Central venous silastic catheters in newborns: localization by sonography and radiology

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Abstract. The positioning of various central venous catheters in newborns including very thin silastic catheters has been checked by sonography. Even the very thin silastic catheters are easily detectable owing to their strong echoes. Diverse malpositions are presented, including non-central positioning detected by sonography. The frequency of control radiographs could be reduced.

Central venous catheters are frequently used in neonatal intensive medicine and it is extremely important to achieve correct positioning of the catheter’s tip [1, 5, 7]. In addition to previous studies using X-ray [2, 8] and ultra-sonographic techniques [3, 4, 6] we have also examined sonographically the positioning of very thin silastic catheters inserted via puncture of a peripheral vein.

Procedure and methods

In total, 19 newborn babies, birth weight ranging from 700 g to 3,950 g, underwent 27 bed-side sonographic examinations. Types of catheters used (Fig. 1):

1. Silastic catheters, outer diameter (OD) 0.64 mm (0.025 in), inner diameter (ID) 0.30 mm (0.012 in), obtained from Dow Corning Corp., Medical Products, Midland, Mich, USA

2. Subclavian catheters, OD 1.0 mm (0.039 in), ID 0.75 mm (0.025 in), obtained from Soc. Francaise des Laboratoires Abbott S.A., St-Rémy, France

3. Umbilical venous catheters, OD Ch. 5 (1.6 mm ± 0.063 in), ID 1.0 mm (0.039 in), obtained from Laboratori Pharmaseal S.p.A., Trieste, Italy

4. Umbilical venous catheters, OD Ch. 8 (2.5 mm ± 0.098 in), ID 1.7 mm (0.067 in), also obtained from Laboratori Pharmaseal S.p.A.

Nine babies received silastic catheters; six subclavian catheters and two at the same time had both the types of umbilical venous catheters.

Fig. 1. Comparison of catheters used in the present study (left to right): silastic catheter, subclavian catheter, umbilical venous catheters Ch. 5 and Ch. 8

Fig. 2. Silastic catheter entering right atrium via vena cava inferior; normal position, sonography
For installing silastic catheters, a peripheral vein at the elbow or ankle was punctured using a large metal cannula (Butterfly system, 19 G) and the catheter pushed through the needle into the venous system. After position control, the metal cannula was removed.

A 3.0 MHz/13 mm transducer (ADR ultrasound), focused at close range, and a scanner “4000 SL” (ADR ultrasound) were used. In all studies the liver served as an acoustic window (subcostal four chamber view), but in addition longitudinal and transhepatic sections, the apical four chamber view and the long-axis view were all used.

Positioning of the catheter’s tip in the right atrium near the sinus venosus and in the central parts of the vena cava superior and inferior, close to the heart, was accepted. Corresponding radiological investigation using 0.3 ml megluminamidotrizoate (Angiografin) for visualization of the non-radioopaque silastic catheters and plain film examination for the other catheter types was carried out at the same time (either on the same or following day).

Results

The silastic catheters were easily detectable by sonar in all cases as sharply contrasting double-contoured echogenic structures in the liver, the inferior vena cava or the heart compartments (Figs. 2, 3, 6). Their