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The second and third right posterior intercostal veins: an alternate route for central venous access with an implantable port in children

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Abstract

Background/Purpose: Some children dependent on total parenteral nutrition for long periods have no more axillary, internal jugular, external jugular, saphenous, and femoral veins available for cannulation. In such patients, the central venous system can still be accessed via the azygos vein by placing an implantable port catheter through one of the right posterior intercostal veins. This is the first known description of such procedure.

Methods: We report the use of the second and third right intercostal veins for placement of the catheter by right intrapleural thoracotomy in 2 pediatric patients with short gut syndrome.

Results: Recovery from the thoracotomy was uncomplicated, and the patients could receive complete intravenous nutritive mixtures immediately after the insertion of the catheter. Both patients remain dependent on total parenteral nutrition and are awaiting an intestinal transplantation.

Conclusion: The knowledge of alternate routes to obtain central venous access for prolonged parenteral nutrition is critically important, and the azygos system can be used when more accessible veins are unavailable.

A key factor in the success of a total parenteral nutrition program in children with short bowel syndrome is prolonged and safe access to the central venous system. There are some patients, mainly the children submitted to a very prolonged period of total parenteral nutrition awaiting an intestinal transplantation, in whom the axillary, external jugular, internal jugular, subclavian, saphenous, and femoral veins cannot be used. In these patients, the central system can still be cannulated via the azygos vein by placement of a catheter through one of the right posterior intercostal veins. Herein we report the use of the second and third right intercostal veins for placement of implantable ports in 2 pediatric patients. These patients presented recently to our hospital with previous dissections of all veins of the superior and inferior vena cava system. This is the first known description in pediatric patients on the use of an intercostal vein accessed through a right intrapleural thoracotomy and placement of an implantable port catheter.

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1. Material and methods

1.1. Anatomy

The posterior intercostal veins lie above the intercostal artery and nerve in the subcostal groove. This neuromuscular bundle is deep into the intercostal muscles and pleura. There are 12 intercostal veins. The first vein drains directly in the right brachiocephalic vein. The second and third veins join together to form a single trunk called the right superior intercostal vein, which empties into the azygos vein (Fig. 1). The lower 9 veins, from the fourth on, drain directly into the azygos vein, which enters the chest through the aortic hiatus. It runs to the right of the vertebral column and, at the fourth thoracic vertebral body, arches forward over the root of the lung to join the superior vena cava [1-3].

1.2. Technique

Under general anesthesia and endotracheal intubation, the child was placed in the left lateral decubitus position, and a right posterior thoracotomy incision (4-6 cm) was made in the fourth intercostal space to access the intrapleural space. After entering the pleural cavity, the lung was displaced anteriorly and the right upper pulmonary lobe was retracted inferiorly to identify the azygos vein with the intercostal branches. It was noted that all these veins were engorged because of the superior vena cava thrombosis. The second or third intercostal veins were identified and isolated by using a right-angle clamp that was placed beneath the vein to mobilize a small segment from the surrounding soft tissue. Two nonabsorbable sutures were placed around the vein to achieve proximal and distal vascular control. Afterward, the distal vein was ligated, and a transverse venotomy was performed. The silastic catheter (6F caliber) was introduced in the intercostal and azygos veins, and the tip was located in the right atrium, under radiological assistance. After these procedures, the catheter was palpated in the superior vena cava to confirm the correct placement. The catheter was tunneled from the intrapleural space posteriorly to the subcutaneous, passing behind the lung through the intercostal incision. Finally, the port was placed and fixed to the thoracic anterior wall. The thoracotomy was closed by layers, and an intrapleural tube was required for 3 or 4 days postoperatively.

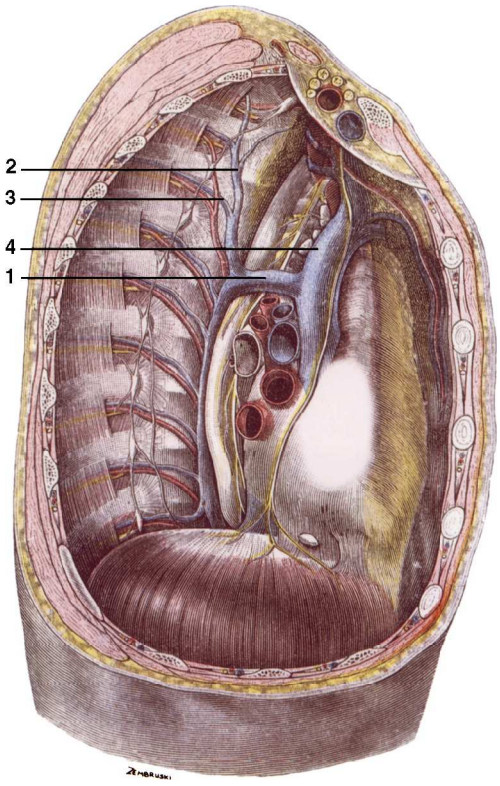

Fig. 1 Diagram shows the azygos vein and its relations with the intercostal veins. 1 Indicates azygos vein; 2 and 3, second and third intercostal veins; 4, superior vena cava.

1.3. Patients

The first case was a 12-month-old girl who presented to the hospital because of short gut syndrome caused by massive resection that is due to necrotizing enterocolitis in the newborn period. She had been on total parenteral nutrition and had 12 cm of jejunum anastomosed to the ascending colon. Thirteen previous venous cut-down procedures were performed, which caused thrombosis of the inferior vena cava. Because all the tributaries of the superior vena cava system had been previously used for catheterization, the azygos system was accessed by cannulation of the second intercostal vein. The implantable port catheter remained in place for 8 months and had to be removed because of a refractory fungal infection. After that, a direct right atrium catheterization was performed, according to the technique described originally by Oram-Smith et al [4]. A right anterolateral thoracotomy incision was made in the third intercostal space, and after exposure and incision of the pericardium, a purse-string suture was placed around the tip of the right atrial appendage to introduce an implantable port catheter into the atrium. This catheter was spontaneously dislodged 3 days after the procedure. After that, a Doppler sonography study showed that the child recanalized her left internal jugular vein allowing for a subsequent catheterization. A Broviac catheter was introduced in this vein, via cut-down. This catheter has been patent and functioning well for the last 13 months.

The second child was a 10-month-old boy with a high imperforate anus and a sigmoidostomy. A short gut syndrome was caused by massive intestinal resection after treatment of intestinal volvulus and necrosis from intestinal adhesions. He had several previous venous dissection procedures and percutaneous subclavian and internal jugular vein catheterizations leading to superior and inferior vena cava thrombosis. As a consequence, large dilated superficial veins were noted in the anterior thoracic wall. An implantable port was placed, and the catheter could be introduced in the right