

Rare complications during surgical vein cannulation in extremely low birthweight neonates

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ABSTRACT: Extremely low birthweight neonates often require total parenteral nutrition by central venous catheterization. The technique of choice is the percutaneous cannulation via the basilica or cephalic vein; in particular cases, these peculiar patients need a cut down catheterization. This paper describes some unusual complications of this surgical approach.

KEY WORDS: Central vein catheter, Extremely low birthweight neonates, Total parenteral nutrition

INTRODUCTION

Central vein catheterization (CVC) is a routine procedure that may be performed using either a percutaneous or surgical approach (1-6); in extremely low birthweight (ELBW) neonates, a surgical access is often required (1-3). Many complications have been described in the patient with CVC such as sepsis, hydrothorax, pneumothorax, thrombosis and catheter migration. We report three rare complications that occurred in this group of patients: phrenic nerve damage, a carotid lesion, and catheter rupture with heart migration.

MATERIALS AND METHODS

Case 1: this female child was born at 24 gestational weeks (g.w.), and weighed 660g. On the 8th day of life a surgical CVC was needed for total parenteral nutrition (TPN), and the right internal jugular vein was utilized. The procedure was performed by a junior surgeon and it was particularly troublesome; a control X-ray showed that the tip of the catheter

was correctly positioned (Nutricath S 4french Vygon®). The day after this procedure a chest X-ray showed that the right diaphragm was quite higher than the left; a diagnosis of phrenic nerve palsy was formulated (Fig. 1). This radiologic image remained unchanged for one month, and the baby developed progressive pulmonary failure, due to multiple causes: bronchodysplasia, pulmonary immaturity and diaphragm relaxation. We decided to wait and see for one month but as no improvement was observed, diaphragm plication via laparotomy was performed in the neonatal intensive care unit. After this procedure it was possible to slowly wean off the baby from the ventilator, and four weeks later she was extubated.

Case 2: this female child was born at 31 g.w. and weighed 1150g. On the 4th day of life the neonatologist requested surgical CVC (Nutricath S 4french Vygon®) for TPN and drug infusion. The junior surgeon who was operating mistook the carotid artery for the internal jugular vein; when it was cut, the blood flow clarified the error. By means of loop magnification (2.5x) four stitches of 8-0 prolene were placed and artery continuity was re-



Fig. 1 - Chest X-ray showing the abnormal position of the right diaphragm (Case 1).

stored; the internal jugular vein was cannulated. Ten days later, echocolor-doppler examination confirmed a regular flow in the artery. The baby was discharged weighing 2700g.

Case 3: this male child was born at 31 g.w. and weighed 780g; he was the last of a quintuplet birth; Apgar scores were 4/1' and 7/5'. On the fifth day of life, a cutdown CVC was performed for TPN. The catheter (Nutricath S/4french Vygon®) was inserted into the right internal jugular vein and its tip was in the right atrium. The baby grew and on the 30th day when he weighed 1100g, it was decided to remove the catheter. The procedure proved to be quite difficult, and some hours later a chest X-ray showed that 1.5-2 cm of the catheter had remained in the heart (Fig. 2). This finding was confirmed by echocardiography. Two days later a combined operation was performed to remove the catheter fragment, the jugular vein was reopened, and a large introducer sheath was inserted (Fig. 3). By this approach the radiologist was able to remove the fragments of the catheter with a loop under fluoroscopy. The baby was subsequently discharged in good condition.

DISCUSSION

The number of neonates who require long-term parenteral nutrition has grown, as have the indications for CVC with silastic catheter. In the group of ELBW requiring prolonged intensive care, venous

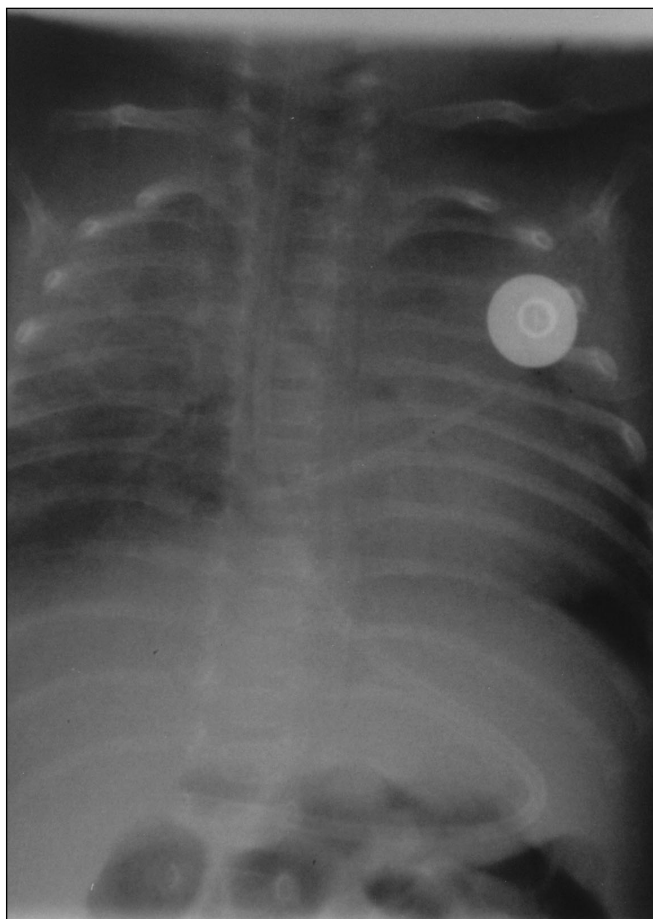


Fig. 2 - Chest X-ray showing the fragment of the catheter in the heart (Case 3).

access usually becomes a major problem in a busy neonatal unit. In our Department this procedure is routinely performed via the percutaneous approach by neonatologist, but when it fails the surgeon is called in; in these cases, a junior surgeon performs the cannulation at the patient's bedside in the neonatal ICU, assisted by the neonatologist who induces general sedation with a slow bolus injection of Fentanyl (0.001-0.002 mg/Kg) followed by continuous infusion at the same dosage; local anesthesia is achieved at the surgical site with 0.1% Lidocaine. Many complications have been described in patients with CVC, such as sepsis, hydrothorax, pneumothorax, vein thrombosis and catheter thrombosis, migration and dislocation (7-11). ELBW neonates present some additional typical complications, due to their small size and at times the anatomic immaturity of some districts; for example, an unusual, but characteristic complication of these neonates is due to the anomalous persistence of the left superior vena cava (8). The complications described in this report are uncommon; without



Fig. 3 - The introducer sheath inserted in the jugular vein and the catheter fragment (Case 3).

doubt, human error was involved but it was “helped” by the size of the structures. With regard to the phrenic nerve palsy it is worth recalling that this is a motor nerve, and it originates from the fourth cervical nerve with some fibers coming from the third and fifth. At the level of the transverse process of the sixth cervical vertebra, the right phrenic nerve lies on the anterior surface of the anterior scalene muscle. In the lower neck the right nerve is just lateral to the internal jugular vein; it

passes beneath the omohyoid muscle, and is covered by the sternocleidomastoid muscle; in the upper part of the chest it remains lateral to the brachiocephalic vein and the superior vena cava (7). The complications of phrenic nerve damage have already been described in adults, and range from a temporary phrenic block following cannulation of the internal jugular and subclavian veins, to prolonged nerve injury lasting as much as 3 years (7). Phrenic nerve palsy is more frequent as a consequence of thoracic or cardiothoracic surgery, and can be resolved within a year, but in the ELBW patient this length of time cannot be tolerated, and a plication of the diaphragm may help to reduce hospitalization time. Only two more cases of such a complication in ELBW infants are described; both were resolved by diaphragm plication (7).

Catheter fragments remaining in the heart or pulmonary vessels have been previously described in both adults and children (9, 11). The singularity of this case lies in the baby’s weight and the size of the vessels. The radiologist needed an adequate-sized vessel to introduce the loop for removing the fragment, so a combined approach was decided; the surgeon reopened the jugular vein, and it was thus possible to place an introducer, and then a loop for catching the fragment in the right ventricle.

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