Image-Guided Transvesicular Drainage of Pelvic Fluid Collections: A Safe and Effective Alternative Approach

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ABSTRACT

To evaluate the safety and efficacy of percutaneous transvesicular drainage of pathologic pelvic fluid collections, a series of 15 patients who underwent 16 transvesicular drainage catheter placements was retrospectively reviewed. All patients had collections suspicious for infection that were posterior to the bladder or superior to the bladder behind loops of bowel, and were otherwise inaccessible. All 15 collections were percutaneously accessed via the bladder with standard drainage catheters. All collections resolved completely with no complications. Percutaneous transvesicular drainage was a safe and effective technique in this series, and can be considered when no direct percutaneous access routes are available.

Image-guided catheter drainage of pathologic pelvic fluid collections can be accomplished via anterior transabdominal, posterior transgluteal, or even transvaginal or transrectal routes (1–6). Transabdominal approaches to fluid drainages are frequently straightforward, but can be made difficult or impossible at times by intervening visceral organs, bone structures, or blood vessels. Transgluteal drainages are often uncomfortable for the patient, and can be complicated by (or be precluded by the risk of) neurovascular injury to the sciatic nerve or branches of the internal iliac artery (7). Transvaginal drainages pose low risk if the anatomy permits them, but they can be uncomfortable and are prone to catheter dislodgment as a result of difficulties with catheter securement (5,6).

For cases in which none of these methods of drainage are feasible because of anatomic or practical considerations, image-guided placement of a drainage catheter through the bladder and onward into the targeted collection may offer a safe alternative route. Indeed, percutaneous suprapubic drainage catheter placement into the bladder is a well-established and well-tolerated procedure for urinary diversion, and, when appropriate, such catheters are easily removed, and the bladder heals readily (8). In addition, a single case report of a successful transvesicular drainage of a seminal vesicle abscess has been reported previously (9). The purpose of the present study was to retrospectively evaluate the efficacy and safety of the image-guided transvesicular approach to pelvic fluid collection drainage as a means to perform such procedures when other more direct anatomical approaches are not possible.

MATERIALS AND METHODS

An institutionally approved retrospective review was performed of 16 transvesicular drainage catheter placements in 15 patients who were referred for pelvic fluid drainage between 1999 and 2014. Demographic data including age and sex were collected, as were diagnosis and procedure details (**Table**). In all patients, preprocedural cross-sectional imaging depicted pelvic collections appropriate for drainage ranging between 2.3 cm and 21.5 cm in diameter, and all such studies were obtained within 72 hours of the respective drainage procedures (**Table**). In addition to the collections seen on imaging, 14 patients had clinical evidence of infection (**Table**). No patient had any uncorrectable coagulopathy or any preexisting lower urinary tract pathologic condition.

In the initial two drainages, traversal of the bladder was unintentional and discovered after the procedure was done. The urology service recommended bladder decompression with a Foley catheter and follow-up cystography after drainage catheter removal. However,

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Table. Demographic and Case Data for Patients who Underwent Transvesicular Drainage Catheter Placement

Pt. No./Age (y)/Sex	Intentional	Diagnosis	Indication	Collection Size (cm)	Relation to Bladder	Drain Placed (F)	Modality Used	Foley Catheter	Duration (d)		
									Drainage	With Catheter	Follow-up
1/38/F	No	Endometriosis s/p laparoscopic lysis of adhesions	Air-fluid collection on CT, fever, leukocytosis	13.5 × 13.2	Superior	10	US/ fluoroscopy	Placed after	7	7	55
2/50/F	No	Appendicitis s/p open appendectomy	Fluid collection on CT, fever	3.2 × 7.0	Superior	10	US/fluoroscopy	To empty bladder	15	29	3,059
3/53/M	Yes	Diverticulitis	Air-fluid collection on CT, fever, leukocytosis	8.0 × 5.6 × 6.0	Posterior	10	US/fluoroscopy	Placed after	31	5	1,327
4/5/F*	Yes	Appendicitis s/p laparoscopic appendectomy	Fluid collection on CT, fever	5.4 × 5.0	Posterior	8, 8	US/CT	Placed after	7	9	9
5/92/F	Yes	Appendicitis	Fluid collection on CT, pain	7.3 × 4.3 × 6.3	Posterior	10	CT	To distend bladder	10	2	10
6/2/F	Yes	Appendicitis	Fluid collection on CT, pain	5.8 × 2.7 × 4.0	Posterior	8.5	US/fluoroscopy	To distend bladder	8	9	52
7/16/M	Yes	Gun shot wound s/p open bowel resection	Fluid collection on CT, pain	3.4 × 3.4	Posterior	8	CT/US	To distend bladder	8	5	1,340
8/40/M	Yes	Appendicitis s/p laparoscopic appendectomy	Fluid collection on CT, leukocytosis, pain	5.3 × 3.8	Posterior	8	CT	None	14	0	14
9/23/M	Yes	Appendicitis s/p laparoscopic appendectomy	Fluid collection on CT, pain	8.0 × 8.0	Posterior	8	US	None	19	0	724
10/19/M	Yes	Appendicitis	Air-fluid collection on CT, pain	7.5 × 5 × 8	Superior	8	US/fluoroscopy	To distend bladder	8	5	164
11/16/M	Yes	Trauma s/p open splenectomy and distal pancreatectomy	Fluid collection on CT, leukocytosis	4.2 × 2.6	Posterior	8	US/CT	None	4	0	16
12/77/F	Yes	Diverticulitis and ovarian cancer	Air-fluid collection on CT	7.3 × 6.8	Posterior	10	CT	Placed after	54	Still in	55

(Continued)

Table. Demographic and Case Data for Patients who Underwent Transvesicular Drainage Catheter Placement (*continued*)

Pt. No./Age (y)/Sex	Intentional	Diagnosis	Indication	Collection Size (cm)	Relation to Bladder	Drain Placed (F)	Modality Used	Foley Catheter	Duration (d) Drainage	Duration (d) With Catheter	Follow-up
13/31/F	Yes	Crohn disease s/p open ileoanal pouch resection	Fluid collection on CT	7.1 × 2.3	Superior	8	CT	To empty bladder	16	34	189
14/7/F	Yes	Appendicitis s/p laparoscopic appendectomy	Fluid collection on US	6.3 × 2.6 × 4.0	Posterior	8	CT	None	14	0	98
15/81/F	Yes	Crohn disease s/p numerous abdominal surgeries	Fluid collection on MR, ureteral obstruction	21.5 × 9.6 × 9.8	Posterior	8	US/fluoroscopy	To empty bladder	14	20	112

Note–The first two patients' bladders were traversed unintentionally, whereas the subsequent 13 patients underwent intentional transvesicular drainage catheter placement.
s/p = status post.
*This patient had two transvesicular catheters placed into a single collection during the same encounter.

when these patients were found to have successful drainages with no adverse events, intentional catheter placement via this route was then cautiously considered as a therapeutic option for future cases. The subsequent 13 patients underwent 14 intentional transvesicular catheter placements into collections that had no feasible transabdominal, transgluteal, or transvaginal pathways for access (**Figs 1a** and **2a, 2b** and **Table**). One patient had two separate catheters placed into a single collection during the same encounter.

All adult patients and one pediatric patient underwent their procedures with intravenous moderate sedation, whereas three pediatric patients received general anesthesia. All patients were already receiving intravenous antibiotic therapy at the time of their procedures. A 20- or 22-gauge Chiba needle (Cook, Bloomington, Indiana) was used in 12 of the drainages performed, whereas a 5-F/19-gauge Yueh catheter/needle system (Cook) was used to access four of the collections. An 8- or 10-F locking drainage catheter (AngioDynamics, Latham, New York; or Boston Scientific, Marlborough, Massachusetts) was then placed in every case (**Figs 1b, 1c** and **2c, 2d**). Thirteen patients were brought back for fluoroscopic catheter evaluation when output decreased or there was concern for catheter malfunction, and catheters were removed if no significant residual cavity was present and there was 10 mL or less of nonpurulent drainage for at least two consecutive days. Two pediatric patients had their catheters removed at the bedside independently by the surgical service when there was sustained clinical improvement.

RESULTS

All drainages were technically successful. Purulent fluid was obtained in all but one of the cases. The 16 drainage catheters placed remained in situ for a mean of 14.8 days (range, 4–54 d). Two of the drains showed urine flow through them during the course of treatment, but this was not considered an adverse event. Fifteen of the drains were removed intentionally when there was abscess resolution on imaging or there was clinical resolution of infection. One drain came out accidentally, but follow-up imaging demonstrated resolution of the abscess. Ten of the 15 patients had Foley catheters placed during or shortly after their drainage procedures. An 11th patient needed a Foley catheter placed after the procedure as a result of urinary retention. Two pediatric patients were given oxybutynin chloride for bladder spasm until their Foley catheters were removed, but it was unclear if the spasm was related to the transvesicular drainage catheters or the Foley catheters. Ten of these Foley catheters were removed at an average of 12.5 days (range, 2–34 d) after the drainage procedure. Cystograms were obtained before Foley catheter removal in five of these patients. At the time of submission of this

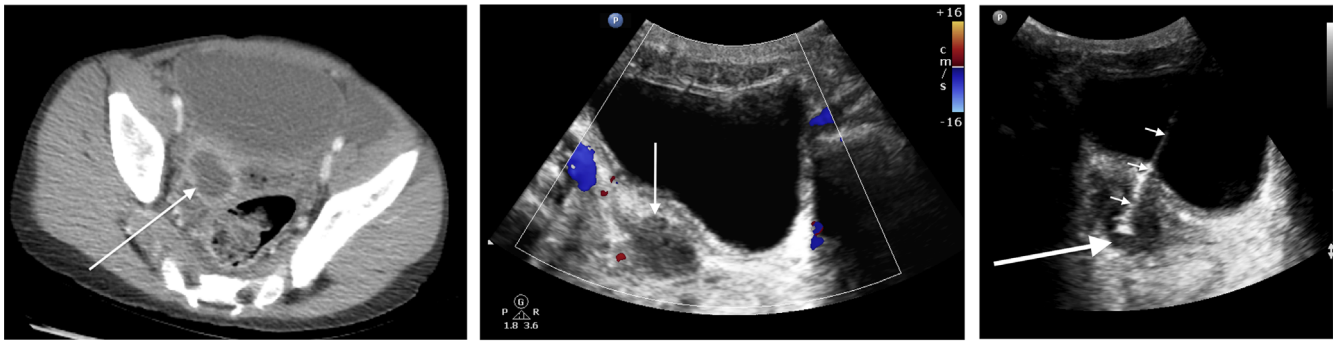

Figure 1. Images from a 7-year-old female patient with appendicitis and right pelvic abscess posterior to the bladder. **(a)** CT scan shows percutaneous access to the collection (arrow) blocked by bone and blood vessels, necessitating a transvesicular approach. **(b)** The same approximate axial image of the collection (arrow) on US. **(c)** The collection (large arrow) was accessed under US guidance, and an 8-F drainage catheter was placed (small arrows).

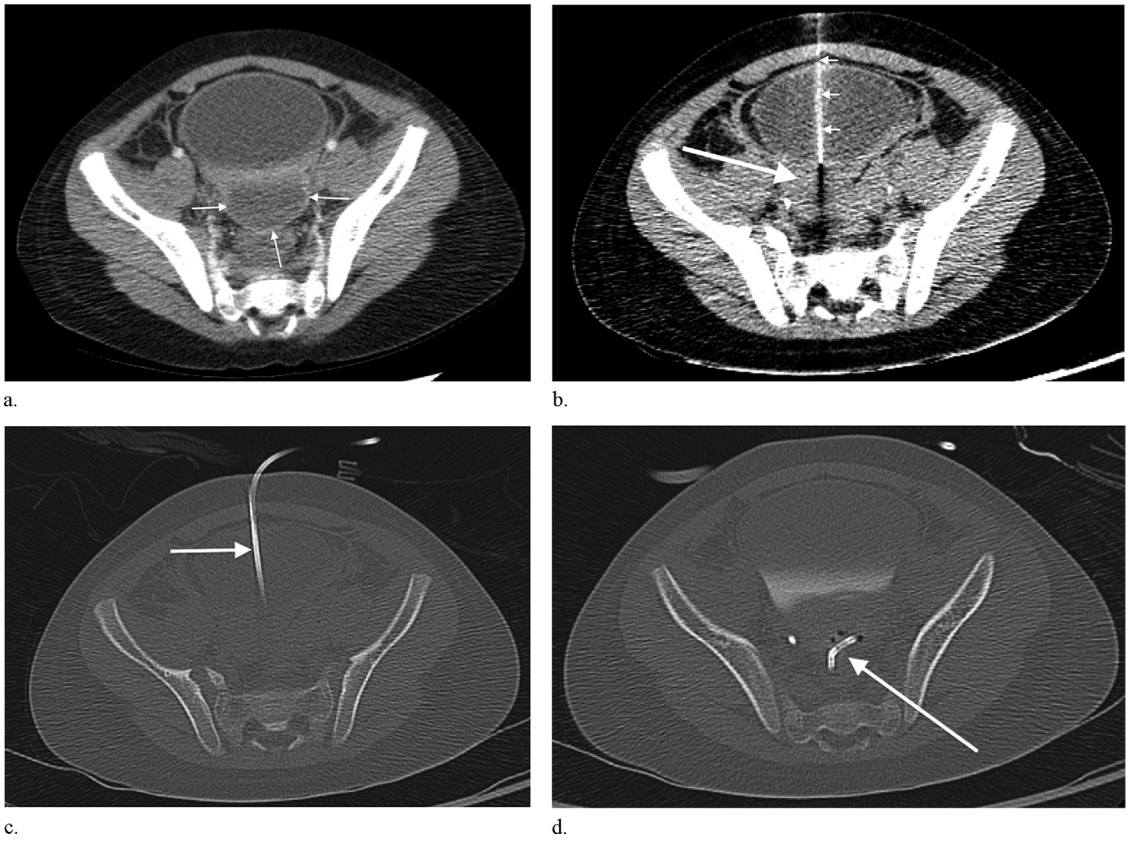

Figure 2. Images from a 77-year-old female patient with diverticulitis and ovarian cancer show a midline pelvic abscess posterior to the bladder. **(a)** CT scan shows percutaneous access to the collection blocked by bone and blood vessels, necessitating a transvesicular approach (arrows). **(b)** Transvesicular 20-gauge Chiba needle placement (small arrows) into the collection (large arrow). **(c,d)** Placement of a 10-F drainage catheter (arrows) via the bladder into the collection. Contrast agent in the bladder is from a previous CT scan.

report, one patient still had a Foley catheter in situ because of an unrelated colovesical fistula seen on an otherwise normal postprocedural cystogram. The remaining 14 patients had normal bladder function after drainage catheter and Foley catheter (if applicable) removal. No internal or external urinary leakage was observed after drain removal, and no urinary tract infections were encountered.

Mean follow-up for these patients was 428.9 days (range, 9–3,059 d), consisting of follow-up computed tomography (CT) scan (n = 10), ultrasound (US) or fluoroscopic catheter check (n = 3), or clinical evaluation (n = 2). For the 13 patients with imaging follow-up, complete resolution of all drained abscesses was seen, with no clinical evidence of bladder malfunction present. For the two patients with clinical follow-up

only, there was no evidence of residual infection or bladder malfunction.

DISCUSSION

There are a few technical points to be considered if a transvesicular approach to drainage of fluid collections is anticipated. Preprocedural placement of a Foley catheter allows for distension or evacuation of the bladder as needed during the procedure. Completely emptying the bladder can open up a previously unavailable window to the targeted collection that avoids the bladder. If the bladder is to be traversed, filling the bladder with sterile saline solution can create an improved sonographic view of the patient's pelvic anatomy, and the distended bladder is more easily pierced in through-and-through fashion with an access needle in a controlled fashion. When access through the bladder into the targeted collection has been achieved, passing dilators and catheters through the anterior and posterior bladder walls is not difficult, particularly if the bladder is kept distended with saline solution (10). Subsequent transcatheter management of these fluid collections can proceed in a manner similar to the standard management of nontransvesicular drainages. The transvesicular drainage catheter may cause mild hematuria but is otherwise well tolerated. Bladder spasm can be treated with anticholinergic bladder agents or phenazopyridine. If there is a need to exchange the catheter as a result of blockage, or to upsize the catheter to more effectively drain the abscess, this can be done with little difficulty, and distending the bladder with sterile fluid can be helpful for these manipulations. If a Foley catheter was placed, it can be removed after drainage catheter removal, and a cystogram may be obtained to confirm that the cystostomy hole has healed.

The present study is limited by its retrospective nature and small sample size, a reflection of the rarity of pelvic fluid collections not amenable to drainage via more standard routes. No drainages in the present series were performed with catheters larger than 10 F, so the safety of this approach with larger catheters could not be assessed. Some aspects of the management of these cases, such as the decisions to perform postprocedural cystography and to remove drainage catheters without follow-up imaging, were determined by external clinical services outside of any standardized management algorithm. Finally, there are numerous factors beyond the trajectory of the drainage catheter placement that are likely more important predictors of treatment success, such as the etiology, size, and complexity of the collection, as well as the patient's abilities to fight infection and heal.

For pathologic collections that are otherwise blocked from percutaneous image-guided drainage by visceral organs, neurovascular structures, or pelvic bones, the results of the present study demonstrate that a percutaneous transvesicular drainage approach offers a safe, effective, and technically straightforward management option. No complications were encountered with this type of drainage, and, with minor modifications, these collections were successfully managed with standard image-guided percutaneous drainage techniques.

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