Neonatal white leg: a case of anatomical misjudgment

Introduction

Knowledge of vascular anatomy is very important, even when conducting simple procedures such as catheterizing neonatal umbilical vessels. There are two umbilical arteries which are branches of the superior vesical arteries, themselves branches of the internal iliac arteries. They carry deoxygenated blood back to the placenta. The umbilical artery is a tributary of the placenta and carries oxygenated blood to the circulation. A representative case is presented to highlight the relevant anatomy.

Discussion

In this case, the second cannula entered an umbilical artery, not the umbilical vein as intended, and travelled along to the left common iliac artery, which it damaged and occluded with thrombus (as confirmed with two-dimensional Doppler ultrasonography). This led to the ischaemic leg.

The management of this condition is to start a fibrinolytic infusion. Recombinant tissue plasminogen activator has been used with the most success, although urokinase is becoming increasingly popular (Richardson et al, 1988; Cheah et al, 2001; Hartmann et al, 2001). There is no good evidence that the addition of a heparin infusion improves the result, but it is used in some neonatal units. Heparin-bonded catheters have been shown by Jackson et al (1987) and Krafte-Jacobs et al (1995) to cause significantly fewer thrombotic complications.

The other important aspect of management is pain control, and the patient was commenced on a morphine infusion after consultation with the pain team.

This article illustrates the importance of accurate siting of umbilical catheters. The ischaemic limb is an uncommon occurrence in the neonatal population with a reported incidence of 5.1 per 100 000 births to 2.4 per 1000 admissions, although the reported incidence of all catheter-related neonatal thrombi is 13–14% in term infants and 64–85% in preterm infants (Schmidt and Zipursky, 1984; Joseph et al, 1985; Boo et al, 1999).

During umbilical cannulation it is vital to be able to distinguish the two umbilical arteries from the single umbilical vein. The umbilical vein is floppy, oval-shaped and much bigger than the two umbilical arteries, which are small, round and lie next to each other. As the calibre of the arteries is much smaller than that of the vein, a larger cannula is used. In this case, a large venous catheter was mistakenly fitted into a near-term umbilical artery, so it is not surprising that it caused arterial wall damage.

A better appreciation of the anatomy along with more frequent post-procedure monitoring, such as observation of the colour of the legs, palpation of the lower limb pulses, two-dimensional Doppler ultrasonography (Oppenheimer et al, 1982; Boo et al, 1999) or contrast-enhanced venography (Richardson et al, 1988; Roy et al, 2002), could have avoided this entirely iatrogenic complication. BJHM

Case Report

A baby girl of 28 weeks' gestation was delivered by emergency caesarean section because of fetal distress. At delivery her heart rate was >100 beats per minute, she cried and gasped, and was initially given bag and mask ventilation. She was subsequently intubated. An umbilical artery catheter was sited with aseptic technique for continuous blood pressure monitoring and arterial blood gas sampling. A second cannula was inserted into an umbilical vessel thought to be an umbilical vein. However, X-ray showed it to be malpositioned and probably arterial, and so it was removed immediately. Three hours later her left leg had turned white (*Figure 1*). She was consequently transferred to the neonatal unit where recombinant tissue plasminogen activator infusion was commenced.

The whiteness did not disappear and no pulse reappeared below the femoral artery. However, the dusky red area above the knee resolved and, after a few days, an obvious area of demarcation of the ischaemia was seen at knee level. The patient subsequently underwent a through-knee amputation and has been fitted with a prosthesis.

Figure 1. The baby girl's ischaemic left leg 3 hours after both umbilical arteries were accidentally cannulated.

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A case of the blues

Using a needle and syringe obtained from his partner's veterinary kit, a middle-aged man attempted suicide by injecting 50 ml of liquid ink from an ink-jet refill kit into his left antecubital fossa, and then both sides of the neck. On arrival at the emergency department his neck was tense bilaterally with the overlying skin discoloured dark blue. He was intubated by gas induction as airway compromise was considered likely.

During the course of the next 6 hours his whole body became profoundly discoloured although he did not suffer any other obvious immediate complication. Communication with the ink manufacturer confirmed that the dye was water soluble and free from nitrobenzenes. The National Poisons Unit had not had a similar case reported previously and advised supportive measures. He was extubated at 72 hours when there was a good air leak around his endotracheal tube.

His skin remained heavily stained with pigment 5 days after admission (*Figure 1*) as did his serum (*Figure 2*) and urine. Despite this dense staining of his skin and serum there was no apparent organ dysfunction and no interference with pulse oximetry or routine laboratory blood investigations. The patient maintained that he had normal colour vision throughout his admission.

He was discharged from the intensive care unit onto a psychiatric ward and subsequently went home. He reported still having discoloured urine 3 weeks after the initial event but was otherwise well.

A search of the literature identified one previous case report of a suicide attempt by injecting ink, although 'India ink' containing nitrobenzenes was injected intravenously which caused a methaemoglobinaemia and that patient required haemodialysis, neither of which occurred in this patient.

There are some important learning points from these cases. Dye does not necessarily interfere with monitoring and different dyes and their solvents have different toxicological effects; a high index of suspicion for cardiovascular, renal and hepatic injury needs to be maintained and the possibility of local necrosis or rhabodomyolysis should always be borne in mind. **BJHM**

Ewert R, Buttgereit F, Prügel M, Reinke P (1998) Intravenous injection of India ink with suicidal intent. *Int J Legal Med* **111**(2): 91–2

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Figure 1. Widespread skin discolouration secondary to ink injection into left antecubital fossa.

Figure 2. Frank discolouration of the patients serum (compared to normal serum).