



Contents lists available at ScienceDirect

International Journal of Surgery Case Reports

journal homepage: www.casereports.com

The use of endo-vascular balloon tamponade technique for the removal of a misplaced nephrostomy tube in the inferior vena cava: A case report



Yousof Al Zahrani^{a,b,*}, Sultan R. AlHarbi^c, Daniele Wiseman^a

^a Division of Interventional Radiology, Medical Imaging Department, Victoria Hospital, London Health Sciences Center, Western University, London, Ontario, Canada

^b Medical Imaging Department, King AbdulAziz Medical City, Ministry of National Guard, Riyadh, Saudi Arabia

^c Department of Radiology, King Saud University, Riyadh, Saudi Arabia

ARTICLE INFO

Article history:

Received 26 April 2016

Received in revised form 26 July 2016

Accepted 26 July 2016

Available online 29 July 2016

Keywords:

Nephrostomy catheter

Complication

Inferior vena cava

Venogram

Computed tomography

ABSTRACT

INTRODUCTION: Inadvertent placement of a nephrostomy tube into the inferior vena cava (IVC) is an extremely rare complication with few reported cases in the literature.

CASE PRESENTATION: We present a lady with obstructive uropathy in a solitary kidney in whom an attempt by the community radiologist to place a nephrostomy tube was complicated by wrong insertion into the IVC. This report illustrates how a safe non-surgical removal of this tube using an intravenous balloon tamponade technique was successfully applied.

DISCUSSION: Intravenous placement of nephrostomy catheters into the inferior vena cava is extremely rare complication. A few case reports have been published in the literature. The majority of these cases were removed in the operating room under general anesthesia. Using Intravenous balloon tamponade technique for removal has not been previously reported.

CONCLUSION: Intravenous balloon tamponade technique is effective and is a good minimally invasive alternative to surgical removal of misplaced nephrostomy tube from IVC.

© 2016 The Authors. Published by Elsevier Ltd on behalf of IJS Publishing Group Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

Inadvertent placement of nephrostomy catheter in the inferior vena cava (IVC) is extremely unusual complication. Few case reports have been published in the literature. Chen et al. reported three cases of intravenous misplacement of nephrostomy catheter following percutaneous nephrolithotomy (PCNL) and incidence of 0.5% in their hospital [4]. There are few other case reports scattered in the literature. Dias-filho et al. reported a rare case of misplacement and migration of the nephrostomy catheter into the right atrium [6]. Most cases in the literature were treated conservatively with bedrest, intravenous antibiotics and controlled tube removal under ultrasound (US), computed tomography (CT) or fluoroscopic guidance. According to the literature, most of these removal procedures were done in more than one step in the operating rooms. Here, we report a case where we used intravenous balloon tam-

ponade technique to remove the misplaced catheter. We performed this procedure in the interventional radiology suite under sedation. To the best of our knowledge, none of these cases in the literature was treated with removal using this minimally invasive technique.

2. Case presentation

Our patient was a 76-year-old woman from a nursing home. She had a previous left nephrectomy in 2003 for chronic pyelonephritis. Her recent medical history has been complicated by obstruction of her post nephrectomy single kidney of unknown cause. The obstruction was managed with a nephrostomy tube insertion. Her nephrostomy fell out on several occasions and had again on this occasion. She presented to the community hospital with urosepsis. She had multiple comorbidities including dementia, heart disease, chronic kidney disease, gastroesophageal reflux, osteoporosis and hypertension. She was treated with intravenous (IV) antibiotics and was referred for a fresh nephrostomy tube insertion. The procedure was complicated. The first attempt failed with the catheter seen “outside the collecting system”. The catheter was removed. The second attempt was technically challenging because of the blood filling the collecting system with reduced visualization on ultra-

* Corresponding author at: Division of Interventional Radiology, Medical Imaging Department, Victoria Hospital, London Health Sciences Center, Western University, London, Ontario N6H 0B1, Canada.

E-mail addresses: yousof1403@hotmail.com, yousof.alzahrani@lhsc.on.ca (Y. Al Zahrani).



Fig. 1. Coronal non-enhanced CT scan image of the abdomen and pelvis showing a right nephrostomy catheter traversing the right kidney with the catheter loop seen within the IVC (arrow).

sound. They proceeded with nephrostomy tube placement and at the end of the procedure, contrast injected through the catheter demonstrated filling of the inferior vena cava (IVC). A non contrast computed tomography (CT) confirmed the pigtail formed in the IVC. It also showed a sheared wire fragment curled in the kidney (Fig. 1). At this time, a second nephrostomy was placed appropriately in the collecting system and after stabilizing the patient, they transferred her immediately to our institute.

The patient was first seen by the vascular team but the surgeons were reluctant to operate because of the comorbid conditions of the patient. They consulted Interventional Radiology. It was not clear to us based on the non contrast CT and before knowing what transpired if the tube was inserted directly into the IVC past the kidney or if it was the renal vein that was traversed and the tip was advanced into IVC via the vein.

On examination, the pulse rate was 102/min and the blood pressure was 124/66 mmHg. She was getting 2L of oxygen through nasal prongs and her peripheral oxygen saturation was 98%. Her abdomen was soft and not tender. She had two nephrostomy tubes with bags attached, one of them was draining bloody urine whereas the other just had small amounts of blood with clot. An indwelling bladder catheter drained very small amount of clotted blood. The patient's white blood cell count was $36.8 \times 10^9/L$. Her potassium is slightly elevated at 5.3 mmol/L and creatinine 269 $\mu\text{mol/L}$, with normal coagulation parameters and hemoglobin of 90 g/L.

Four units of cross-matched packed red cells were placed on standby.

The patient was immediately taken to interventional radiology department. Vascular Surgeon was also present at the time of the procedure in case there was any significant bleeding, which

there was not and she did remain stable afterwards. A substitute informed consent from the patient's son was obtained. Controlled removal of the misplaced nephrostomy catheter utilizing percutaneous intravenous balloon tamponade technique was performed according to the following procedure.

The right common femoral vein was punctured using ultrasound. A 5-French pigtail angiographic catheter was inserted and an IVC venogram was subsequently performed. This showed the aberrant pigtail catheter was likely within the IVC through the right renal vein (Fig. 2a). A large compliant (Coda) balloon was placed in the peri-renal IVC (Fig. 2b). Via a left-sided common femoral vein puncture, a 7-French renal double curve sheath was inserted and the right renal vein accessed with a Cobra (C2) catheter through which a renal vein venogram was performed. It delineated the branch was most likely traversed by the aberrant nephrostomy based on where the nephrostomy traversed. A 6×20 mm balloon was placed across this area (Fig. 2b). Once these balloons were satisfactorily positioned, we rolled the patient upright anterior oblique in order to access the aberrantly placed nephrostomy tube. We used the second nephrostomy tube which is in the right position as a monitor and opened this up so we could see what was draining. Under fluoroscopic guidance, a wire through the aberrant nephrostomy was advanced and the wire went up the IVC. We then proceeded to inflate the IVC balloon as well as the renal vein balloon and then the nephrostomy tube was successfully retracted over the wire. A large gush of blood then came into the appropriately positioned nephrostomy tube so this was subsequently clamped. A 5-French long sheath was advanced over the wire and a venogram of the IVC performed. This was pulled back slowly and I was able to elucidate a renogram confirming good position of my balloon. The sheath was retracted back slowly. We waited at least 10 min before deflating the coda balloon once it was determined that her blood pressure was stable throughout as well as her heart rate. The IVC Coda balloon was then exchanged out for a pigtail and did an IVC venogram which showed no evidence of extravasation from the IVC (Fig. 2c). At that point the renal vein balloon was finally deflated and repeated the venogram and again no evidence of extravasation was seen. This balloon was removed and then gradually removed the long sheath and wire.

Her infection was clearing and her white count continued to decrease while in hospital. She remained afebrile on oral antibiotics. She maintained her baseline kidney function with no further gross hematuria. She was tolerating a regular diet and appeared to be at her baseline. She was discharged home uneventfully. The plan was to try to retrieve the aberrant guidewire via the nephrostomy tube tract in a couple weeks as an outpatient procedure. But unfortunately the patient died four weeks later due to congestive heart failure secondary to coronary artery disease.

3. Discussion

Percutaneous nephrostomy catheter placement is one of the most commonly performed procedure for acute or chronic upper urinary tract obstruction. Intravenous misplacement of nephrostomy catheters into the inferior vena cava (IVC) is extremely rare complication. In the literature, most of these complications were seen following percutaneous nephrolithotomy (PCNL) or nephrostomy tube exchange. The majority of these cases were treated with controlled removal in the operating room (OR) under general anesthesia in one or two steps. Surgical retraction procedures such as open pyelotomy and exploratory laparotomy have been reported [8,3].

Intravenous misplacement of nephrostomy catheters is usually seen on the left side according to the literature. The pre-existing chronic infection like in our case is a risk factor for intravenous

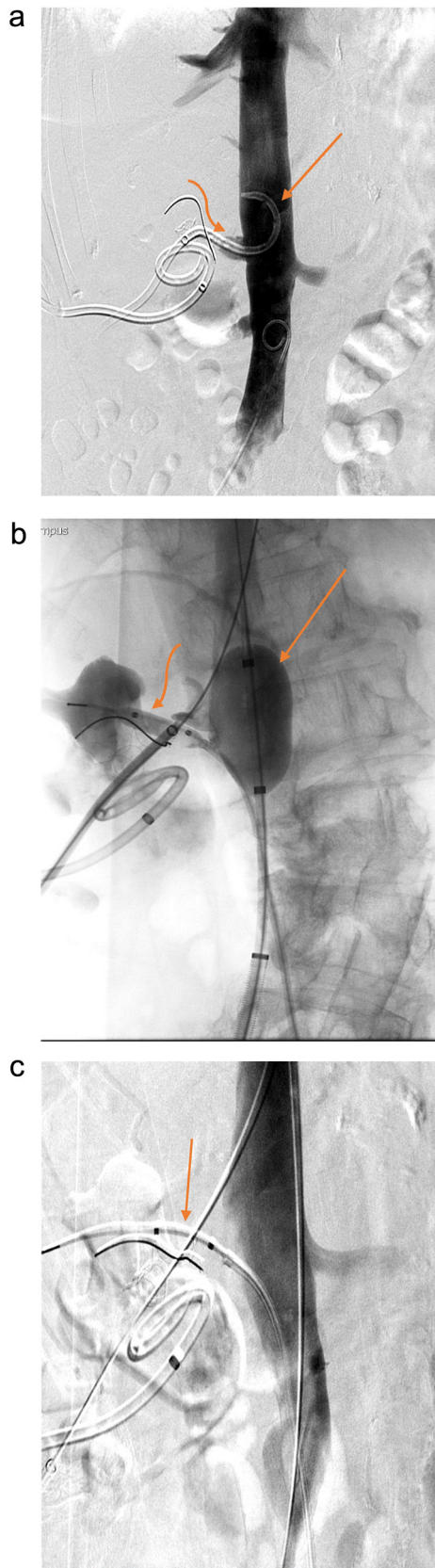


Fig. 2. (a) A cavogram via pigtail angiographic catheter showing the intravenous position of one of the right nephrostomy catheters within the IVC (arrow) through right renal vein (curved arrow). (b) A fluoroscopic spot image showing simultaneously inflated balloons within the IVC (arrow) and right renal vein (curved arrow). (c) A cavogram post deflation of the right renal vein balloon (arrow) and complete removal of the misplaced nephrostomy catheter showing no contrast extravasation.

catheter migration [7]. Patients with solitary kidney are more prone to have this rare complication [4]. Poor visualization of the renal calyces owing to bleeding in the kidney may contribute to misplacement of the tube into the vascular system [4].

Mazzucchi and his colleagues reported two cases of intravenous misplacement of nephrostomy catheters following PCNL. Their first case was a misplacement into the left renal vein and removed under general anesthesia in the operating room. Their second case was inadvertent placement of the nephrostomy catheter into the IVC. This catheter was repositioned in the collecting system in OR and removed 48 h later [2].

Kotb et al. reported a percutaneous silicon catheter insertion into the inferior vena cava, following percutaneous nephrostomy exchange in the outpatient clinic. They treated this complication with open surgical pyelotomy [3].

Chen and his colleagues reported three cases of intravenous misplacement of nephrostomy catheter following PCNL. Two of these nephrostomy catheters were placed inadvertently into the IVC and were removed under US monitoring. The third case was misplaced into the renal vein following PCNL and was removed under US monitoring with the surgical team on standby. They recommended that once intravenous misplacement is detected, the tube should be closed immediately. Then, the closed tube should be pulled back and repositioned immediately at the site of entry into renal vein under CT, ultrasound or fluoroscopic monitoring, if its tip is located in the renal vein trunk, IVC or even the atrium. The closed nephrostomy tube can be removed in the operating room under CT, US or fluoroscopic guidance. They recommended one step removal if the misplaced catheter tip is in the renal vein adjacent to the sinus after seven days [4].

Li and his colleagues did a literature review on management of intravenous migration of urologic catheter. They added two cases of intravenous misplacement of nephrostomy catheters to the literature as well. The first one was a misplaced nephrostomy catheter following PCNL which was removed using US guidance in the OR under general anesthesia. The second case was complete intravenous migration of double J ureteric stent into the IVC which was removed from the IVC through the femoral vein [7].

There is another case report of misplaced nephrostomy catheter in left renal vein mentioned by Tarhan et al. The nephrostomy catheter was removed by open surgery under general anesthesia by the vascular surgeon in the operation room according to their report [1].

Dias-Filho et al. reported inadvertent renal vein catheterization and migration of the nephrostomy catheter to the right atrium during nephrostomy catheter change treated with fluoroscopically monitored removal [6].

Wang et al. mentioned a rare case of both arterial and venous injury as well as intravenous nephrostomy catheter misplacement of the kidney at the same time following PCNL. He reported intravenous misplacement of nephrostomy catheter and subsequent pseudoaneurysm formation. The nephrostomy tube was withdrawn in stages with the surgical team on standby. The pseudoaneurysm was treated with percutaneous embolization successfully [5].

In our case, balloon tamponade was very effective and minimally invasive procedure to control the bleeding from the injured renal vein and IVC. Our procedure was performed in the interventional radiology suite under conscious sedation. We were able to remove the misplaced nephrostomy catheter in one step at the same day. Alternating the patient's position between prone and supine position during the procedure was the main challenge of using endovascular balloon tamponade for removal of the misplaced nephrostomy catheter.

4. Conclusion

Endovascular balloon tamponade during removal of intravenously misplaced nephrostomy catheter may be sufficient to control the bleeding. This can be performed in one step without exposing the patient to general anesthesia or open surgery. Positioning the patient during the procedure is the main challenge of this technique.

Conflicts of interest

None.

Sources of funding

No funding.

Ethical approval

Case report.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Yousof Al Zahrani has written the manuscript. The procedure was carried out by Sultan R. AlHarbi and Daniele Wiseman. The

radiological imaging studies were reported and managed by Yousof Al Zahrani and Daniele Wiseman.

Guarantor

Yousof Al Zahrani.

References

- [1] Hüseyin Tarhan, İlker Akarken, Özgür Cakmak, Ertan Can, Yusuf Ozlem Ilbey, Ferruh Zorlu, Misplaced nephrostomy catheter in left renal vein: a case report of an uncommon complication following percutaneous nephrolithotomy, *Urol. J.* 11 (May–June (03)) (2014) 1715.
- [2] Eduardo Mazzucchi, Anuar Mitre, Artur Brito, Marco Arap, Claudio Murta, Miguel Srougi, Intravenous misplacement of the nephrostomy catheter following percutaneous nephrostolithotomy: two case reports, *Clinics* 64 (1) (2009) 69–70.
- [3] Ahmed Fouad Kotb, Ahmed Elabbady, Khaled Refaai Mohamed, Mohamed Adel Atta, Percutaneous silicon catheter insertion into the inferior vena cava, following percutaneous nephrostomy exchange, *Can. Urol. Assoc. J.* 7 (7–8) (2013) e505–e507.
- [4] Xiao-Feng Chen, Shan-Qun Chen, Liang-Yu Xu, Ye Gong, Zhuang-Fei Chen, Shao-Bin Zheng, Intravenous misplacement of nephrostomy tube following percutaneous nephrolithotomy: three new cases and review of seven cases in the literature, *Int. Braz. J. Urol.* 40 (2014) 690–696.
- [5] Chaojun Wang, Shanwen Chen, Fuqing Tang, Baihua Shen, Metachronous renal vein and artery injury after percutaneous nephrostolithotomy, *BMC Urol.* 13 (2013) 69, <http://dx.doi.org/10.1186/1471-2490-13-69>.
- [6] Aderivaldo C. Dias-filho, Guilherme A.V. Coaracy, Wallace Borges, Right atrial migration of nephrostomy catheter, *Int. Braz. J. Urol.* 31 (2005) 470–471.
- [7] D. Li, L. Xiao, Z. Tang, L. Qi, K. Luo, L. Huang, et al., Management of intravenous migration of urologic catheter, *Urology* 82 (2013) 248–252.
- [8] G. Shaw, T.M. Wah, M.J. Kellett, S.K. Choong, Management of renal vein perforation during a challenging percutaneous nephrolithotomy, *J. Endourol.* 19 (2005) 722–723.

Open Access

This article is published Open Access at scimedirect.com. It is distributed under the [IJSCR Supplemental terms and conditions](#), which permits unrestricted non commercial use, distribution, and reproduction in any medium, provided the original authors and source are credited.