

Management of trapped microwire during femoral arterial access in a pediatric patient

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Abstract

Femoral arterial access complications (e.g., arteriovenous fistula, pseudoaneurysm, vessel dissection, haematoma and vasospasm) are not uncommon and are likely underreported in the pediatric population. We present a case of severe vasospasm with microwire entrapment during attempted femoral arterial access in a 20-month-old. Successful microwire removal was achieved after systemic administration of nitroglycerin using a combination of pharmacological techniques that benefited from close collaboration between the interventional neuroradiology, pediatric interventional cardiology and anaesthesia teams.

Keywords: femoral arterial access complications, vasospasm, pediatric

Abbreviation key

IAC intra-arterial chemotherapy

IEpA inferior epigastric artery

Introduction

Complications of arterial access during diagnostic or interventional vascular procedures are not uncommon and remain a potential source of morbidity. They are more likely to occur in the pediatric population because of small vessel sizes and an increased tendency to develop vasospasm [1,2]. We present the case of a 20-month-old boy undergoing a third cycle of intra-arterial chemotherapy (IAC) administration for intraocular retinoblastoma, in whom femoral arterial access was complicated by inadvertent advancement of a microwire into the inferior epigastric artery (IEpA). Severe vasospasm developed, resulting in microwire entrapment. The management decisions leading to successful microwire removal in our patient were principally based on the experience related to radial artery wire entrapment during percutaneous coronary intervention [3,4]. Successful microwire removal was made possible in our patient through close collaboration between the interventional neuroradiology, pediatric interventional cardiology and pediatric anaesthesia teams.

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Technique

A 20-month-old, 12 kg boy with bilateral retinoblastoma presented for his third cycle of IAC. Two previous cycles alternating right and left femoral arterial accesses were uncomplicated. Arterial access was obtained after the induction of general endotracheal anaesthesia and pharmacologic paralysis. Normal patient temperature was maintained by adjusting room temperature and using a warming blanket (Bair Hugger; Arizant, East Prairie, Minnesota, USA). Pulse oximetry was monitored on the great toe on the side of puncture, a standard of care in our practice for pediatric procedures.

The puncture site was localised using fluoroscopy (0.5 pulses/sec, anti-scatter grids removed). A 4-French micropuncture kit, including a 21-gauge needle, 0.018-inch nitinol microwire, dilator, 0.035-inch guide wire and 4-F sheath (Cook, Bloomington, Indiana, USA) was used. The right femoral pulse was palpable, and a single wall puncture technique yielded brisk blood return. The 0.018-inch microwire was gently advanced through the micropuncture needle without resistance. A second fluoroscopic image was obtained to confirm the arterial entry site (Fig. 1). It showed an aberrant course of the microwire along the right side of the spine, suggesting passage into a small side branch, most likely the IEpA. Resistance was encountered when gentle traction was applied in order to pull back the microwire. A second attempt at withdrawal made a few minutes later under fluoroscopic monitoring (2 p/s) was unsuccessful. The right toe pulse oximetry remained 100 %.

We waited 20 min in order to allow the suspected vasospasm to resolve prior to additional retrieval attempts. The micropuncture needle was removed and haemostasis was obtained with gentle manual compression. The right toe pulse oximeter continued to show 100 % oxygen saturation with a normal arterial waveform, both of which were maintained throughout the procedure. The inner dilator of the micropuncture set was introduced into the femoral artery over the entrapped wire and gently advanced into the origin of the IEpA, in order to improve proximal support and ease withdrawal; however, we remained unable to withdraw the microwire.

A rotating haemostatic valve was then connected to the dilator, with its tip still in place in the origin of the IEpA, and local, intra-arterial nicardipine was administered around the microwire directly into the spastic vessel. Only a small volume was delivered (0.2 ml, 0.1 mg/ml) because of the resistance to the injection that raised concern for potential arterial injury. The rotating haemostatic valve was removed, haemostasis confirmed and topical EMLA cream (lidocaine 2.5 % and prilocaine 2.5 %) was applied under a sterile dressing. The IAC procedure was then performed via uneventful left femoral artery access using a micropuncture set as described above. Systemic heparin was administered (70 IU/kg) after successful left femoral access. After completion of the procedure, the left femoral sheath was kept in position and set to continuous heparinised saline flush (30 ml/hr).

The right groin dressing and EMLA cream were removed. Additional gentle attempts at removing the wire proved unsuccessful. A 3-French Mayo catheter (Cook, Bloomington, Indiana, USA) was advanced over a 0.035 Bentson wire (Cook) into the right common iliac artery via the left femoral access. A contrast injection (Fig. 2) showed a patent right common femoral artery without evidence of injury. Another attempt at retracting the microwire was unsuccessful. Direct injection of nitroglycerin through the dilator into the right IEpA was again thought to be unsafe because of the resistance to injection felt by the operator. Therefore, the decision was made to proceed with intravenous nitroglycerin administration. The left femoral sheath was transduced for arterial pressure monitoring, and an intravenous infusion of

nitroglycerin was initiated at a dose of 0.1 mcg/kg/min. Nitroglycerin was chosen rather than a calcium channel blocker due to its short half-life and the decreased risk of hypotension. Gentle attempts at removing the microwire were made every 10 min under intermittent low-dose pulsed fluoroscopic monitoring (1 p/s). After each failed attempt at wire retrieval, the nitroglycerin infusion dose was increased while maintaining haemodynamic stability. When the nitroglycerin dose reached 5 mcg/kg/min, the wire and dilator were successfully removed and haemostasis was obtained with manual compression. Total fluoroscopy time was 25.1 min and total radiation dose was 20.5 mGy (ka,r) and 39.91 μGym^2 (PKA), which is within the reported range for IAC in retinoblastoma [5]. The patient experienced no other complications and was discharged the next morning.

Discussion

Management of entrapped wires has been described during radial arterial access in adult patients, primarily during cardiac catheterisation [6]. Complications of femoral arterial access are not uncommonly encountered during pediatric interventional procedures, especially in neonates and infants [1]. Paediatric anesthesiologists have gained experience in managing complications of radial arterial access and have been able to help manage complications during cardiac procedures [3]. Wire entrapment is a well-documented yet rare complication of arterial access in adults, notably in the radial artery [4]. Paediatric patients are especially susceptible to vasospasm and, therefore, at a higher risk of wire entrapment. The case described here illustrates the application of good practice principles from other disciplines, cooperation among specialties and attention to details such as radiation dose despite occurrence of a complication. These methods, summarised below, can be helpful when dealing with a trapped microwire and should be considered as the first line of management, rather than open vascular surgical retrieval [7].

Gentle attempts at wire retraction should be performed under direct visualisation with low-dose, pulsed fluoroscopy.

Attempt local maneuvers (gentle, local intra-arterial infusion of nicardipine; topical EMLA cream).

Follow with systemic administration of intravenous nitroglycerin, starting at 0.1 mcg/kg/min. Stepwise increase the dose while maintaining haemodynamic stability.

Conflict of Interest

We declare that we have no conflict of interest.

References

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Figures

Figure 1 - 20-month-old boy with retinoblastoma. Stored posteroanterior fluoroscopic image (0.5 p/s, anti-scatter grids removed, low-dose pediatric protocol) of the right pelvis demonstrates the needle tip overlying the femoral head and the 0.018 wire (arrows) coursing abnormally to the right of the spine.

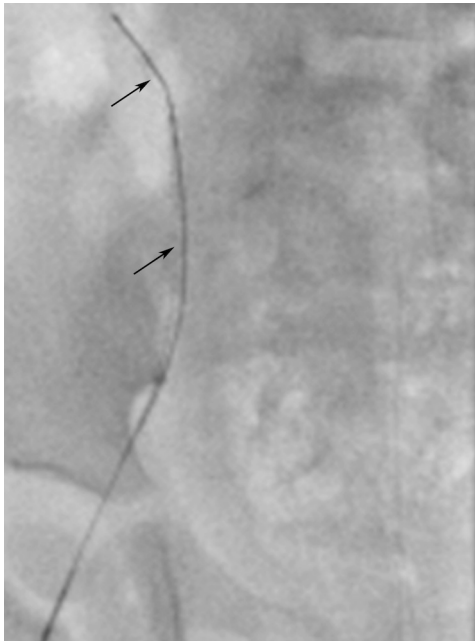


Figure 2 - 20-month-old boy with retinoblastoma. Posteroanterior unsubtracted (left panel) and subtracted (right panel) images from a right common iliac artery angiogram through a 3-F Mayo catheter (black arrow) advanced over the iliac bifurcation from the left common femoral access. The external iliac and common femoral arteries are patent after successful removal of the entrapped microwire. The inner micropuncture dilator (white arrow) is seen.

