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CASE REPORT

Gelatin sponge (Spongostan®) and N-butyl-2-cyanoacrylate: Utility on percutaneous treatment of persistent urinary leakage after partial nephrectomy. Case report and review of the literature.

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Summary ***Introduction: Percutaneous treatment of persistent urinary fistula after partial nephrectomy using N-butyl-2-cyanoacrylate and gelatin sponge (Spongostan®) is an effective and relatively non-invasive procedure that should be considered when a conservative approach fails. Three successful cases of percutaneous embolization by using N-butyl-2-cyanoacrylate have been reported in the literature. To our knowledge, the use of Spongostan for the treatment of urinary fistula after partial nephrectomy has not been previously described.***
Case report: We present the case of an 82-year old man who underwent percutaneous closure of a urinary fistula following partial nephrectomy by using gelatin sponge (Spongostan®) and N-butyl-2-cyanoacrylate.
Conclusions: We encourage the use of this technique in selected cases. Collaboration amongst urologists and skilled interventional radiologist is strongly recommended.

KEY WORDS: *Cyanoacrylates; Fibrin foam; Gelatin sponge; Urinary fistula.*

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INTRODUCTION

Partial nephrectomy (PN) is gold standard for treatment of small renal masses. PN is not exempt of complications, *urinary fistula* (UF) is one of the most common. Its incidence rates between 2 and 10%, depending on the complexity of the surgery. The vast majority of fistulas are self-limited within short-term. However, a small percent of urinary fistula may require active treatment, either by open repair or by percutaneous approach.
In the current case, we report the use of N-butyl-2-cyanoacrylate and gelatin sponge (*Spongostan®*) in a persistent urinary fistula.

CASE REPORT

An 82-year-old man was assessed for an incidentally detected left renal mass at our institution. A CT scan confirmed the presence of a 46 mm round partially, posterior, upper pole mass. (Figure 1) Patient's significant past medical history included hypertension, pace-maker implantation and left hip replacement. A robotic assisted laparoscopic partial nephrectomy was performed. The procedure required intraoperative conversion to open procedure due to sclerolipomatosis. Pathology report showed a pT1a Fuhrman 1-2 clear cell renal carcinoma with negative surgical margins. Patient's post-operative course showed prove of urinary leakage on *post-operative day 1* (POD1). A double-J catheter was inserted to improve urinary drainage. At retrograde pyelography, a leakage on the central calix was observed. Patient was discharged on POD10 and readmitted one week after due to fevers and diarrhea. A CT scan revealed a left retroperitoneal urinoma 3 cm in diameter with actual drainage through the chest wall and skin (Figure 2). The double-J catheter was exchanged to a single-J 8 Ch for better drainage. Ten day after the exchange a CT scan showed persistent leakage. Fistula consisted in a large cavity opened to the perirenal tissue. A percutaneous approach was used to have a direct way to the fistula. There absorbable gelatin sponge (*Spongostan®*) was applied to the fistulous cavity to reduce the volume. Five strips of approximately 5 mm x 50 mm were pushed through the introducer to create a scaffold into the renal breach. Then 1 mL of N-butyl-2-cyanacrilate (*Glubran 2®; GEM, Italy*) was located over the leakage orifice above the gelatin sponge. The post-procedure retrograde pyelography showed a substantial reduction on the fistulous tract. A 6 Ch drainage pigtail tube outside the kidney in the urinoma as well as a single-J stent were placed at the end of the procedure. (Figure 3). Patient was discharged home the day after the procedure. Follow-up CT scan performed within 30 days of procedure showed a decreased debit and complete reduction in urinoma size. Both catheters were removed after the control CT scan, 1 month after the procedure and patient never develop any relapse.

DISCUSSION AND LITERATURE REVIEW

According to AUA and EAU Guidelines, PN is considered the standard treatment for T1a tumors and it

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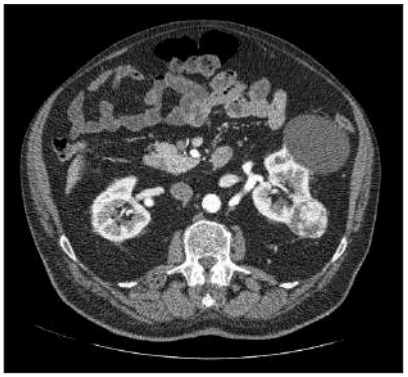

Figure 1.
CT scan confirmed the presence of a 46 mm round partially, posterior, upper pole mass.

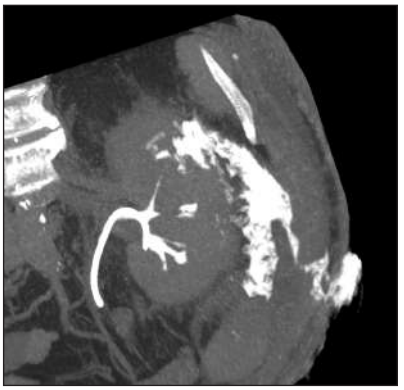

Figure 2.
CT scan revealed a left retroperitoneal urinoma 3 cm in diameter with actual drainage through the chest wall and skin.

Figure 3.
The post-procedure retrograde showed a substantial reduction on the fistulous tract. A 6 Ch nephrostomy tube as well as a single-J stent were placed at the end of the procedure.

should be favored over radical nephrectomy in patients with T1b, whenever feasible. Controversial data has been published regarding oncological outcomes of small renal masses in surgical terms. Retrospective data by *Van Poppel et al.* and EORTC group supports the use of PN, however, the only prospective randomized trial comparing both techniques did not show large advantage for PN (1). It is well known that PN is not exempt of complications. Tumor size, blood loss, ischemia time and endophytic mass location are factors related to UF formation. Several authors have described conservative and non-conservative approaches for UF management. *Kundu et al.* reported a conservative approach perinephric drainage (2). Ureteric stent placement is a widely accepted strategy in case of persistent urinary leak and a minimum of 30-45 days might be required for resolution. Other authors have used endoscopic fulguration of the fistula for sealing. Hemostatic agents and tissue sealants are now being used commonly during laparoscopic and robotic (LPN or RPN). The use of fibrin glues may offer adequate hemostasis in patients undergoing LPN when the collecting system is not opened, but in case of entering, a sutured bolster is recommended. Nevertheless, in 2007, *Porpiglia and coworkers* published results to the contrary (3).

The use of surgical sealants and biologic agents like thrombin, fibrin and collagen glues can be considered when a persistent leakage is present after PN, and they have been successfully used for over one decade. Percutaneous embolization of UF is a relatively novel technique that has been used in the last decade (4). More recently the application of cyanoacrylate glues has been reported in different branches of surgery for endoscopic treatment of refractory bile leaks, gastroenteric fistulae, intracranial vascular malformations and also for the management of urinary fistulas.

To our knowledge few cases in literature described the endoscopic utilization of cyanoacrylate in repairing UF after urological maneuvers and until now there are only 4 single cases reports of percutaneous successful utilization of cyanoacrylate glue in repairing UF after PN have been reported till date (5, 6). In addition, two clinical case series: one of 13 cases in 9 years by Muto et al that reported the use of cyanoacrylate glue in repairing endoscopic percutaneous and endovaginal urinary fistula of various etiologies with a high success rate and few complications (7). The second by *Selli et al.* described 5 patients presenting UF, but only 3 following PN treated with cyanoacrylate glue endoscopically (8). Our case describes the association and combination of Spongostan to the already approved N-butyl-2-cyanacrilate (*Glubran 2®*). N-butyl-2-cyanacrilate is composed of N-butyl-2-cyanoacrylate monomer and metacryloxysulpholane monomer. This compound presents favorable properties such as a good biocompatibility and progressive reabsorption without causing foreign body granulomas.

The property of nearly instantaneous bonding makes cyanoacrylates an effective haemostatic agent and tissue adhesive. Its polymerization time is rather fast in a wet environment, specifically with weak bases, such as water and blood. The gluing of the catheter tip is a potential complication of the technique especially in case of no dilution of the cyanoacrylate. Moreover, accidental glue injection directly into the collecting system may cause urinary obstruction. A skilled interventional radiologist is required for these procedures. *Spongostan®* is a dry artificial sterile sponge of fibrin prepared by clotting with thrombin a foam or solution of fibrinogen. It is used to provide effective local hemostasis in cases of venous oozing where traditional hemostasis has failed. Moreover, *Spongostan®* serves as a scaffold for proteins or cells implanted into defects fulfilling its function as a cell scaffold (9). The combination of sealants in our case was critical to obtain a success of treatment with the purpose of decreasing the defects of parenchyma, filling in the cavity and avoiding a large contact with the urine that could compromise the polymerization of glue. *Ishii K. et al.* in a PN animal model study demonstrated that fibrin

sealant plus the collagen or gelatin hemostat have a stronger hemostatic effect than fibrin sealant applied alone (10). The histological investigation showed that the fibrin sealant adhered well to kidney tissue when it was applied with the collagen or gelatin hemostat, showing the advantage of combining these two materials for achieving effective hemostasis and closure effect. In our case Spongostan sheets are not only important as a bolster at the site of glue application, but also because a new complex is formed at the fistula site when the two substances are used in combination. Finally, one critical factor for success in UF closure using cyanoacrylate is the ratio between the length and the diameter of the fistulous tract. Tissue losses greater than 1 cm are unlikely to be completely plugged, and urine may continue to flow around the cast. The fistula diameter to length ratio is the more relevant prognostic factor for success and the combination of two sealants in our cases was the key to obtain a complete resolution.

Conclusions

In conclusion, minimally invasive techniques to solve urinary refractory leakage after PN is a safe option.
The application of gelatin sponge (*Spongostan®*) and N-butyl-2-cyanoacrylate improves the outcome resolution, particularly in difficult and high volume UF, without implying increased risk of urinary obstruction.
We encourage the use of this technique in selected cases. Collaboration amongst urologists and skilled interventional radiologist is strongly recommended.
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