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Chirurgie de la main 33 (2014) 299–302
CHIRURGIE DE LA main

Clinical case

Acute hand ischemia after radial artery cannulation resulting in amputation

Ischémie aiguë et l'amputation de la main après cannulation de l'artère radiale

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Received 14 February 2014; received in revised form 10 April 2014; accepted 3 May 2014
Available online 27 May 2014

Abstract

Although radial artery cannulation is a common procedure, in rare cases, it can cause thrombosis leading to severe ischemia of the hand and potentially subsequent gangrene resulting in tissue loss. In this case report, a patient who developed a severely ischemic left hand subsequent to radial artery cannulation is presented. Doppler ultrasound studies showed adequate flow in the patient's hand, however complete thrombosis of the radial artery and significant low flow of the ulnar artery were found using arterial angiogram. The ischemia progressed and surgical intervention to revascularize the hand was unsuccessful, which led to the ultimate amputation of the patient's hand. In cases such as these, where Doppler ultrasound findings show flow but the hand ischemia continues to progress, further diagnostic studies and surgical intervention should be performed as soon as possible to minimize the amount of tissue loss.

Keywords: Amputation; Gangrene; Hand; Ischemia; Catheterization; Ultrasonography

Résumé

Bien que le cathétérisme de l'artère radiale soit une procédure courante, dans de rares cas, elle peut se compliquer d'une thrombose entraînant une ischémie sévère de la main puis une gangrène. Nous rapportons un cas d'ischémie aiguë après cathétérisme de l'artère radiale ayant conduit à une amputation. Devant un tableau d'ischémie de la main dans les suites d'une cannulation de l'artère radiale, des examens d'échographie Doppler répétés retrouvaient un débit adéquat dans la main du patient, alors que l'artériographie objectivait une thrombose complète de l'artère radiale et une faible circulation dans l'artère ulnaire. L'ischémie a progressé et une intervention chirurgicale de revascularisation a échoué, conduisant à l'amputation de la main du patient. Dans de tels cas, où les résultats de l'échographie Doppler montrent une circulation alors que les signes cliniques d'ischémie s'aggravent, d'autres examens paracliniques doivent être réalisés précocement afin de pouvoir proposer une prise en charge précoce et éviter l'amputation.

Mots clés : Amputation ; Gangrène ; Main ; Ischémie ; Cathétérisme ; Échographie

1. Introduction

Radial artery cannulation to continuously monitor blood pressure and facilitate repeated blood sampling is a common procedure, as the radial artery is easily accessible and the hand usually has considerable collateral circulation. In some cases, however, radial artery cannulation can cause thrombosis leading to severe ischemia of the hand and potentially subsequent gangrene resulting in tissue loss. The incidence of radial artery flow occlusion or transient thrombosis after cannulation has been reported to range from 0.2% up to 88% [1–6]. In most situations, even if radial artery thrombosis

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http://dx.doi.org/10.1016/j.main.2014.05.001

Fig. 1. Left hand ischemia. Left: dorsal aspect of the left hand. Right: volar aspect of the left hand.

occurs, the ulnar artery and the complete palmar and dorsal carpal arches provide enough blood supply for the entire hand [1]. However, even with complete arches, which may be confirmed with the Allen's test, flow from only one artery may be insufficient to provide adequate blood supply to the hand [6]. Besides clinical examination, if there is doubt regarding adequate circulation, Doppler ultrasound (DUS), arterial angiogram or magnetic resonance angiogram (MRA) may be used to assess blood flow to the hand [5,7].

In this case report, a patient with a complete superficial palmar arch who developed a severely ischemic left hand subsequent to radial artery cannulation is presented. The patient had normal flow on DUS studies, however complete thrombosis of the radial artery and significant low flow of the ulnar artery were found using arterial angiogram. Despite late revascularization of the hand, the patient subsequently developed severe ischemia and hand amputation was needed.

2. Case report

A 69-year-old female presented to the emergency department with tachypnea, high white blood cell count, tachycardia, hypotension, respiratory failure, high fever and urinary tract infection. The patient's medical history included transient ischemic attacks, multiple deep vein thrombosis with pulmonary embolism and placement of an inferior vena cava filter, and she was under warfarin treatment. The patient was diagnosed with urosepsis and admitted to the intensive care unit, intubated, proper septic shock management (e.g., cardiac output, vital signs, urine output, antibiotics, vasopressor treatment) was initiated, and a left radial artery catheter was placed. Vasopressor treatment was given (vasopressin, 0.04 units/min). In the following hours, the patient developed sluggish circulation in the left thumb, the radial artery cannula was removed, and a vascular surgery consultation was requested. The thumb was discolored but DUS showed flow in the radial and ulnar arteries and the palmar arch. The ulnar artery pulse was palpable but the radial artery pulse was not. Medical management with heparin was continued.

The next day, extension of the cyanosis in the hand was noted. DUS showed strong signals of the radial and ulnar arteries, as well as the palmar arch, with palpable ulnar pulse. Later that day, increased cyanosis was observed, along with swelling. The ulnar pulse was palpable with the same positive DUS signals. As the day progressed, the ischemia increased. DUS still showed the same flow. During this time, venous thrombosis was considered because of positive arterial DUS findings. Later, a consultation with the on-call hand surgeon revealed that the left hand was cyanotic and it was determined that the circulation of the hand was compromised due to the arterial line. Continued medical management was recommended due to the patient's medical status.

In the following hours, the entire hand became cyanotic and dry gangrene of the fingertips occurred. DUS, however, still showed flow to the entire hand. The necrosis in the hand was thought to be warfarin necrosis and/or vasopressor extravasation since the DUS showed normal flow. Four days after admission, another consult with the subsequent on-call hand surgeon was completed due to the worsening ischemia and necrosis (Fig. 1). The patient's left hand was severely cyanotic with compromised circulation at the distal forearm and no capillary refill with pain and no two-point discrimination. The radial pulse was not palpable and the ulnar pulse was very weak. An angiogram was ordered, and results showed no radial artery flow, no finger circulation, and significantly decreased

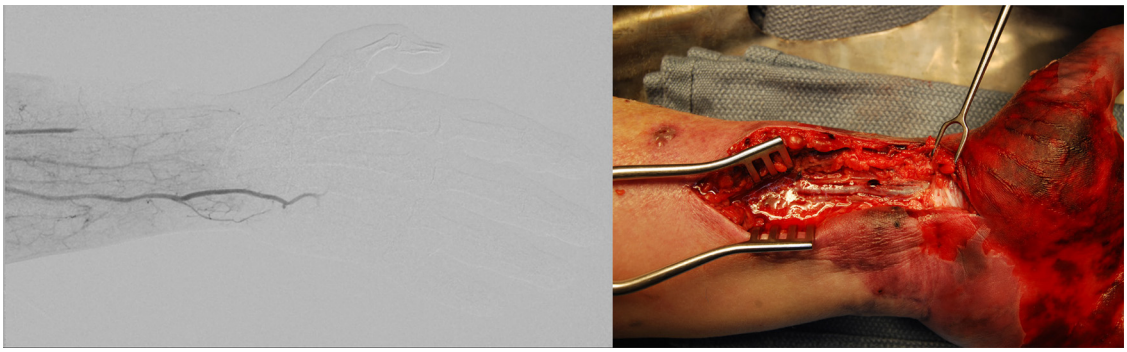

Fig. 2. Left: angiogram showing no radial flow and significantly decreased ulnar flow. Right: revascularization attempt following angiogram shows thrombosis in the radial artery.