words : Anesthesia; Catheterization; Postoperative Complications; Ischemia

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Received : 20 June 2000

Accepted : 8 August 2000

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*Support was provided from departmental and/or
institutional sources.

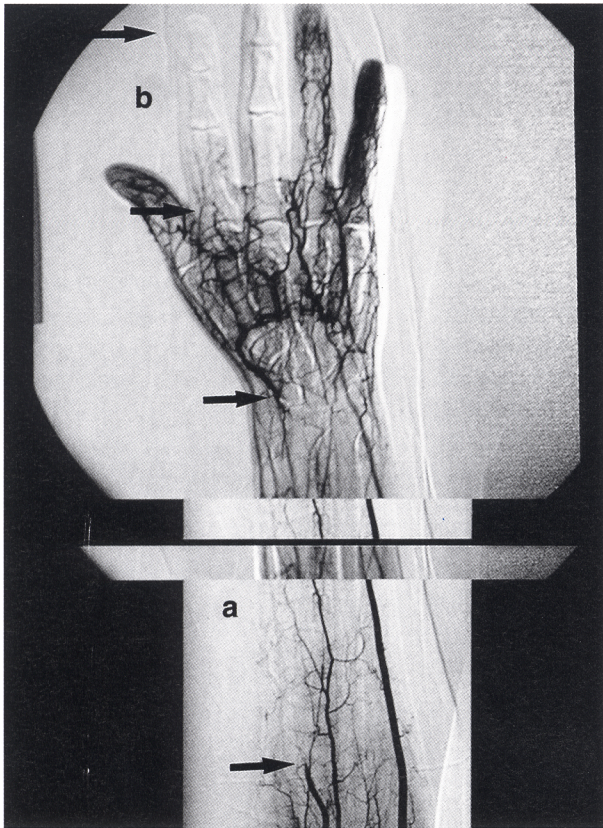
INTRODUCTION

The use of indwelling arterial catheters has become a common practice to facilitate continuous arterial blood pressure monitoring and serial measurements of arterial blood gases. Complications of arterial catheterization have rarely been reported (1). In particular, arterial occlusion by local thrombus formation or embolization is a serious complication of radial artery catheterization (2-6). We present a case of patient with digital ischemia following apparently uncomplicated radial artery cannulation with normal preoperative Allen's test. Thrombectomy of common digital artery restored the radial and common digital flow.

CASE REPORT

A 48-yr-old man presented to our institution with herniated nucleus pulposus at the 4th to 5th lumbar disc level diagnosed by magnetic resonance imaging. He had no specific medical and surgical histories and he had stopped smoking 15 years before. Preoperative electrocardiogram, coagulation studies, and chest radiographs were unremarkable. Baseline laboratory studies were within normal limits. The adequacy of ulnar collateral

circulation was preoperatively examined using modified Allen's test. After induction of anesthesia, a 2-inch, 20-gauge Teflon catheter was placed in the left radial artery by direct arterial cannulation. The arterial cannula was flushed with physiologic saline solution containing 2 units of heparin per mL by a continuous-flow device at 3 mL/hr. The patient underwent a interfacet fusion with pedicle screw under general anesthesia. No vasopressor was administered. Postoperatively, the arterial catheter was removed as soon as the patient was transferred to the general surgical ward. Although the patient felt the change of sensation in the tip of left index and middle fingers on the 4th postoperative day, he was discharged on the 7th postoperative day. On the 8th postoperative day, however, the cold sense, pain, and blue discoloration were noted over the left two fingers (index and middle), and he was readmitted to the hospital. Examination revealed the absence of left radial pulse and the cold, sluggish blanching of the left index and middle fingers. Angiographic examination also demonstrated a total radial arterial occlusion and complete obstruction from middle phalanx to second common digital artery with organizing thrombus (Fig. 1). A vascular surgeon recommended an emergent surgical exploration of common digital artery. During the operation, the surgeon resected the thrombosed part of the arteries and bridged the de-



fect with vein graft from dorsum of left foot as Y-shape. Postoperatively anticoagulation with heparin (3000 units every 4 hr for 4 days) and dextran 40 (500 cc per day for 5 days), methyl prednisolone (125 mg per 8 hr for 2 days), and antibiotics (for 13 days) were administered. The patient was refrained from smoking or drinking caffeine and cold drafts. Although postoperative examination revealed absence of the left radial artery pulse, the pain was relieved and color returned to pink (Fig. 2). The patient had no problems in left index, but felt cold intolerance in the middle finger. Fifteen days after the thrombectomy and vein graft, radial pulse returned and we performed follow-up angiogram. It showed restored radial circulation and adequate perfusion to the fingers (Fig. 3). Follow-up examinations were done every 2 weeks and the radial pulse was continuously palpable for 2 months. Later we recommended the patient another angiogram, but he refused.

Fig. 1. Radial arterial occlusion (a, arrow) and complete obstruction from middle phalanx to second common digital artery (b, arrow) with organizing thrombus confirmed by brachial angiogram.

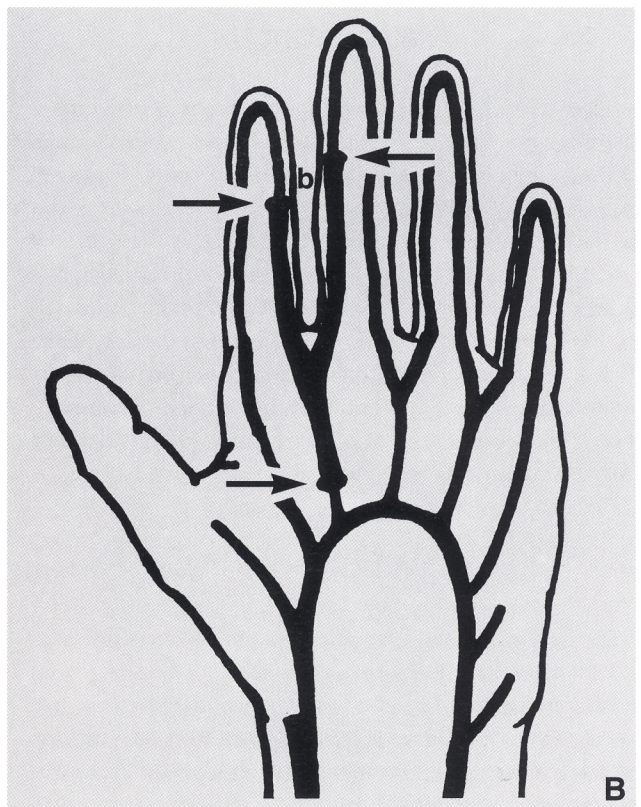


Fig. 2. A: The color of left index and middle fingers returned to pink after prompt thrombectomy and arteriorrhaphy with vein graft from dorsum of left foot as Y-shape (a). B: Schematic illustration shows the location of vein graft of Y-shape (b, arrow).

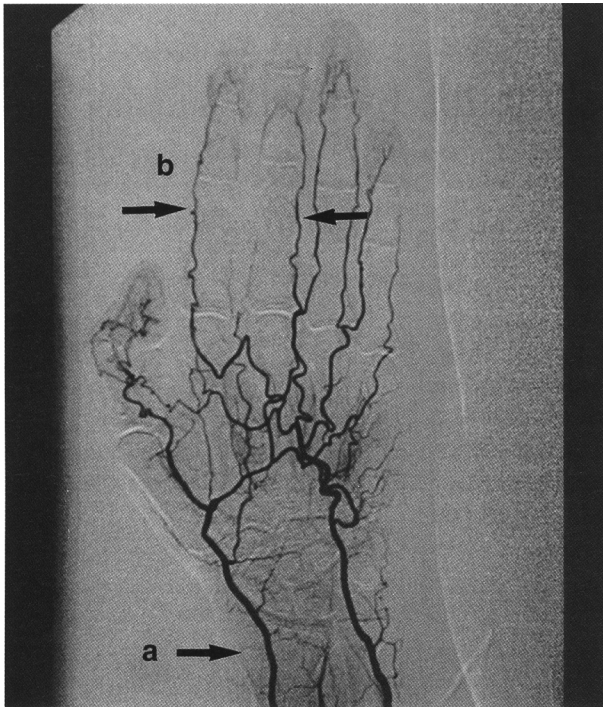


Fig. 3. Brachial angiogram performed after vein graft shows restored radial circulation (a, arrow) and adequate perfusion to the radial side of index finger and ulnar side of middle finger (b, arrow).

DISCUSSION

Despite the high incidence of transient radial artery thrombosis following cannulation (up to 88%) (7) and occlusion following decannulation (up to 60%) (6), arterial cannulation resulted in remarkably few vascular complications because of abundant collateral flows to the hand. Several risk factors for the development of complications of radial artery cannulation have been identified. In this case the patient suffered from a slowly progressive ischemic injury of two fingers despite the normal preoperative Allen's test and an uncomplicated perioperative course. The arterial thrombosis appears to be caused by changes in the integrity of the vessel wall related to the presence of the cannula. Other possible risk factors include the use of vasopressors, hypotension, prior arterial injury, duration of cannulation (8), hypolipoproteinemia (9), marked thrombocytosis and myeloproliferative disease (10), disseminated intravascular coagulation (DIC) (11), and embolism from the left side of the heart (3). We believe that the ischemia in our patient probably resulted from dislodgement of thrombi, which arose from the site of radial arterial puncture and distal passage of a portion of the thrombus to the common digital artery and digital arteries of the index and middle fingers. The etiology of thrombus remains unclear, but we do not regard the

cannula design as a contributing factor to the thrombus formation. Some clinical cases demonstrated unfortunate outcomes (12) when the treatment was procrastinated by doing the nonsurgical modalities such as repeated sympathetic blockades, systemic anticoagulation, low molecular weight dextran, and intra-arterial verapamil administration (13). Irreversible digital ischemia, ultimately requiring amputation, might have developed if the immediate surgical exploration was delayed in this patient. If palmar or digital vessels are not visualized, early intervention and more aggressive management are advocated for the symptomatic ischemia and revascularization. Therefore we report this case to emphasize that prompt thrombectomy with arteriorrhaphy with vein graft may be another efficacious therapy of digital ischemic injury following decannulation.

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