



Operative Technique

Peripherally inserted central catheter in neonates: A safe and easy insertion technique[☆]Ibrahim Uygun^{*}

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ABSTRACT

Purpose: Peripherally inserted central catheters (PICC) are used extensively in neonates. However, insertion of these thinnest catheters is a very delicate procedure. We developed an easy and safe insertion technique for 2-French (F) PICCs with a new fine-tipped introducer cannula created without modifying commercial products by advancing a 24-gauge peripheral venous cannula through a half-peeled (20-gauge) introducer cannula. We evaluated neonates treated with our new PICC insertion technique.

Methods: Information was collected retrospectively on all 32 2-F PICCs inserted during the 4-year period from November 2010 to November 2014. We monitored neonates, recording the success rate of placement, number of insertion attempts, reasons for removal, and complications.

Results: In total, 32 2-F PICCs were placed in 31 patients (19 (61%) males and 12 (39%) females; median age 7 (range: 1–36) days, median weight 2200 (range: 800–4100) g) using the new technique. The vein accessed most commonly was the long saphenous vein (87%). The duration of catheterization was 10.3 ± 4.2 days. Almost all PICCs were inserted successfully (32/33, success rate 97%) and in the first venipuncture (28/32, 88%). Of the PICCs, 81% were removed after completion of therapy or upon death. Two minor bleeding complications were noted at the insertion site.

Conclusions: This novel technique is an easy and safe way of inserting a 2-F PICC in neonates. It can be used by anyone in a neonatal unit who can insert a 24-gauge peripheral venous access.

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Central venous access is essential in neonatal intensive care units for drug administration and parenteral nutrition. Peripherally inserted central catheters (PICC) have been used extensively in surgical and medical neonates since 1973 [1–6]. Most PICC insertion techniques are through-the-introducer techniques. In this technique, a butterfly needle, splitting needle, peelable cannula, split cannula, or peripheral venous cannula (PVC) is used as an introducer [6–13]. Peripheral insertion is safer than direct central venous puncture. However, the placement of very thin catheters in neonates is an extremely delicate procedure; the diameters of the veins are smaller than that of the introducer, and it is very difficult to stabilize the introducer [6–13].

In our neonatal surgical intensive care unit, we developed an easy and safe insertion technique for 2-French (F) PICCs using commercial products without modifications that is applicable to all neonates. The purpose of the present study was to evaluate the neonates treated with the new PICC insertion technique.

1. Patients and methods

Information was collected retrospectively on all PICCs inserted at Dicle University Hospital Neonatal Surgical Intensive Care Unit over the 4-year

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period from November 2010 to November 2014. PICCs were inserted using our new technique, described below, by one pediatric surgeon (Dr. Uygun). One-French PICCs were excluded from the study. We monitored neonates in whom 2-F PICCs were placed using the new technique, recording the success rate of placement, number of insertion attempts, reasons for removal, and all complications.

We did not administer analgesic treatment involving a local anesthesia, sedation, or general anesthesia during insertion of the PICCs because our technique is similar to PVCs insertion. However, all producers were carried out under strict sterile conditions. Percutaneous femoral vein catheterization was initially preferred for those neonates whose peripheral veins were not suitable [14].

In our new insertion technique, a 2-F PICC set and a 24-gauge (G) PVC were used.

A 2-F PICC set consisted of the following:

1. A Nutriline 2-F PICC set with 20-G peelable cannula (Microflash) as an introducer (Vygon GmbH, Aachen, Germany, product code: 1252.30) or a Pediatric Vascu-PICC 1.9-F PICC set with 19-G Tear-Away Cannula (Medcomp, Harleysville, PA, USA). We preferred a 30-cm long introducer and stylet with a peelable cannula.
2. A 24-G PVC (B-Cat IV Cannula, Bicakcilar AS, Istanbul, Turkey)

First, the introducer was prepared under sterile conditions (Fig. 1). The PICC set was opened, and the introducer peelable cannula was taken inside the set (Fig. 1A). Its needle was then discarded (Fig. 1B),

and the cannula was half-peeled (Fig. 1B). A 24-G PVC was advanced wholly through this half-peeled cannula (Fig. 1C). The new fine-tipped introducer cannula (FTIC) was then ready (Fig. 1D, E).

An appropriate vein for the planned insertion with distal regions that had not been subjected to any venipuncture was selected. Our first preference was usually the long saphenous vein at the ankle because it is large and offers easy cannulation, dressing, stabilization, and access to the vena cava (Fig. 2A). The extremity of the insertion side was fully prepared with povidone-iodine three times and fully inserted into the hole of a sterile wrap (Fig. 2A). A tourniquet was applied to distend the selected vein, and the extremity was immobilized by the assistant's hand (Fig. 2B). Povidone-iodine in the insertion region was cleaned with alcohol to allow viewing of the selected vessel (Fig. 2A). The skin slightly distal or lateral to the site of the proposed venipuncture site was punctured using an 18- or 20-G syringe needle to facilitate entry of the introducer through the skin, especially in neonates over 2000 g. The FTIC was inserted through the puncture site and advanced slowly into the vein until blood flowed back freely (Fig. 2B). The FTIC was advanced a few millimeters farther to ensure that the distal end was in the vein. The needle was then withdrawn a few millimeters to avoid piercing the back wall of the vein (Fig. 2C). The FTIC was advanced farther until it dilated the skin and was placed inside the vein fully, up to the FTIC's wings. The needle was removed completely (Fig. 2D). The 24-G PVC was also wholly removed while the wings of the FTIC were grasped with the thumb to avoid back movement (Fig. 2E). The FTIC was checked for the free backflow of blood through it (Fig. 2F). The tourniquet was removed. Then, the 2-F PICC,

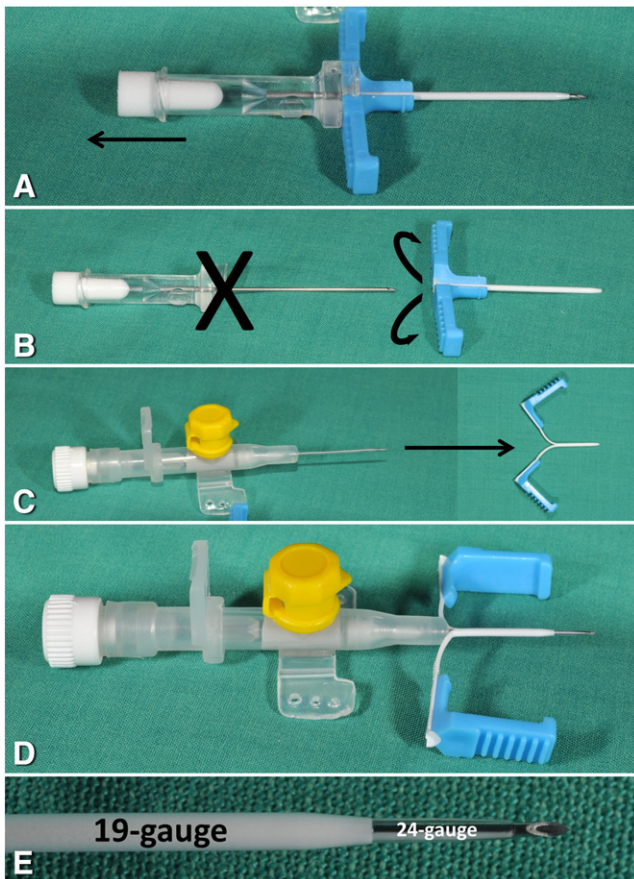


Fig. 1. Preparation of the fine-tipped introducer cannula to facilitate placement of the 2-F peripherally inserted central catheter (PICC). The PICC set is opened, and the introducer peelable cannula is taken inside the set (A). Its needle is discarded (cross sign) (B). Then, the cannula is half-peeled (curved arrows) (C). A 24-G PVC is advanced wholly through this half-peeled cannula (arrow) (C). Finally, the new fine-tipped introducer cannula (24-gauge tip; 19-gauge body) is now ready (D, E).

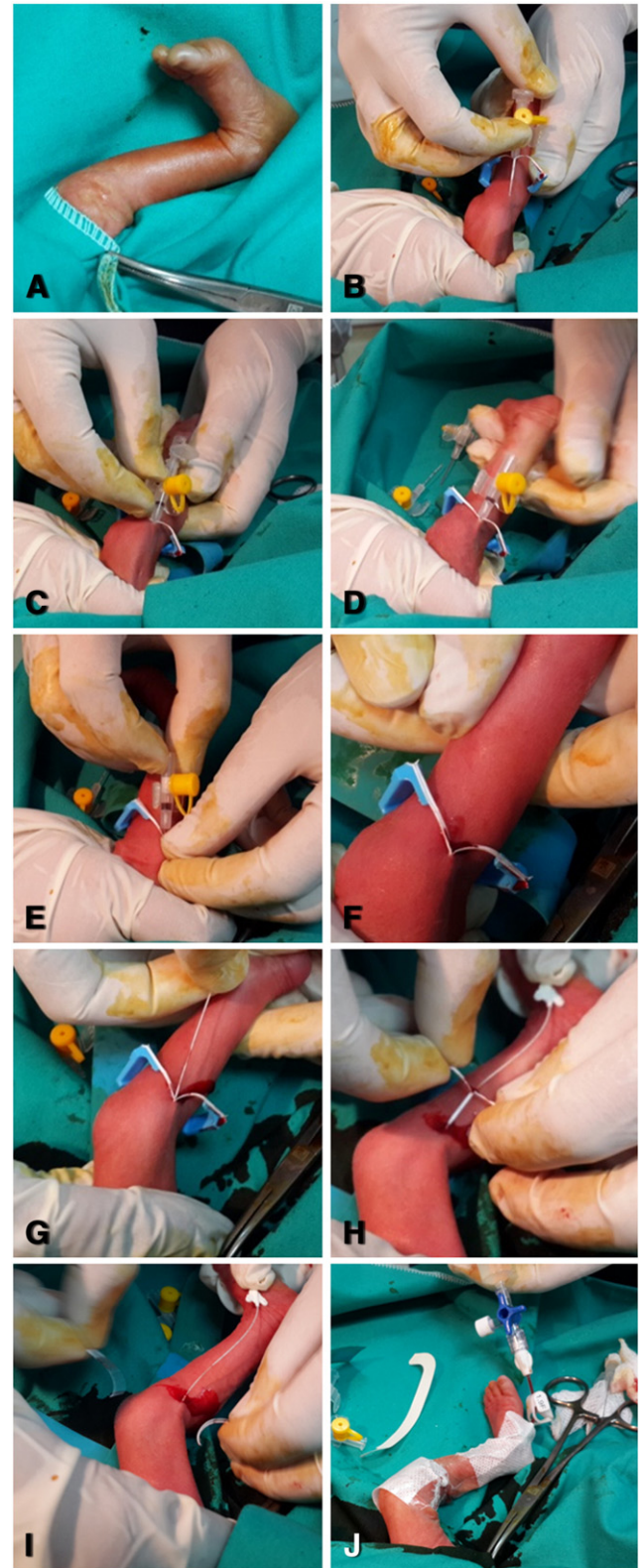


Fig. 2. The insertion of the 1.9-F peripherally inserted central catheter using the novel fine-tipped introducer cannula (A–J) (see text for details).

previously flushed with saline, was advanced to the central vein through the FTIC up to a predetermined length (Fig. 2G). The FTIC was then removed from the skin, peeled, and discarded (Fig. 2H, I). Gauze compression was applied for a few minutes to stop any bleeding from the venipuncture site. After bleeding control, a mini-gauze dressing was typically applied to the venipuncture site as a tamponade for

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