Case report

JVA The Journal of Vascular Access

Subaortic left brachiocephalic vein and real-time ultrasound-guided puncture

The Journal of Vascular Access
1–4

DOI: 10.1177/11297298211034606
journals.sagepub.com/home/jva
SAGE

Fernando Montes-Tapia[1], José Arenas-Ruiz[2], Rosa Palma-Soto[3], Zelenia Garcia-Alcudia[1], Claudia Yasbek Rodríguez-Garza[4] and Ángel Martínez-Ponce de León[2]

Abstract

We describe a subaortic left brachiocephalic vein, a congenital anomaly that can be suspected during the rapid central vein assessment before central venous catheterization. Since the vein descends vertically/obliquely rapidly from its origin, we suggest that the puncture should be made at a greater angle (50°–60°) than what is usually used to puncture this vein (20°–30°). Failure to identify this anomaly may cause a failed puncture or complications from the puncture of adjacent blood vessels.

Keywords

Subaortic, left brachiocephalic vein, real-time ultrasound, ultrasound-guided puncture, central venous catheter

Date received: 31 March 2021; accepted: 4 July 2021

Introduction

Vascular access of the brachiocephalic vein (BCV) by ultrasound (US) in pediatric patients was first reported in 2011 by Breschan et al.[1] Since that date, the advantages over other vascular accesses in the cervicothoracic region have been described in different series and patient age groups.[2–4]

Systematic evaluation through rapid central vein assessment (RaCeVA)[5] allows the evaluation of vessel permeability, vessel diameter, identification of neighboring structures, and especially vessel location and trajectory, information that is important to have before vascular access.

We present a patient with an abnormal arrangement of the left brachiocephalic vein identified during RaCeVA before central venous catheterization.

Case description

The patient is a 12-month-old boy, 11 kg of weight, with a diagnosis of craniosynostosis, which required a central venous catheter for anesthetic management. A Sonosite EDGE® ultrasound with a 13-6 MHz Hockey-stick transducer was used.

RaCeVA: The left cervical venous vascular structures were explored, following the left internal jugular vein in the short axis at the level of the cricoid cartilage and descending in a proximal direction. With the US probe in the left supraclavicular fossa, the confluence of the left internal jugular vein with the left subclavian vein and its continuation with the brachiocephalic vein was identified in the long axis; however, it did not follow its normal horizontal retroclavicular and sternal path (Figure 1(a)) but descended steeply from its origin (confluence of the internal jugular vein and left subclavian vein) almost vertically intrathoracic (Figure 1(b) and (c)).

[1]Department of Pediatrics, Universidad Autónoma de Nuevo León, México
[2]Service of Neurosurgery, Universidad Autónoma de Nuevo León, México
[3]Pediatric Anesthesiology, Universidad Autónoma de Nuevo León, México
[4]Radiology Department, Universidad Autónoma de Nuevo León, México

Corresponding author:
Fernando Montes-Tapia, Department of Pediatrics, Universidad Autónoma de Nuevo León, Torre de Pediatría, Av. Madero y Gonzalitos s/n, Monterrey, Nuevo León CP 64460, México.
Email: fernando.montestp@uanl.edu.mx

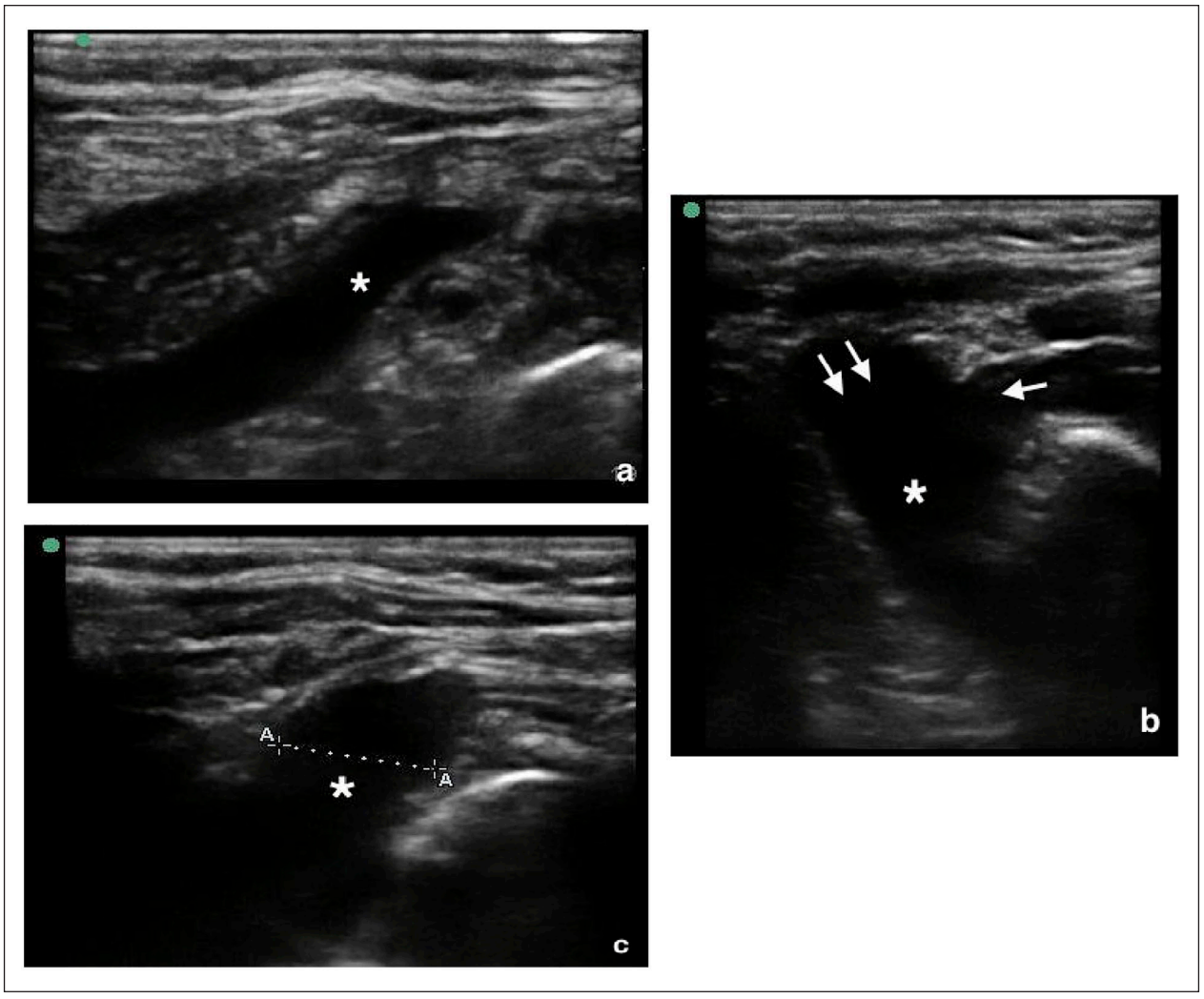

Figure 1. (a) Long axis view * left brachiocephalic vein in a normal horizontal retro clavicular and sternal path in a patient of the same age (12 months old) as the patient of the case report. (b) Long axis view * left brachiocephalic vein in the patient of the case report, ↓ left subclavian vein, ↓↓ left internal jugular vein. (c) Long axis view * left brachiocephalic vein in vertical/oblique path in the patient of the case report—diameter A–A 0.71 cm.

Puncture technique

The patient was placed in the supine position with an intercapular roll, and the head turned to the right. After standard prep and drape of the cervicothoracic area, catheterization was performed at an angle between 50° and 60° with an 18-gauge, peripheral catheter in the long axis at the level of the left brachiocephalic vein guided by ultrasound in real-time; then the guide was introduced and followed by ultrasound; a vertical/oblique intrathoracic trajectory toward the right side was observed. Then, using the Seldinger technique, a 7 Fr. double-lumen 20-cm catheter was inserted.

Due to the abnormality of the BCV path, fluoroscopic control of the path of the guidewire and CVC is performed. (Figure 2(a) and (b)). The descent of the catheter into the left brachiocephalic vein was visualized, crossing obliquely from the left side to the right of the dorsal column at the level of the thoracic vertebrae T8 and T9 then descending to the right side of the spine toward the right atrium.

Discussion

There is currently no consensus on choosing the side of placement of a vascular access in the brachiocephalic vein. Some researchers report advantages with right BCV access,[6] others with the left BCV.[1,2,4] Still, we could also say that the choice is made after RaCeVA, and a personal preference, beyond not yet having strong scientific evidence.

The left brachiocephalic vein is formed from the union of the internal jugular vein and the subclavian vein posterior to the medial end of the clavicle. It then crosses the thorax from left to right almost horizontally, anterior to the branches of the aortic arch, to join the right brachiocephalic vein posterior to the first intercostal joint and form

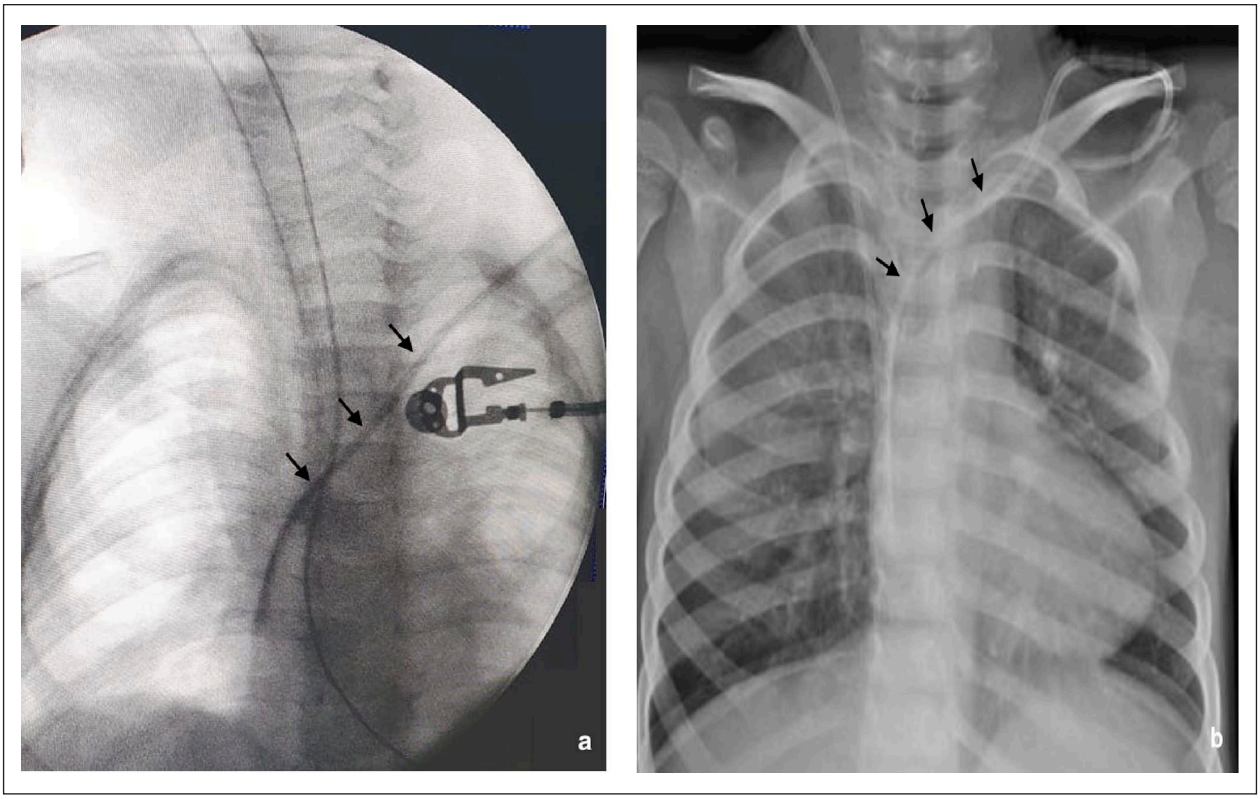

Figure 2. (a) Fluoroscopic image of the patient of the case report. Arrows are indicating a vertical/oblique catheter path in the subaortic left brachiocephalic vein. (b) X-ray of a patient of the same age (12 months old) as the case report patient. Arrows are indicating a normal catheter path in the left brachiocephalic vein above the aorta.

the superior vena cava to the right of the thoracic spine, entering the right atrium.[7,8]

The left brachiocephalic vein is usually easily visualized in a long-axis view since most of its horizontal trajectory can be evaluated.[2,4,9,10] Still, this case shows a congenital abnormality, a vertical/oblique course of the subaortic left brachiocephalic vein toward its junction with the right brachiocephalic vein, to the right of the thoracic spine, and then descending to the superior vena cava.

The incidence of this anomaly is 0.2% to 1%. It is mostly associated with congenital cardiac abnormalities, and to a lesser proportion, isolated, as we report. The etiology of this congenital anomaly is probably due to embryological abnormalities in the anastomosis of the cardinal veins before the eighth week of gestation. This abnormality can cause a left brachiocephalic vein malformation.[7]

We consider that this anomaly can be suspected when RaCeVA is performed, evidencing the trajectory of the left brachiocephalic vein, which rapidly descends vertically/obliquely from its origin. Due to this, we suggest that the puncture should be performed at a greater angle (50°–60°) than is usually done for the puncture of this vein (20°–30°).[4] Failure to identify this abnormality may cause a failed puncture or complications from the puncture of adjacent blood vessels. Likewise, we confirm the importance of performing RaCeVA before real-time ultrasound-guided central venous catheterization.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Informed consent

Written informed consent for publication was obtained from the patient's legal guardians.

ORCID iD

Fernando Montes-Tapia https://orcid.org/0000-0003-4407-221X

References

1. Breschan C, Platzer M, Jost R, et al. Consecutive, prospective case series of a new method for ultrasound-guided supraclavicular approach to the brachiocephalic vein in children. *Br J Anaesth* 2011; 106: 732–737.

2. Klug W, Triffterer L, Keplinger M, et al. Supraclavicular ultrasound-guided catheterization of the brachiocephalic vein in infants and children: a retrospective analysis. *Saudi J Anaesth* 2016; 10: 143–148.
3. Oulego-Erroz I, Alonso-Quintela P, Domínguez P, et al. Canalización del tronco braquiocefálico guiada por ecografía en neonatos y lactantes. *An Pediatr (Barc)* 2016; 84: 331–336.
4. Merchaoui Z, Lausten-Thomsen U, Pierre F, et al. Supraclavicular approach to ultrasound-guided brachiocephalic vein cannulation in children and neonates. *Front Pediatr* 2017; 5: 211.
5. Spencer TR and Pittiruti M. Rapid central vein assessment (RaCeVA): a systematic, standardized approach for ultrasound assessment before central venous catheterization. *J Vasc Access* 2019; 20: 239–249.
6. Barone G, Pittiruti M, Ancora G, et al. Centrally inserted central catheters in preterm neonates with weight below 1500 g by ultrasound-guided access to the brachio-cephalic vein. *J Vasc Access*. Epub ahead of print 10 July 2020. DOI: 10.1177/1129729820940174.
7. Chen SJ, Liu KL, Chen HY, et al. Anomalous brachiocephalic vein: CT, embryology, and clinical implications. *AJR Am J Roentgenol* 2005; 184: 1235–1240.
8. Kahkouee S, Sadr M, Pedarzadeh E, et al. Anomalous left brachiocephalic vein: important vascular anomaly concomitant with congenital anomalies and heart diseases. *Folia Morphol (Warsz)* 2017; 76: 51–57.
9. Oulego-Erroz I, Munoz-Lozon A, Alonso-Quintela P, et al. Comparison of ultrasound guided brachiocephalic and internal jugular vein cannulation in critically ill children. *J Crit Care* 2016; 35: 133–137.
10. Breschan C, Platzer M, Jost R, et al. Ultrasound-guided supraclavicular cannulation of the brachiocephalic vein in infants: a retrospective analysis of a case series. *Pediatr Anaesth* 2012; 22: 1062–1067.