

Alternative technique for femoral access in neonates undergoing cardiac catheterization

Nicola McCay, Keviin Walsh

Department of Paediatric Cardiology, Children's Health Ireland, Dublin, Ireland

ABSTRACT

We report an alternative technique for femoral access in neonates <3.5 kg undergoing cardiac catheterization. By modifying a 0.014" Balance middleweight Elite wire and using a 24-gauge Galt introducer needle, we have noted increased ease and success in obtaining vascular access in this challenging cohort.

Keywords: Access, cardiac, catheterization, neonates

INTRODUCTION

We report an alternative technique for femoral access in neonates undergoing cardiac catheterization. This technique may facilitate cardiac catheterization in neonates weighing < 3.5 kg. Neonates with duct-dependent pulmonary circulation reliant on prostaglandin, premature babies needing transcatheter duct closure, those with lung disease, unstable hemodynamics, and previous vascular complications are likely to benefit from this technique.^[1] Interventions warranting femoral access include neonatal balloon atrial septostomy, diagnostic catheterization, balloon pulmonary and aortic valvuloplasty, and coarctation angioplasty and stenting procedures.^[2]

Obtaining access in a small baby is challenging even for the most experienced operator, especially in those with very low birth weight, despite the use of ultrasound.^[1]

DESCRIPTION OF THE TECHNIQUE

This new technique enables reliable femoral venous and arterial access using a 24-gauge Galt needle (Galt Medical Corp, USA) and a 0.014" balance

middleweight (BMW) Elite 190 cm guidewire with a hydrophilic coating [Figure 1] (Abbott Inc., USA). The equipment is prepared before the procedure to enable quick placement of the wire and the sheath once access is obtained. The 0.014" BMW wire is modified by breaking it at the 30-cm demarcation point [Figure 2]. This creates a shorter distal portion of the wire (30 cm), which is much easier to manipulate than a 190-cm long wire.

The Galt needle is a narrow 24-gauge needle with ultrasound/echogenic reflective scoring on its distal 4 mm that can be placed within the femoral vessel using ultrasound guidance [Figure 3]. Its small dimension allows a more stable placement within a small vessel, risking displacement even with a slight movement. Once the needle tip is secure in the vessel lumen, the modified 0.014" BMW wire is advanced within the vessel. Its coating allows frictionless placement, and its flexibility and steerability enable wire placement through a small space with challenging angles between the needle entry point and the vessel lumen. Correct wire placement within the vessel is confirmed with fluoroscopy. The 4Fr sheath can then be easily tracked over the stiffer part of the 0.014" wire.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: McCay N, Walsh K. Alternative technique for femoral access in neonates undergoing cardiac catheterization. *Ann Pediatr Card* 2024;17:52-4.

Access this article online

Quick Response Code:



Website:

<https://journals.lww.com/aopc>

DOI:

10.4103/apc.apc_181_23

Address for correspondence: Dr. Nicola McCay, Department of Paediatric Cardiology, Children's Health Ireland, Cooley Road, Crumlin, Dublin D12 N512, Ireland.

E-mail: nicmccay29@gmail.com

Submitted: 08-Dec-2023

Revised: 02-Apr-2024

Accepted: 03-Apr-2024

Published: 24-May-2024

There were 13 cardiac catheterization cases in neonates <3.5 kg who had vascular access performed by a single interventionalist in our center using the described technique between March 2022 and August 2023, with medical notes available for retrospective review. Cases were performed using femoral vascular access following the implementation of this new technique, and 12/13 (92.3%) were successful upon the first attempt. Following the implementation of this technique, we subjectively noted that gaining vascular access in neonates was faster and more reliable. No vascular complications were reported in these neonates over the 17 months following implementation of this technique.

DISCUSSION

Cardiac catheterization for neonates and small infants can be challenging.^[1-4] Multiple studies have indicated that vascular complications increase inversely with the size of the infants.^[3-8] Our rate of successful vascular access on the first attempt of 92.3% is higher than published data on femoral vascular access technique in neonates of 88.2% success on the first attempt.^[3] Although our retrospective study is small and not statistically significant, we feel that our collective subjective observation that this

technique has greatly improved the speed and efficacy with which we obtain vascular access in neonates <3.5 kg undergoing cardiac catheterization, that it has value. We believe that successful and prompt vascular access will reduce complications in this challenging cohort, where the most common cardiac catheterization complications are vascular.^[1-4]

Alakhfash *et al.* reviewed 174 infants under 3 months who had undergone cardiac catheterization procedures between 2012 and 2017. Vascular complications seen in 14% of patients were the leading list of complications.^[2] Gokdemir and Cindik reviewed 323 neonates who underwent ductal stenting. The authors identified femoral artery thrombosis in 7.2%.^[3] They reported that most femoral arterial occlusions were reversible, secondary to arterial spasm, and the incidence increased inversely with patient age.^[4] Coarctation interventions that required larger sheaths or sheath exchanges were at the highest risk for femoral arterial thrombosis in neonates.^[4]

Studies have reported multiple factors that may contribute to vascular complications in neonates undergoing cardiac catheterization. Accessing the femoral artery at a site of previous catheterization, long procedures, large sheaths, and sheath exchanges in small babies were strongly linked to neonatal vascular complications, with the strongest association being patient size.^[3,4,6,7] Studies have also shown that procedural planning and operator experience minimized vascular complications in neonates undergoing cardiac catheterization.^[8] It has also been noted that infiltration of local anesthetic before the puncture and before sheath removal, in addition to adequate dosing of heparin prophylaxis, might protect the femoral artery from stenosis or occlusion after transfemoral critical coarctation stent angioplasty in neonates weighing between 600 and 1350 g.^[8]

We have described a reliable neonatal femoral vascular access technique that should improve the proficiency of obtaining access and, therefore, reduce the risk of vascular complications, in line with studies indicating risk reduction with operator experience, technique, and length of case.^[1,2,4,8]



Figure 1: 24 Gauge Galt needle, (Galt Medical Corp, Garland, TX) removed from packet following use

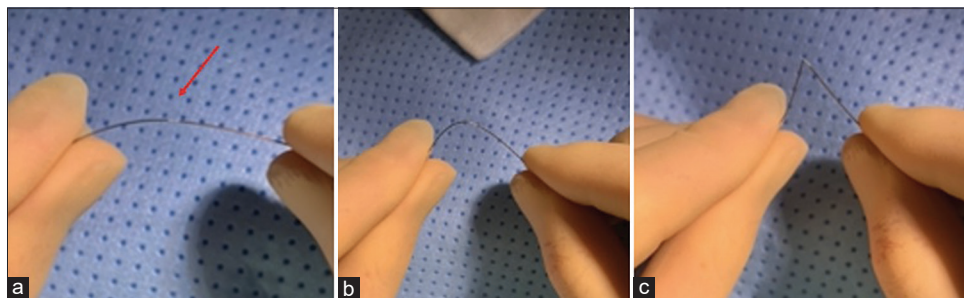


Figure 2: (a) The 0.014" BMW wire has a demarcation point at 30 cm which is highlighted by the red arrow in picture, (b and c) The 0.014" BMW wire is easily modified by breaking it at the 30 cm demarcation point as shown

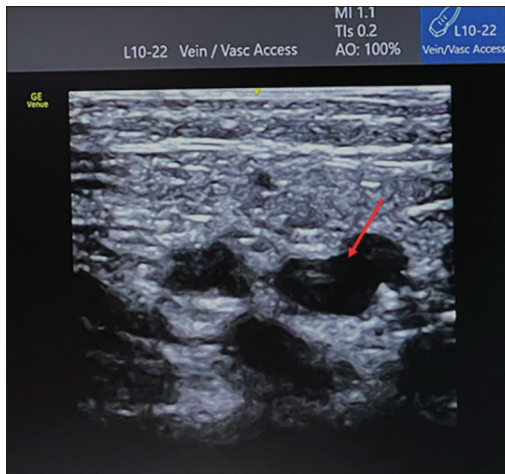


Figure 3: The narrow 24 Gauge needle with ultrasound/echogenic reflective scoring on its distal 4 mm that placed within the femoral vein using ultrasound guidance

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Qureshi SA, Kumar RK. Vascular access in pediatric interventions: Science or skill? *Ann Pediatr Cardiol* 2020;13:1-3.
2. Alakhfash AA, Jelly A, Almesned A, Alqwaiee A, Almutairi M, Salah S, *et al.* Cardiac catheterisation interventions in neonates and infants less than three months. *J Saudi Heart Assoc* 2020;32:149-56.
3. Gokdemir M, Cindik N. Risk factors and frequency of acute and permanent femoral arterial occlusion in neonates with CHD who undergo ultrasound-guided femoral arterial access. *Cardiol Young* 2023;33:1574-80.
4. Gokdemir M, Cindik N. Frequency and predictors of acute and persistent femoral artery occlusion in infants with congenital heart disease: A study using ultrasonography for arterial access and the diagnosis of arterial occlusion. *Pediatr Cardiol* 2023;44:1191-200.
5. Agha HM, Abd-El Aziz O, Kamel O, Sheta SS, El-Sisi A, El-Saiedi S, *et al.* Margin between success and failure of PDA stenting for duct-dependent pulmonary circulation. *PLoS One* 2022;17:e0265031.
6. Bansal N, Misra A, Forbes TJ, Kobayashi D. Femoral artery thrombosis after pediatric cardiac catheterization. *Pediatr Cardiol* 2021;42:753-61.
7. Glatz AC, Shah SS, McCarthy AL, Geisser D, Daniels K, Xie D, *et al.* Prevalence of and risk factors for acute occlusive arterial injury following pediatric cardiac catheterization: A large single-center cohort study. *Catheter Cardiovasc Interv* 2013;82:454-62.
8. Mini N, Zartner PA, Schneider MBE. Stenting of critical aortic coarctation in neonates between 600 and 1,350 g. Using a transfemoral artery approach. A single center experience. *Front Cardiovasc Med* 2022;9:1025411. doi: 10.3389/fcvm.2022.1025411.