

Removal of Broken Umbilical Venous Catheter from Inferior Vena Cava Via Cardiac (Femoral) Catheterization: A Case Report in Neonatal Intensive Care Unit (NICU) of Mataria Teaching Hospital

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ABSTRACT

Background: Arterial and venous umbilical catheters are used for drugs, fluids, and blood products administration and for exchange transfusion, in delivery room for neonatal resuscitation, and also for admitted critically ill neonates. Neonatologist can insert both umbilical catheters easily in short time. In spite of this, many unavoidable complications can occur as pericardial effusion, sepsis, thrombosis, and arrhythmia. Umbilical catheter breakage is a rare complication but it can happen during insertion or removal of the catheter. Various procedures are used for retrieval of the broken catheter. Surgical, vascular, and pediatric cardiac expert in catheterization should be consulted to choose the safest method for removal of the fractured catheter and to be stand by in case of failure of the chosen technique during the intervention.

Case Report: A 20 days old near term infant with a birth weight of 2400 g was born by cesarean section. He was admitted to NICU of Mataria Teaching Hospital because of respiratory distress due to congenital pneumonia.

Results: A reported case of a near term male at neonatal intensive care unit (NICU), Mataria Teaching Hospital was diagnosed by X-ray, on the second day of the removal of umbilical venous catheter (UVC), to have a fractured UVC at junction of hepatic vein and right atrium. Patient was transferred to Ain Shams University Children Hospital Cath Lab for trial of percutaneous removal of the remaining catheter segment, where it was retrieved successfully.

Conclusion: Fracture and embolization of a UVC is a rare but serious complication. Percutaneous retrieval of broken catheters using minibasket microsnares is amenable and safe procedure in neonates that can be done with minimal patient risk.

Keywords: Broken umbilical venous catheter (UVC), Cardiac catheterization, NICU.

INTRODUCTION

Arterial and venous umbilical catheters (UAC and UVC) are used in resuscitation room and in critically ill neonates for drugs, fluids and blood product administration or exchange transfusion ⁽¹⁾.

Many unavoidable complications can occur with umbilical catheters insertion as pericardial effusion ⁽²⁾, sepsis, thrombosis, arrhythmia and catheter breakage ⁽³⁾.

Clues for broken umbilical catheter segments may include difficulty in insertion of another one ⁽⁴⁾, as well as other misleading symptoms such as need for mechanical ventilation and elevation of acute phase reactants ⁽⁵⁾.

Kotnis et al. ⁽⁶⁾ reported late presentation of a broken catheter tip presented 15 months later by an umbilical abscess.

MATERIAL

A 20 days old near term infant with a birth weight of 2400 g was born by cesarean section. He was admitted to NICU of Mataria Teaching Hospital because of respiratory distress due to congenital pneumonia.

Ethical consent:

An approval of the study was obtained from Mataria Teaching Hospital Academic and Ethical Committee. Parent of child were informed that the case would be published as case report and this was accepted. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

RESULTS

Table (1) showed the data of the registered cases since.

Table (1): Registered data of the reported cases

	GA (weeks)	BW (Kg)	Type	Length (cm)	Site	Intervention	Complications	Type of Anesthesia: Total time of intervention
Our case	36	2.4	UVC	8	IVC & Right Atrium	Microsnar	No	General:: 30 minutes
Khasawneh et al. 2021 (2 cases) (7)	36 36	3.2 3.7	UAC, UVC	1.8 2	UA IVC	Forceps Surgical	NO NO	NO General
Patel et al. 2019 (8)	24+5	0.63	UVC	1.5	Right ventricle	Microsnare	No	General
Saha and Saha 2019 (5)	-	2.36	UVC	-	Between Right , Left atrium	Goose neck snare	No	General
Varan et al. 2018 (9)	30	1.5	UVC	-	Right upper pulmonary vein	Percutaneous pigtail+ goose neck snare	No	General
Habib and Hillis 2016 (10)	28	1.37	UVC	10	Left atrial appendage	Grasping forceps	No	General: 35 minutes
Demire et al. 2016 (11)	28	1.25	UVC	7	Rt. atrium	Snare wire	No	General: 15 minutes
Venkates 2015 (12)	40	4	UVC	-	UV	Open(surgical)	No	-
Dogan 2015 (13)	28	1	UAC	-	Aorta	Transumbilical,multipurpose snare	Femoral right iliac artery thrombosis	-
Nigam et al. 2014 (14)	38	0.97	UVC	-	Pulmonary artery	Coronary wire and balloon	No	Sedation: 20 minutes
Dhua et al. 2013 (15)	37	1.8	UVC	-	Across Right Atrium (SVC to IVC)	Endovascular) (transfemoral)	No	General
Smith et al. 2013 (16)	26	-	UVC	-	UV	Open (supra umbilical)	No	General
Mitchell et al. 2007 (17)	27	-	UAC	-	UA	Laparotomy	No	General
Gasparis et al. 2004 (4)	38	3.76	UVC	-	Left atrium	Open dissection+ trans-vascular through umbilical vein	No	General
Young et al. 2003 (18)	28	0.8	PICC	-	Right atrium	Gooze neck snare	No	- : 12.8 minutes
Pérez-Martínez et al. 2002 (19)	FT	-	PICC	-	Tricuspid valve	Endo-vascular	No	General
Kotnis et al. 2000 (6)	-	-	UAC	10	Common iliac artery	Open (infra abdominal)	-	General
Hsu et al. 1998 (20)	26	0.78	PICC	5	SVC	goose neck snare	Hypothermia	Sedation: 30 minutes
Brion et al. 1998 (1)	26	0.87	UVC	-	UV	Open cut down +wire loop	No	General
Simon-Fayard et al. 1997 (21)	29 31	0.81 1.11	UAC UVC	-	Left iliac UV	Loop snare Pigtail Snare	-	-
Murphy et al. 1995 (22)	FT	3.65	UAC	-	UA	Open (trans umbilical with a forceps)	-	Local
Ruiz et al. 1995 (23)	30	1.11	UVC	8	Left superior pulmonary vein	Percutaneous pigtail catheter snare wire	No	Sedation: 9.7minutes
Gross et al. 1987 (24)	37	3.2	UVC	-	Left atrial appendage to ductus venous	Endovascular trans-femoral	No	-
Wagner et al. 1987 (25)	28	1.1	UAC	-	Extremity vessel	Open Laparotomy	Limb ischemia	General
Smith 1978 (26)	33 32	1.37 1.37	UAC UVC	-	Femoral artery UV	Wire loop Loop snare	-	-
Choi et al. 1977 (27)	32 28	1.31 0.95	UAC UAC	-	Right common iliac Thoracic Aorta	Open (surgical dissection) Not retrieved	No Died	General
Lackey and Taber 1972 (3)	-	-	UAC	-	Thoracic aorta	Open	-	-

RT: full term, GA=gestational age, BW=body weight, UVC=umbilical venous catheter, UAC=umbilical artery catheter, PICC=peripherally inserted central venous catheter line, IVC= inferior vena cava, UA= umbilical artery, UV= umbilical SVC=superior vena cava vein. - = not mentioned in the corresponding paper.

CASE PRESENTATION

A 20 days old near term infant with a birth weight of 2400 g was born by cesarean section. He was admitted to NICU of Mataria Teaching Hospital because of respiratory distress due to congenital pneumonia. He was intubated and mechanically ventilated. A 5 French UVC was inserted during the initial days of his stay for blood sampling and administration of IV antibiotics and IV fluids. Proper position of the UVC was documented after insertion by abdominal and chest X-ray. After hemodynamic and respiratory stabilization, the UVC was removed on the tenth day of admission. Abdominal and chest X-ray imaging 2 days post removal of the catheter showed remaining part in the IVC and the heart (**Figure 1**). None-enhanced CT scan of the chest and abdomen was done (**Figure 2**), showing inferior tip of the catheter segment located within the intra-abdominal portion of umbilical vein, then running superiorly & posteriorly traversing the liver passing into the left hepatic vein through the ductus venosus passing upwards into the right atrium. The catheter passed to the left atrium (likely through a patent foramen ovale) to end into upper right pulmonary veins.

Patient was transferred from Mataria Teaching Hospital NICU to Ain Shams University Children Hospital Cath Lab for trial of percutaneous removal of the remaining catheter segment.

Informed consent was obtained from the patient's parents. Under general anaesthesia right femoral vein access was obtained placing a 6 French short sheath. Intravenous heparin (100 IU/kg) was administered. 0.014 inch snare was used initially to grasp the distal end of the broken segment, however, this was not possible as it was trapped in the ductus venosus. The proximal end was seen in right atrium (probably dislodged from the previous position described in the CT scan) and trial was done to grasp it using the same snare but the trial was not successful. Then a minibasket microsnare was introduced and could grasp the proximal end of the broken segment. The fractured fragment of UVC was retrieved fluoroscopically-guided.

Total procedural time was 30 minutes. Control fluoroscopy demonstrated total removal of the broken UVC (**Figure 3**). Blood loss during the procedure was minimal.

After revision with NICU stuff, multiple fixing stitches of the UVC in this patient hindered its smooth removal and probably required some tension on removal, which resulted in a broken segment (**Figure 4**).

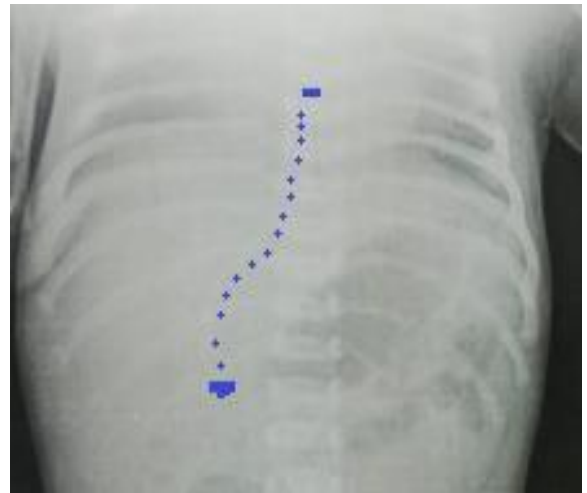


Figure (1): X-ray chest and abdomen



Figure (2): Non-enhanced CT chest and abdomen

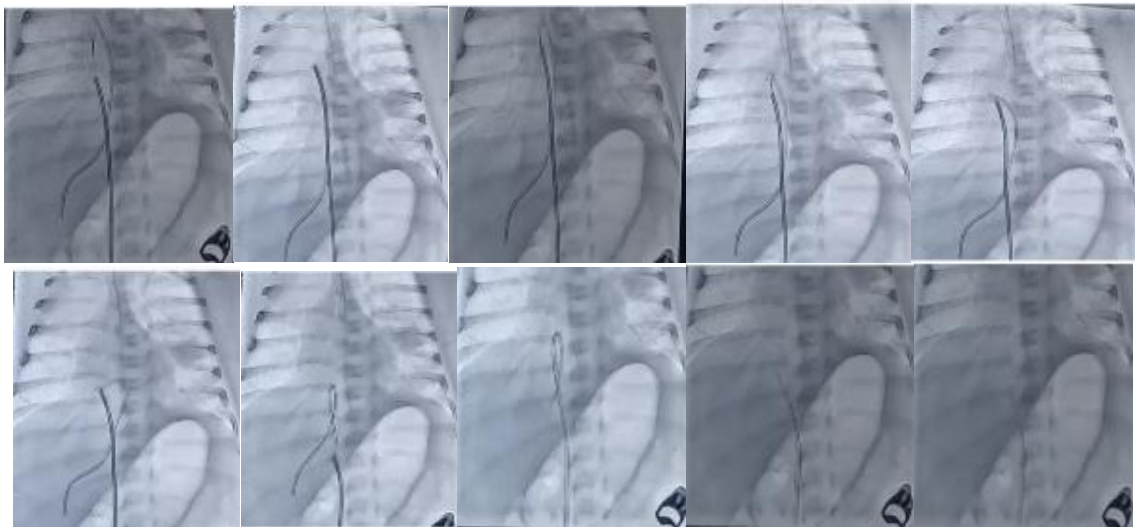


Figure (3): Steps of removal of UVC via minibasket snare



Figure (4): The removed broken part

DISCUSSION

Neonatal care requires skilled personnel in multiple procedures, as endotracheal intubation, chest tube and umbilical catheter insertion and others. Each procedure has its benefit in stabilization of critically ill neonates. On the other hand, multiple complications may happen with variable incidences. Infection and faulty positioning are the commonest complications of umbilical catheterization in addition to possible vasospasm, thrombosis, breakage during fixation or removal of the stiches. Percutaneous⁽²⁸⁾ or surgical⁽²⁹⁾ removal of dislodged catheters were reported, which needs a multi-disciplinary team including neonatologists, vascular and pediatric surgeons and pediatric cardiologists (cardiac interventionist) for selecting the best intervention using snares or biopsy forceps. To our knowledge 32 cases were reported since 1972 including our case. Their gestational age ranged from 24 ± 5 days -40 weeks and Birth Weight from 630 - 4000 g. Eleven of them were UAC, 17 were UVC and 3 were peripherally inserted central catheter (PICC). Intervention through femoral catheterization was done in 17 cases while in 13 cases the broken part was removed by open surgery. The sites of dislodgement were left superior pulmonary vein, left atrium, right atrium, right ventricle and inferior vena cava.

In our case withdrawal of the proximal end of UVC using minibasket snare was successful. In all mentioned cases the broken part was successfully removed out from first attempt⁽¹¹⁾ but several attempts in the same setting⁽¹⁴⁾ or later trial was taken with different approach^(5,7).

All cases were successfully done with minimal blood loss without further complications except one case, where it was difficult to be retrieved. Another obstacle was the need to transfer the case to a specialized center as reported by Gasparis *et al.*⁽⁴⁾ and this was another obstacle in our case.

CONCLUSION

Fracture and embolization of UVC is a rare but serious complication. Percutaneous retrieval of broken catheters using minibasket microsnare is amenable and safe procedure in neonates that can be done with minimal patient risk. Careful care of umbilical catheter as well as and careful insertion and removal, besides confirmation of the length of insertion or removal of the whole catheter is mandatory. Follow up X-ray should be done shortly after the end of the procedure for early detection of this rare unexpected complication and rapid intervention.

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