CAIR Case of the Month

Case Courtesy of Drs. D. Choo and R. Samji
University of Alberta

UNIVERSITY OF ALBERTA

- 75 year old male underwent laparotomy and insertion of a peritoneal dialysis (PD) catheter on January 25, 2018

- A second laparotomy was performed on June 26, 2018, with a new fixation cuff as the catheter had migrated in the subcutaneous tissues and was unable to be exteriorized

- Presents Oct 4, 2018 with a several day history of the catheter poorly filling and not draining

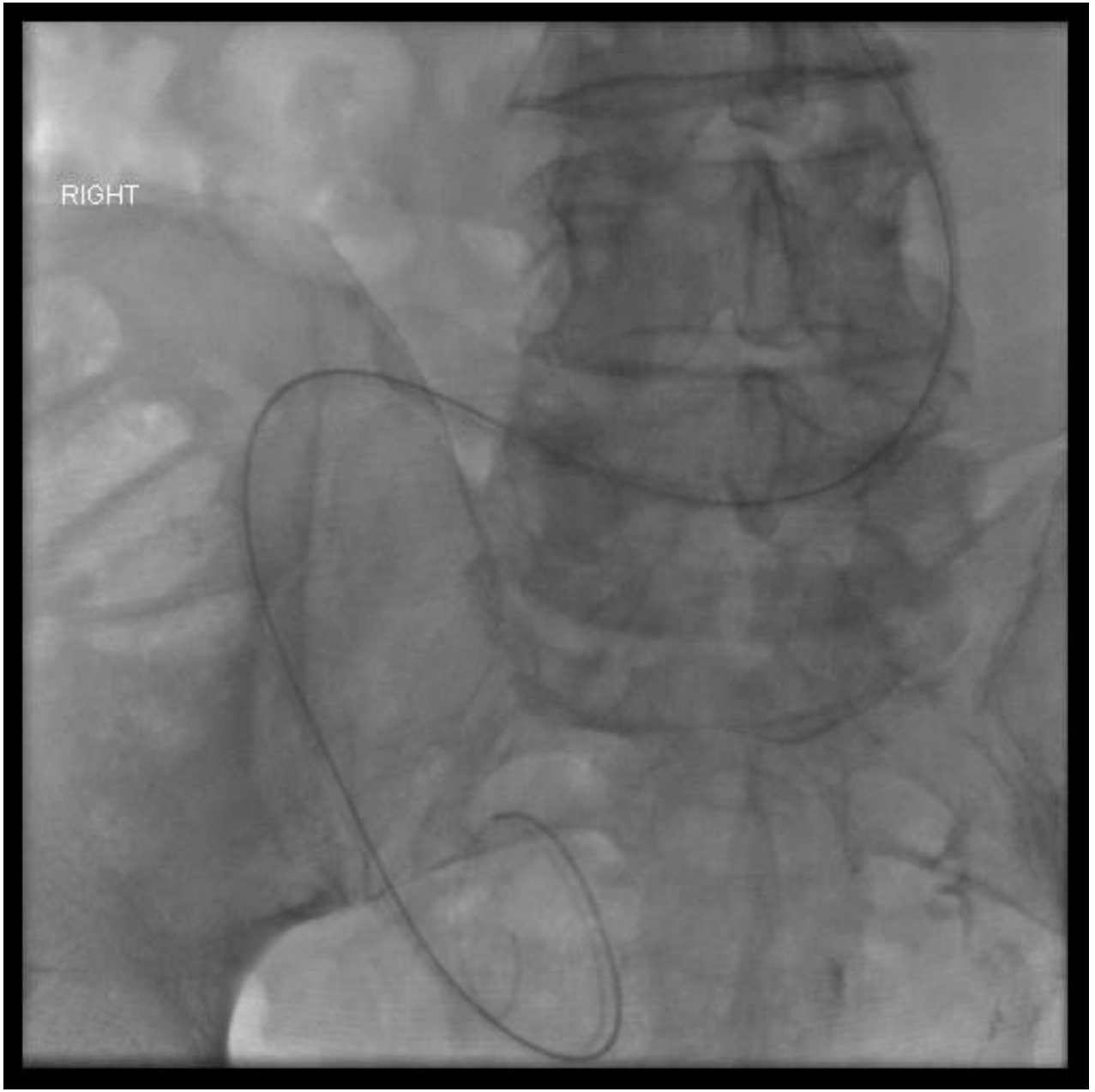
- Dialysis team asked if we could attempt to salvage the catheter via a minimally invasive approach, to avoid a third laparotomy

- As part of the informed consent, the patient was told that we don't know the exact risks of the procedure, but we him consented for all reasonable plausible risks (such as bleeding, infection and bowel injury)

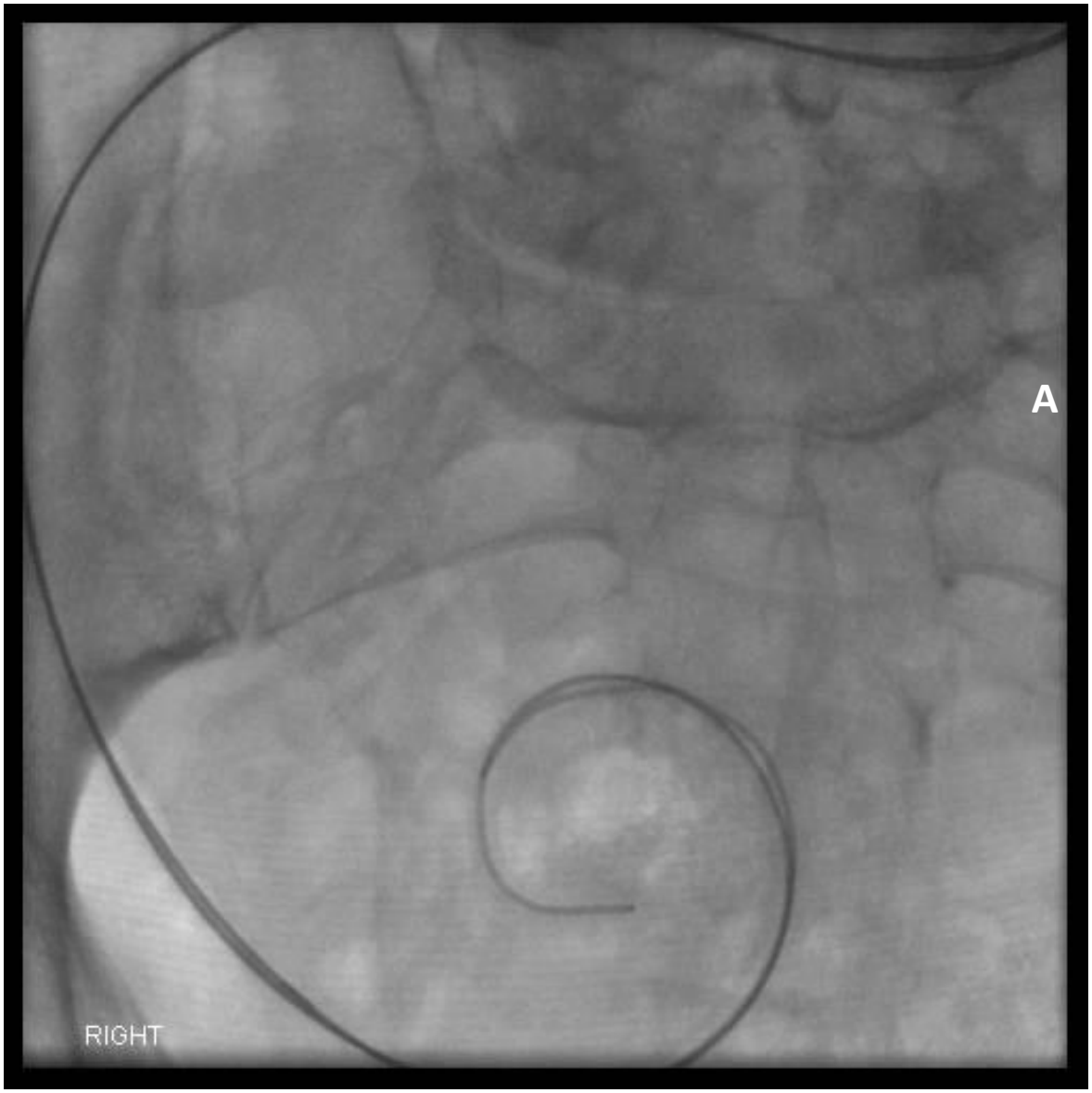
- We mentioned the literature has described declogging and repositioning these catheters with an Amplatz wire to varying success
  - We told the patient we will try that plus anything else we feel that is safe that comes to our minds

- We told him we didn't know for sure the probability of success, but hoped there would be a 50% chance of catheter salvage

- No sedation given
- Initial image showed the catheter positioned appropriately in the right hemipelvis
- The catheter would not flush or drain well
- An 0.035 Bentson wire could not be advanced beyond the catheter tip, due to resistance



- Then, two 0.035 Glidewires were able to be advanced just beyond the catheter tip
  - These were spun/rotated in the catheter using forceps and removed
- Then two 0.035 Amplatz wires were used in the same fashion, being rotated within the catheter



- Fibrin sheaths/plugs were removed from the Amplatz wires
- While the catheter was able to flush more easily, poor drainage was still noted

- Given the continued poor drainage, three 0.035 Glidewires were advanced into the catheter
- Unfortunately this resulted in the catheter tip flipping into the RUQ

- A metal stiffener from a biliary catheter was used to reposition the catheter in the pelvis

- Then the catheter was freely draining peritoneal fluid
  - Contrast injection confirmed wide patency

- The catheter has been functioning well since

Learning from this case, we developed a novel algorithm for treatment of clogged or malpositioned PD catheters:

1. Fluoroscopy to see if the PD catheter is appropriately positioned in the pelvis
2. Inject contrast to assess patency
3. If malpositioned, reposition into the hemipelvis using the metal stiffener from a biliary catheter
4. If clogged, rotate two 0.035 Glidewires inside the catheter
5. If still clogged, then rotate two 0.035 Amplatz wires inside the catheter

Since then, we were asked to treat other catheters that appeared clogged or malpositioned

A preliminary retrospective audit of the efficacy/outcomes of these cases was performed:

Primary outcomes:

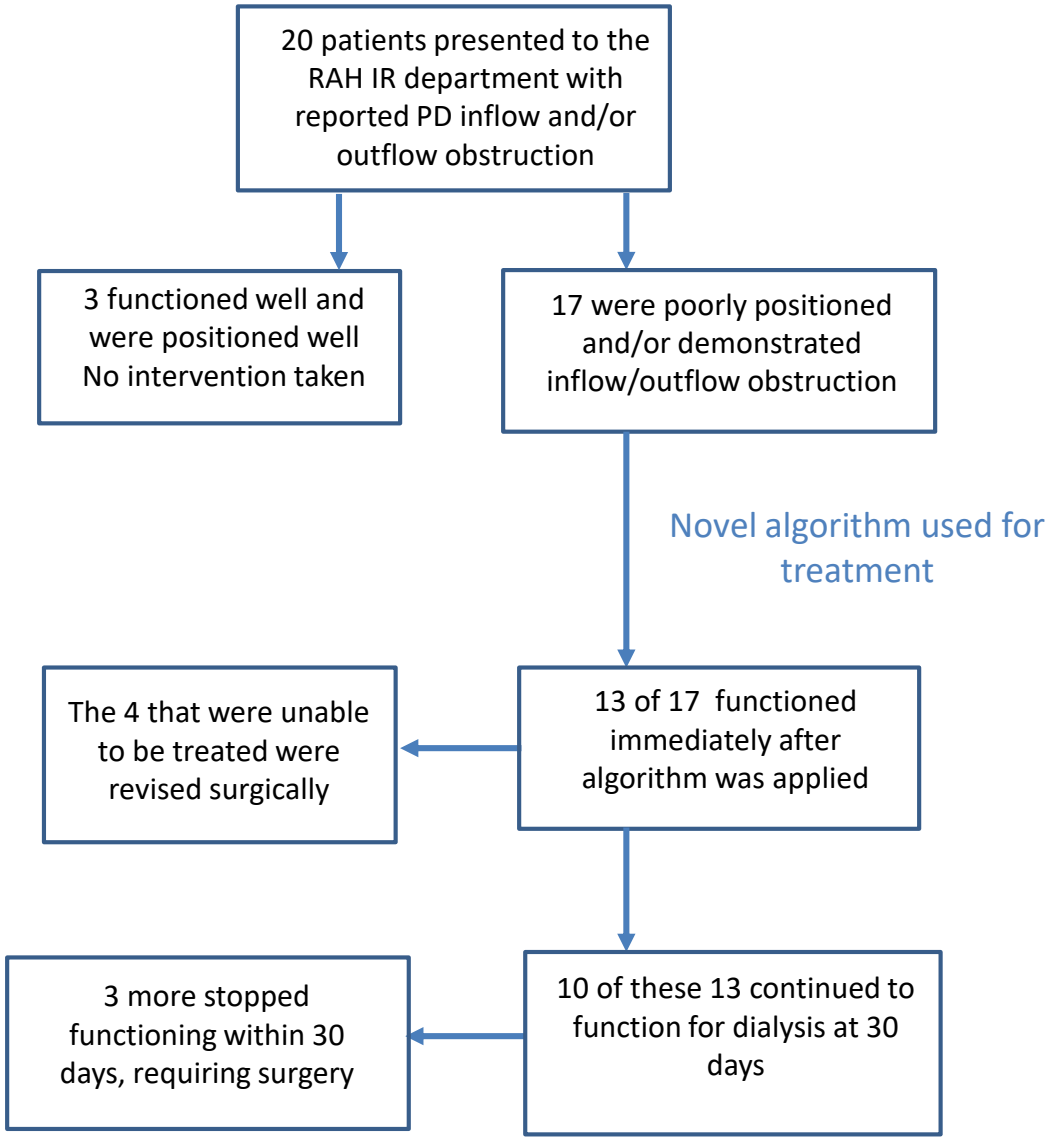
- Immediate success – defined as immediate restoration of adequate catheter flows at the end of the procedure

- Clinical success – defined as continued PD catheter use for dialysis at 30 days after the manipulation

Materials and Methods:

- A single-center, retrospective audit
- From October 2018 to March 2019 patients with malfunctioning PD catheters who presented to the interventional radiology suite for PD treatment were retrospectively reviewed
- All had PD catheters placed surgically and had either inflow or outflow obstruction, as documented by the dialysis team
- The novel technique involving rotating guidewires and repositioning the catheter with a biliary metallic stiffener was used to treat the malfunctioning catheters
- Complications were documented

Results:


20 patients presented to the RAH IR department with reported PD inflow and/or outflow obstruction
3 functioned well and were positioned well No intervention taken
17 were poorly positioned and/or demonstrated inflow/outflow obstruction
Novel algorithm used for treatment
13 of 17 functioned immediately after algorithm was applied
The 4 that were unable to be treated were revised surgically
10 of these 13 continued to function for dialysis at 30 days
3 more stopped functioning within 30 days, requiring surgery

Results:

Gender	Age	No intervention required	No Immediate Success	Immediate Success	Clinical Failure	Clinical Success	Date when placed surgically	Date of IR manipulation	Time between (days)	Date of surgical revision	Complications (major or minor)
M	57			1		1	Nov 6th, 2018	Mar 18th, 2019	132		0
M	31			1		1	Oct 9th, 2018	Mar 14th, 2019	156		0
F	39			1	1		Nov 23rd, 2018	Mar 3rd, 2019	100	April 12th, 2019	0
F	21			1		1	Oct 19th, 2018	Feb 26th, 2019	131		0
M	68			1		1	Jan 27th, 2017	Feb 26th, 2019	761		0
M	51			1		1	July 29th, 2016	Feb 20th, 2019	937		0
M	61	1					Sept 25th, 2018	Jan 24th, 2019	122		0
M	71		1				Aug 31st, 2018	Jan 30th, 2019	153	Mar 8th, 2019	0
M	13			1		1	Jul 27th, 2018	Dec 21st, 2018	148		0
F	50		1				May 11th, 2018	Dec 18th, 2018	222	Dec 21st, 2018	0
M	58		1				Mar 20th, 2018	Dec 11th, 2018	267	Jan 25th, 2019	0
F	70						Oct 26th, 2017	Dec 10th, 2018	411		0
M	58	1		1		1	May 1st, 2018	Nov 29th, 2018	213		0
M	62		1				Oct 23rd, 2018	Nov 13th, 2018	21	Dec 20th, 2018	0
F	55	1					Feb 6th, 2018	Nov 7th, 2018	274		0
M	70			1		1	Oct 17th, 2017	Oct 16th, 2018	364		0
M	78			1	1		Aug 17th, 2018	Oct 16th, 2018	60	Nov 14th, 2018	0
M	70			1		1	July 24th, 2018	Oct 5th, 2018	73		0
F	60			1	1		Jan 6th 2016	Oct 4th, 2018	1002	Oct 30th, 2018	0
M	75			1		1	Jan 25th, 2018	Oct 4th, 2018	252		0

- Mean age = 55.9 y; range, 13-78 y (females = 6, males = 14)
- Average time between initial surgery and clinical successful IR manipulation: 316.7 days
- Average time between initial surgery and clinical unsuccessful IR manipulation: 260.7 days
- **Immediate success rate was 76% (13 of 17)**
- **Clinical success rate was 59% (10 of 17)**
- **No major or minor complications**

Discussion:

- Peritoneal dialysis (PD) is an effective therapy for end-stage renal disease[1]
- The incidence of PD catheter malfunction is reported as high as 30%[2]
- Catheter outflow obstruction is responsible for up to 60% of malfunction[3,4]
- Traditionally, catheter salvage has required invasive surgery, via laparotomy or more recently, laparoscopy
- Often while waiting for surgery, patients need to be temporarily shifted to hemodialysis with placement of a tunneled central line
- Minimally invasive PD catheter declogging has been described using a single guidewire with varying results
  - In one study of 77 manipulations only 22 resulted in long term success[5]

Discussion:

- The reported success with surgical revision is high (93%–100%), but with a documented complication rate (7%–39%)
  - Peritonitis, tunnel infections, dialysate leaks, hernias, and hemorrhage[6-10]

- Of the 17 catheter manipulations performed using our novel technique, the immediate success rate was 76% (13 of 17)
  - The clinical success rate was 59% (10 of 17)
  - Our complication rate was zero

- No literature yet describing this novel rotary technique using 2 wires or using a biliary stiffener for PD manipulation

- With the complication rate being zero, these early results for the use of this novel technique of fluoroscopic technique is promising as a safe procedure with a 59% chance of success to attempt to restore PD catheter life and avoid a more invasive surgery

Discussion:

- Time between initial PD placement surgery and IR manipulation was also looked at, which found the average time between initial surgical placement and manipulation to be higher in those patients where IR manipulation was successful (316.7 vs 260.7 days)
  - Due to small sample size the significance of this result is uncertain

- Limitations of the audit are that it is a retrospective single center review with a small sample size and short interval follow-up

Conclusion:

- While still small in sample size, the early results for the use of the novel technique of fluoroscopic guidewire rotation and metallic stiffener manipulation to salvage PD catheters is promising as a safe, relatively effective (> 50% chance of clinical success) procedure to restore PD catheter function before more invasive surgical interventions are attempted

- Further research (with a larger sample size) is required

References

1. United States Renal Data System. 2016 USRDS annual data report: Epidemiology of kidney disease in the United States. National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD, 2016

2. Cope C, Kramer MS. Letter: Laparoscopic retrieval of dialysis catheter. Ann Intern Med 1974;81:121.

3. Kimmelstiel FM, Miller RE, Molinelli BM, Lorch JA. Laparoscopic management of peritoneal dialysis catheters. Surg Gynecol Obstet 1993;176:565-70.

4. Velasco García MA, García Ureña MA, Carnero F, Fernández Ruiz E, Remón Rodríguez C, Aljama Pérez-de-Lastra P, et al. Omental entrapping of the peritoneal dialysis catheter solved by a laparoscopic approach. Perit Dial Int 1997;17:194-5.

5. Miller, M., McCormick, B., Lavoie, S., Biyani, M., & Zimmerman, D. (2012). Fluoroscopic Manipulation of Peritoneal Dialysis Catheters: Outcomes and Factors Associated with Successful Manipulation. CJASN 7 (5) 795-800; DOI: 10.2215/CJN.09850911

6. Brandt CP, Ricanati ES: Use of laparoscopy in the management of malfunctioning peritoneal dialysis catheters. Adv Perit Dial 12: 223–226, 1996

7. Amerling R, Maele DV, Spivak H, Lo AY, White P, Beaton H, Rudick J: Laparoscopic salvage of malfunctioning peritoneal catheters. Surg Endosc 11: 249–252, 1997

8. Yilmazlar T, Yavuz M, Ceylan H: Laparoscopic management of malfunctioning peritoneal dialysis catheters. Surg Endosc 15: 820–822, 2001

9. Lee M, Donovan JF: Laparoscopic omentectomy for salvage of peritoneal dialysis catheters. J Endourol 16: 241–244, 2002

10. Yilmazlar T, Kirdak T, Bilgin S, Yavuz M, Yurtkuran M: Laparoscopic findings of peritoneal dialysis catheter malfunction and management outcomes. Perit Dial Int 26: 374–379, 2006

11. Kappel JE, Ferguson GMC, Kudel RM, Kudel TA, Lawlor BJ, Pylypchuk GB: Stiff wire manipulation of peritoneal dialysis catheters. Adv Perit Dial 11: 202–207, 1995

12. Savader SJ, Lund G, Scheel PJ, Prescott C, Feeley N, Singh H, Osterman FA, Jr: Guide wire directed manipulation of malfunctioning peritoneal dialysis catheters: A critical analysis. J Vasc Interv Radiol 8: 957–963, 1997

13. Simons ME, Pron G, Voros M, Vanderburgh LC, Rao PS, Oreopoulos DG: Fluoroscopically-guided manipulation of malfunctioning peritoneal dialysis catheters. Perit Dial Int 19: 544–549, 1999

14. Lee CM, Ko SF, Chen HC, Leung TK: Double guidewire method: A novel technique for correction of migrated Tenckhoff peritoneal dialysis catheter. Perit Dial Int 23: 587–590, 2003