

Brachial thrombosis in a premature neonate

A case report



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Alessia Giaquinta, Massimiliano Veroux, Carla Virgilio, Matteo Angelo Cannizzaro,
Domenico Zerbo, Alessandra Leonardi, Pierfrancesco Veroux

*Vascular Surgery and Organ Transplant Unit, Department of Surgery, Transplantation and Advanced technologies,
University Hospital of Catania, Catania, Italy.*

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Arterial injuries in infants are rare and in most cases are of iatrogenic origin as a consequence of catheterization, venipuncture or arterial blood sampling. These lesions require an accurate, noninvasive clinical diagnosis and prompt exploration and reconstruction using microvascular techniques to restore perfusion and to avoid morbidity and even mortality. We present a 3-day-old infant with a brachial artery thrombosis by a white thrombus as a consequence of an unsuccessful attempt to introduce an intravascular catheter. A microvascular reconstruction was performed, with complete restoration of the blood flow. Any suspected vascular injury needs immediate clinical and diagnostic assessment in order to avoid potential life-threatening complications. Surgery is mandatory in case of extensive arterial injuries, in case of inadequate distal blood supply or in case of progressive worsening of ischemic clinical findings.

KEY WORDS: Arterial injury, Arterial thrombosis, Brachial artery, Iatrogenic injuries, Infant, White thrombus.

Introduction

Aggressive treatment in the neonatal intensive care unit (NICU) has increased the risk of iatrogenic vascular lesions as a consequence of catheterization, venipuncture or arterial blood sampling¹. Arterial occlusion in infants, although uncommon, may result in gangrene and limb loss^{2,3}. These lesions require an accurate, noninvasive clinical diagnosis and prompt exploration and recon-

struction using microvascular techniques to restore perfusion and to avoid morbidity and even mortality⁴.

We report a rare case of iatrogenic vascular injury in a neonate caused by a white thrombus as a consequence of an unsuccessful attempt of brachial vein catheterization.

Case report

A 3-day-old neonate, born at a gestational age of 33 weeks, and weighing 2.5 kg was hospitalized in the NICU for a severe sepsis due to a renal infection. The neonate developed an acute renal insufficiency, a respiratory distress, thrombocytopenia and a disseminate intravascular coagulation. The neonate was treated with antibiotics, and transfused with 8 IU of fresh plasma and platelets.

After an unsuccessful attempt to introduce an intravascular catheter in the left brachial vein to assure intra-

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Correspondence to: Massimiliano Veroux, MD, PhD, Vascular Surgery and Organ Transplant Unit, Department of Surgery, Transplantation and Advanced Technologies, University Hospital of Catania, Via Santa Sofia, 83 95128 Catania, Italy (e.mail: veroux@unict.it).



Fig. 1: Contrast-enhanced spiral computed tomography of the left arm demonstrated the thrombosis of the upper part of the brachial artery (big arrows), and the absence of blood flow in the distal part of the arm and the complete occlusion of the arterial palmar arch of the hand (small arrows).

venous infusions and nutritional support, the neonate presented with a progressive coldness and paleness of the left arm. At clinical examination distal brachial, radial and ulnar arterial pulses were not detectable and a severe ischemia of the arm and an extensive skin necrosis of the hand were present. Doppler ultrasonography showed a proximal occlusion of the left brachial artery due to the presence of an endoluminal thrombus. There was no detectable flow in the distal arterial district of the hand. A contrast-enhanced spiral computed tomography of the left arm demonstrated the thrombotic occlusion of the upper left brachial artery (Fig. 1), and the neonate was immediately sent to the operating room.

Through a 3-cm incision centered over the brachial artery, the artery was isolated for a distance of 25 mm, obtaining proximal and distal control. A 15-mm longitudinal arteriotomy was performed, revealing a 18-mm white thrombus at the puncture site, where an intimal dissection was detected. The thrombus was removed and the arteriotomy was closed with an autologous saphenous vein patch.

Doppler examination revealed a normal arterial signal distal to the arteriotomy, but no flow signals were detected at the arterial palmar arch of the hand.

In the early postoperative period, the neonate was treated with intra venous heparin (18 units/Kg/h) and iloprost (Endoprost®, Italfarmaco, Italy) (0.5 ng/kg/min). There was a progressive improvement of clinical conditions and the ischemic lesions of the dorsal side of the forearm and hand completely resolved two days after the

surgical procedure. Unfortunately, the necrotic lesions of the distal part of the hand required an amputation of the distal part of two fingers.

Discussion

Although not very frequent in infants, vascular injury is a pathology that can severely threaten the life of the patients or their extremities as a result of the narrowness of their vessels. Pediatric arterial injuries are usually of iatrogenic origin resulting from cardiac catheterization in children with congenital heart disease or from multiple arterial punctures for blood gas determination, bypass cannulation, arterial monitoring catheters, or venipuncture⁵.

The most common complications associated with catheter placement include hemorrhage, arteriovenous fistula formation, infection, vascular spasm and thrombosis with subsequent thromboembolic and ischemic events⁶. In severe cases, thrombosis can lead to acute limb ischemia.

Brachial artery injuries are particularly rare in neonates, usually being a complication of accidental brachial artery puncture during brachial vein cannulation, a procedure not recommended in prematures⁷. Regardless of the type of injury, these patients need a prompt diagnosis and treatment. Clinical examination may be elusive and symptoms such as blue discoloration, coolness and poor pulses require particular attention⁸⁻¹¹. These signs may be transient, but may progress rapidly to frank gangrene. In case of suspected arterial injury, doppler ultrasonography should be immediately performed to better define the extension of the arterial injury, predicting the clinical evolution. Angiography and CT scan should be reserved for dubious cases or for surgical planning.

Minimal arterial injuries with good clinical evolution in neonates may be safely managed with drugs, such as heparin, urokinase, or streptokinase. The newborn infant appears to require a proportionately larger amount of heparin than an adult, and it seems difficult to maintain a therapeutic level of this drug¹. Gamba *et al.*¹ suggested a 48 hours of thrombolytic therapy and if clinical examination show no improvement, surgery may be proposed.

However, in severe ischemic lesions or in cases of failure of conservative management, surgery is indicated to immediately resolve the limb ischemia and to prevent the long-term consequences of chronic hypoperfusion of the limb, such as different limb length and size.

In our case, the complete thrombosis of the upper part of the brachial artery, the absence of distal arterial blood flow of the hand demonstrated by Doppler examination and CT scan, and the severe ischemic lesions of the hand mandated surgical intervention.

Several potential mechanisms have been proposed to possibly contribute to the thrombotic occlusion after arter-

ial catheterization. Clinical observation by Fraken *et al.*¹² confirmed that the size of the catheter in relation to the vessel diameter is a major contributor to arterial spasm in infants¹², and arterial spasms are an important factor leading to thrombotic occlusion after arterial catheterization^{13,14}.

We can assume that arterial thrombosis with a white thrombus in our neonate was caused by either the intimal dissection of the brachial artery as a consequence of accidental arterial puncture and by the large amount of platelets infused to contrast the thrombocytopenia caused by the disseminate intravascular coagulation. This mechanism was confirmed in two patients with acute femoral occlusion, in which intimal dissection was identified at the time of thrombectomy¹³.

Conclusions

Vascular injuries in pre-term neonates are very rare. Any suspected vascular injury needs immediate clinical and diagnostic assessment in order to avoid potential life-threatening complications. Surgery is mandatory in case of extensive arterial injuries, in case of inadequate blood supply to the extremities or in case of progressive worsening of ischemic clinical findings.

Riassunto

I traumi vascolari arteriosi degli arti nei neonati sono rari e nella maggior parte dei casi sono di natura iatrogena, quale conseguenza di una cateterizzazione venosa o di un prelievo ematico. Tali lesioni richiedono un'accurata diagnosi non invasiva ed un pronto ed efficace trattamento chirurgico con tecniche di ricostruzione microchirurgica per ripristinare la perfusione e per evitare un alto tasso di complicanze e persino la morte del neonato. Descriviamo il caso di un neonato di 3 giorni di vita con una trombosi completa dell'arteria radiale da un trombo bianco, a seguito di un tentativo infruttuoso di cateterizzazione venosa. È stato eseguito un intervento di ricostruzione con tecnica di microchirurgia vascolare con un completo ripristino del flusso arterioso. Ogni sospetta lesione arteriosa necessita di una immediata diagnosi e di un efficace trattamento, in modo da ridurre l'incidenza di complicanze potenzialmente letali. Il trattamento chirurgico è indispensabile in caso di estese lesioni arteriose, in caso di fallimento della terapia conservativa, e nell'eventualità di una rapida progressione

delle lesioni ischemiche o in caso di un inadeguato compenso vascolare a valle della trombosi.

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