Case report - Cardiac general

Direct right atrial insertion of a Hickman catheter in an 11-year-old girl

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Abstract

Central venous lines are of particular importance in seriously ill children that require parenteral nutrition, chemotherapy, or other medications. The jugular or subclavian veins are ordinarily used for primary access. Alternatives include the femoral veins, the intercostal veins, and transhepatic approaches. If the use of these standard sites of placement is made impossible, due, for example, to chronic thrombosis, an alternative approach has to be found. The following report presents the case of an 11-year-old girl with short-bowel syndrome and a desperate need for parenteral nutrition. Over the course of her treatment, she developed chronic thrombosis of the jugular, subclavian, and femoral veins, as well as thrombosis of the inferior vena cava. As an alternative route for central venous access, we describe a successful direct placement of a tunnelled catheter into the right atrium via a right anterolateral thoracotomy.

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1. Introduction

Congenital or acquired short-bowel syndrome is a serious disease associated with a high-morbidity rate [1]. The cause of the acquired childhood form is an extensive resection of the small intestine within the scope of illnesses, such as necrotizing enterocolitis (NEC) or gastroschisis [2]. It leads to a state of malabsorption with unbalanced electrolyte and fluid levels, as well as malnutrition.

A crucial element in medical care is special alimentation management [2]. Children suffering from this disease are often dependent on total parenteral nutrition for months or years, which necessitates central venous access [1]. Hickman or Broviac catheters are principally chosen, as they offer the advantage of protection against catheter infection by means of an antibacterial cuff and a long-tunnel distance. The jugular or subclavian veins are ordinarily used for primary access. However, the insertion and conservation of a safe and prolonged central venous access in these patients is often complicated by thrombosed central veins [3, 4].

2. Case report

An 11-year-old girl was born prematurely with connatal gastroschisis, intestinal non-rotation, meconium peritonitis, and NEC. Several resections of the small and large bowel were necessary, which resulted in a short-bowel syndrome. As a result of a Bianchi operation, her small intestine is approximately 38 cm in length, and the colon measures about 25–30 cm. Consequently, she is reliant on parenteral nutrition, and frequent central venous catheter insertions are unavoidable.

The first complications arose in 2004 when the catheter recumbent in the left internal jugular vein malfunctioned, and thrombosis of the right internal jugular and subclavian veins was detected. The catheter was placed anew in the left internal jugular vein. A few days later, the catheter malfunctioned, and thrombosis of the left internal jugular vein and of the innominate vein was ascertained. Insertion of a new catheter into the left great saphenous vein was performed. The girl was anticoagulated with Enoxaparin.

In 2005, examinations showed catheter-induced thrombosis of all neck and arm veins, as well as thrombosis of the inferior vena cava and left femoral vein. An interventional transhepatic catheter installation was chosen. This catheter malfunctioned in 2007, and a catheter insertion into the left internal thoracic vein was performed. The girl came back to us a few months later with a beginning thrombosis of this catheter. It proved extremely difficult to find a site for central venous access, and, due to her medical history, a direct right atrial catheter insertion was considered as the best option.

A right anterolateral thoracotomy through the sixth intercostal space was selected as operative approach. After the lysing of a few pleural adhesions, the pericardium was opened. A small incision was made 3 cm below the right clavicle, through which the Hickman catheter (11-F Lifecath-Biflux®, Vygon, Germany) was tunnelled and led into the mediastinal thoracic space above the thoracotomy (Fig. 1). Close to the inferior vena cava, the catheter was then...
introduced in the right atrium and the catheter tip was placed in the superior vena cava. Through an intraoperative transoesophageal echocardiography, a snapping of the catheter tip into the tricuspid valve was excluded. The catheter was secured onto the right atrium with two pericardial-patched Prolene purse-string sutures and attached additionally to the pericardium. After closing the wound in typical fashion, the catheter was fixed to the skin.

The postoperative clinical course progressed without complication. Parenteral nutrition was already begun on the day of operation. The two lumens of the new Hickman catheter were used alternately, and anticoagulation with Enoxaparin was continued.

A year later, the patient developed catheter-induced sepsis with detection of Staphylococcus aureus. Antibiotic therapy was successful, enabling the catheter to be left in position.

At the current time, the catheter has been in use for three years without further complications.

3. Discussion

For children with intestinal failure, central venous lines for parenteral nutrition are indispensable [1]. Usually, the subclavian or jugular veins are used for central venous access. Whenever these veins are not available, there are some alternative routes on hand, such as approaches through the femoral, brachiocephalic, intercostal, or internal thoracic veins [5]. Nevertheless, there is a rare group of patients in whom neither the standard nor the common alternative sites of placement are available due to chronic thrombosis or other reasons. Since the use of parenteral nutrition in children has been increasing [5], it is likely that this patient group with extremely difficult central venous access will also grow in size. Determining new access possibilities for a safe and prolonged central venous catheter has gained in importance and should not be neglected.

A direct right atrial catheter insertion is described only a few times in the literature and with varying outcomes. Oram-Smith et al. reported a successful catheter placement directly into the right atrium in 1978 [6]. On the other hand, Apelgren et al. described a catheter-dislocation into the right pleural space in 1981 [7]. The patient died a few months later. Hayden et al. published a case report in 1981 about a catheter-insertion directly into the right atrium [8]. Migration of the catheter into the pulmonary artery was detected four months later, and the patient died three months after catheter correction as a result of septic pulmonary emboli. To the contrary, Birnbaum et al. documented in 1996 a successful video-assisted direct right atrial catheter insertion for long-term parenteral nutrition [9].

Although literature indicates that this procedure may lead to major complications, our case report demonstrates that a direct right atrial catheter can be a worthwhile and perhaps life-saving alternative for obtaining central venous access for long-term parenteral nutrition in a patient with multiple thrombosed veins.

One should eventually even consider whether a direct right atrial catheter should be inserted earlier if all sites primarily used for central vein access are not available, for mechanical disruption of the endothelium is more frequent, and the risk of thromboembolism increases in the smaller veins used as alternatives [3]. This leads to repeated catheterization with rising risk of thrombosis [3] and reduces quality of life through frequent hospital stays. In any case, a mandatory requirement for this approach is a well-functioning pediatric unit with basic experience in this field.

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References