Percutaneous retrieval of a broken umbilical vein catheter from left atrium in a premature newborn case report and literature review

Mohammed Habib* and Mohammed Hillis
1Cardiology Department, Alshifa Hospital, Gaza, Palestine
2Pediatric Cardiology Department, Alshifa Hospital, Gaza, Palestine

Abstract
A 28-week-old preterm infant with a birth weight of 1370 g had a broken segment of umbilical vein catheter (UVC) lodged in the left atrium. It was observed that a 10-cm fragment of catheter had migrated to the left atrium appendage through the patent foramen ovale. The catheter was successfully retrieved by fluoroscopically guided percutaneous cardiac catheterization using grasping forceps after failed many trials of snare wire without complication.

Presently described was a case of fractured and embolized UVC in a very low-birth weight preterm infant, and its successful retrieval via percutaneous endovascular approach.

Discussion
The UVC have contributed a great deal in managing critically ill
Habib M (2016) Percutaneous retrieval of a broken umbilical vein catheter from left atrium in a premature newborn case report and literature review

Table 1. Listed of umbilical vein catheter fracture.

| No. | Year | Authors | Cases | Gestation at Birth (Weeks) | Weight (gms) | UVC in | Lodged at | Retrieval |
|-----|------|---------|-------|---------------------------|-------------|--------|-----------|-----------|
| 1   | 1972 | [6]     | 1     | NA                        | NA          | A      | Thoracic aorta | Open      |
| 2   | 1977 | [5]     | 2     | 32                        | 1310        | A      | Umbilical artery | Open      |
|     |      |         |       | 28                        | 950         | A      | Thoracic Aorta  | Not retrieved |
| 3   | 1978 | [7]     | 2     | 33                        | 1370        | A      | Femoral artery  | Wire loop  |
|     |      |         |       | 32                        | 1370        | V      | Umbilical vein  | Loop snare |
| 4   | 1987 | [8]     | 1     | NA                        | NA          | A      | Extremity vessel | Open      |
| 5   | 1987 | [9]     | 1     | 37                        | 3200        | V      | One end in left atrial appendage, other end in ductus venosus | Endovascular (trans-femoral) |
| 6   | 1995 | [3]     | 1     | 30                        | 1117        | V      | Left superior pulmonary vein | Percutaneous pigtail catheter and a snare wire with fluoroscopy |
| 7   | 1995 | [10]    | 1     | NA                        | NA          | A      | Umbilical artery | Open (trans-umbilical) |
| 8   | 1997 | [11]    | 2     | 29                        | 815         | A      | Umbilical artery | Loop snare |
|     |      |         |       | 31                        | 1117        | V      | Umbilical vein  | Pigtail+ Snare |
| 9   | 1998 | [12]    | 1     | 26                        | 870         | V      | Umbilical vein  | Open cutdown + wire loop using fluoroscopy |
| 10  | 2000 | [13]    | 1     | NA                        | NA          | A      | Common ilica artery | Open (infra-umbilical) |
| 11  | 2004 | [14]    | 1     | 38                        | 3761        | U      | Umbilical vein  | Open dissection+ endovascular through umbilical vein |
| 12  | 2007 | [15]    | 1     | 27                        | NA          | A      | Umbilical artery | Laparotomy |
| 13  | 2013 | [16]    | 1     | 26                        | NA          | V      | Umbilical vein  | Open (supra-umbilical) |
| 14  | 2013 | [17]    | 1     | 37                        | 1800        | V      | Across right atrium with one end in SVC, other end in IVC | Open (Supra-umbilical) failed then Endovascular (Trans-femoral) |
| 15  | 2014 | [18]    | 1     | 38                        | 970         | V      | Pulmonary artery | Loop snare |
| 16  | 2015 | [19]    | 1     | 40                        | 4000        | V      | Umbilical vein  | Open |
| 17  | 2016 | [20]    | 1     | 38                        | 1250        | V      | Right atrium    | Wire loop |
| 18  | 2017 | Our case| 1    | 38                        | 1400        | V      | Left atrial appendage | Loop snare failed then grasping forceps |

Figure 2. 0.018-in floppy guidewire was cross and advanced into umbilical vein.

Figure 3. Control fluoroscopy demonstrated total removal of the broken UVC.

patients in NICU. Complications are related to positioning and long duration of catheterization. Lodged fragments of catheter are relatively very rarely reported. These complications include nosocomial sepsis, vasospasm, vascular perforation, thrombosis, emboli (air, thrombus) and catheter fracture [1-4].

The mechanism of UVC breakage has been proposed and discussed by Choi et al. [5]. He reported two cases of broken UVC.
and proposed that it is possible that the UVC can get inadvertently damaged by needles or scissors during catheter insertion and fixation many methods of removal have been described, including surgical techniques, percutaneous retrieval via snaring or biopsy forceps.

An exhaustive search of the literature revealed only 17 articles with 20 cases of broken UVC in neonates (Table 1).

Included our case, totally 21 cases were analyzed. Gestational Age were (26-38) weeks. Gestation weight were (970 to 4000) grams. The catheter was placed and broken in umbilical artery in 9 cases and in umbilical vein in 12 cases. Totally 12 cases the broken catheter was removed by surgical techniques, 8 cases was removal by different percutaneous intervention (snaring or biopsy forceps) and in one case the broken catheter was not retrieved.

Gasparis et al. [15] described a successful removal of a dislodged UVC through the umbilical vein using endovascular Amplatz loop snare. This minimally invasive route was also used by Ruiz et al. [3] who have reported successful retrieval of a broken umbilical vein catheter lodged in the left superior pulmonary vein from a 30 week preterm neonate.

We initially resorted to umbilical vein cut down and exploration as the lower end but this attempt failed. A check radiograph revealed that the broken fragment of UVC had actually migrated higher up and hence its removal was possible only by endovascular method and it was then successfully performed by a trans-umbilical approach by the interventional cardiologist using a goose neck snare but this attempt also failed. In the last we trial to removal a broken umbilical vein catheter by small grasping forceps via umbilical via a 5-F standard snare sheath.

Conclusion

Umbilical venous catheterization is very common in the care of preterm newborn. Complications in such common invasive interventions cannot be avoided. Fracture and embolization of a UVC is a rare but serious complication. Presently reported was the successful retrieval of a fractured and embolized UVC in a preterm infant, via percutaneous endovascular approach, without complication.

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