



ORIGINAL ARTICLE

Ultrasound-guided cannulation of the brachiocephalic vein in neonates and infants[☆]



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KEYWORDS

Central venous catheterization;
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Abstract

Introduction: Central venous catheter (CVC) insertion in neonates and small infants is a challenging and high risk procedure. Ultrasound (US) guided cannulation increases the success rate and reduces procedural-related complications. The internal jugular vein is the most frequent site for US-guided CVC insertion. However this approach is technically demanding in neonates and small infants. US-guided supraclavicular cannulation of the brachiocephalic vein (BCV) is a new approach that may be advantageous in case of difficult central venous catheterization. We present our preliminary experience with this technique in a case series of neonates and small infants.

Methods: Case series of neonates and small infants weighing less than 5 kg, in whom US-guided supraclavicular cannulation of the BCV was attempted. A longitudinal “in plane” supraclavicular approach to the BCV was performed using a 12 Hz linear or a 8 Hz microconvex transducer. All cannulations were performed by the same operator, a paediatrician with previous experience in US-guided central venous catheterization.

Results: The study included 6 patients with a median (range) weight of 2.1 (0.94–4.1) kg and age of 1.9 (0.6–4) months. Two cases required 2 punctures, while cannulation was achieved at the first attempt in the remaining 4 cases. There were no procedural or catheter-related complications. CVCs were withdrawn after 9 (6–15) days.

Conclusions: The US-guided supraclavicular approach to the BCV is a feasible and safe alternative in neonates and very small infants. More studies are needed to define the role of this new venous access before its routine application in daily practice.

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PALABRAS CLAVE

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Canalización del tronco braquiocefálico guiada por ecografía en neonatos y lactantes**Resumen**

Introducción: La inserción de catéteres venosos centrales (CVC) en neonatos y lactantes pequeños es una técnica difícil y de riesgo. La canalización guiada por ecografía (ECO) aumenta la tasa de éxito y reduce las complicaciones. El acceso más habitual es el de yugular interna; sin embargo, en neonatos y lactante pequeños es técnicamente más difícil que a otras edades. Presentamos nuestra experiencia preliminar con una nueva técnica de canalización venosa central aplicable a neonatos y lactantes pequeños: el acceso supraclavicular del tronco braquiocefálico (TBC) guiado por ECO.

Métodos: Serie de casos de neonatos y lactantes de peso inferior a 5 kg en los que se ha intentado la canalización guiada por ECO del TBC mediante abordaje supraclavicular. Se utilizó un abordaje longitudinal en plano del TBC desde la fosa supraclavicular con un transductor lineal de 12 Hz o microcóncavo de 8 Hz. Todas las canalizaciones fueron realizadas por el mismo operador, un pediatra con experiencia previa en la canalización guiada por ECO.

Resultados: Se incluyó a 6 pacientes con una mediana (rango) de peso de 2,1 (0,94-4,1) kg y edad de 1,9 (0,6-4) meses. En 2 casos se requirieron 2 intentos, canalizándose el TBC en un intento en los 4 restantes. No se observaron complicaciones relacionadas con el procedimiento ni con la permanencia del catéter, siendo los CVC retirados al cabo de 9 (6-15) días.

Conclusión: El acceso supraclavicular al TBC guiado por ecografía es una alternativa factible y segura en neonatos y lactantes muy pequeños. Son necesarios más estudios antes su utilización rutinaria en la práctica clínica.

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Introduction

Cannulation of central veins is an essential procedure in critically ill children. However, among small neonates and infants, due to the smaller size of vessels and the proximity to other structures (especially in the access to the internal jugular vein and the subclavian), it is a complex technique with greater risk of immediate mechanical complications (multiple attempts, arterial puncture, pneumothorax).¹ Traditionally, a series of external anatomical references has been used for location and for the venous puncture, depending on the chosen vein and approach (blind technique).² Currently, the use of ultrasound (US) is recommended to locate the vascular structures and to guide the venous puncture, both in adults and in children, since it has been shown to increase the rate of success and reduce the number of puncture attempts and immediate mechanical complications.³⁻⁶

Less experience is available in US-guided central vein cannulation in small neonates. The internal jugular vein approach is usually used. However, this has a lower success rate than at other ages due to the technical difficulty presented by the small size of the vessel, the scant room for manoeuvring, and the tendency of the internal jugular vein to collapse with breathing and with minimum pressure of the transducer. Currently, based on existing evidence, routine use cannot be recommended, although the methodology of the studies from which this conclusion was derived has been criticised by some authors.^{7,8}

In recent years, a new approach has been suggested, consisting of cannulation of the brachiocephalic veins (BCV)

from the supraclavicular area, which could offer advantages in these patients. BCV is the largest-size vein which may be accessed for percutaneous cannulation, and it is simple to visualise with US in small children due to its superficial location. It has the advantage of allowing an in-plane longitudinal approach with improved control of the needle, having achieved good results in paediatric anaesthesia.⁹⁻¹² However, experience in this approach is very scarce with critically ill small neonates and infants,¹³ and therefore we believe it is of interest to submit our preliminary experience with a series of very small neonates and infants.

Patients and methods**Type of study: series of consecutive cases**

Patients: neonates and infants with weight below 5 kg who had BCV cannulation in the period between April 2014 and January 2015. No patient was excluded.

Procedure: the indications were made by the medical team in charge of each patient, considering their clinical condition and available vein access points. It was performed under analgesedation using the conventional Seldinger technique under sterile conditions. The infant was placed in the Trendelenburg position at -30° , with a roll under the shoulders and the head rotated to 45° contra-laterally to the cannulation side. A portable ultrasound was used (Vivid i General Electrics, Haifa, Israel), equipped with a 12 Hz linear probe and an 8 Hz micro-convex. A 2D and colour-Doppler exploration of the jugular veins, subclavian, and

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