

Novel Cost-effective Specimen Retrieval Bag in Laparoscopy: Nadiad Bag

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OBJECTIVES	To describe an innovative bag for effective specimen retrieval with the aim of reducing the cost of surgery. Retrieval bags are useful in specimen retrieval after ablative surgery.
METHODS	The components of the retrieval bag are a polyethylene roll, nylon thread, and a 5F ureteral catheter. The lower end is double-sewn with an autoseal device. The neck of the bag consists of a folded edge of the polyethylene bag, which is single-sewn. The folded tunnel accommodates the 5F ureteral catheter and nylon thread. Introduction is performed through the 10-mm port with the help of an atraumatic grasper without any special introducer sheath. Two laparoscopic instruments are required to open, place the specimen within, and close the bag. The bag is extracted by extending the port incision, if required.
RESULTS	The bag was used in 40 cases, including radical prostatectomy in 7, simple nephrectomy in 18, nephroureterectomy in 11, and adrenalectomy in 4. The running cost of the retrieval bag was <US\$2, the least expensive of the specimen retrieval systems currently available. The bag had good laparoscopic visibility in all cases. Organ entrapment required a certain learning curve. The overall entrapment time was 7.6 ± 3.4 minutes. None of the specimens ruptured during entrapment. The entrapment time differed depending on the type of specimen retrieved. The retrieval time for kidney, prostate, and adrenal specimens was 8 ± 3 , 3 ± 2 , and 3 ± 1.3 , respectively.
CONCLUSIONS	The retrieval bag is inexpensive and easy to make and maintain, and effectively useful with good maneuverability. UROLOGY 75: 1213–1216, 2010. © 2010 Elsevier Inc.

Surgical specimens must often be extracted during laparoscopic surgery. In 1990, Clayman et al.¹ designed the first organ retrieval bag (LapSac, Cook Urological, Spencer, IN) specifically designed for laparoscopic nephrectomy. A variety of organ retrieval systems have been designed and have become commercially available. An ideal organ entrapment system should be easy to handle, with provisions for easy entrapment, good visibility, and the need for a minimal number of ports.² In addition, the bag should be stable and have good resistance.² A variety of modified, novel, and indigenous retrieval bags have been described, including modified zipper bags and nonpowdered gloves.³⁻⁵

Of the various bags available, the major drawback for most of them is the cost. We describe an indigenously made, cost-effective, innovative bag with the aim of reducing the cost of laparoscopic surgery with effective specimen retrieval.

MATERIAL AND METHODS

The local institutional review board approved the project, and all patients provided written informed consent before the use of the bag. The retrieval bag is made of the following components: a 5F ureteral catheter (Devon Industries, Bangalore, India) and a nylon thread. The bag is prepared using a plastic roll (Steribag, PCI, Kandivali, Mumbai, India), which can be cut into various sizes, ranging from 4 to 10 in. (Fig. 1). The sheet is closed at 1 end to prepare the retrieval bag; the seams of the bag are closed with an autoseal device (Rainbow Manufacturers, Rajkot, India) to avoid leakage of the sac contents (Fig. 1). A tunnel is created around the open end of the bag to thread the ureteral catheter with a nylon thread (Fig. 1). Usually 1 ureteral catheter is cut into 2 pieces and used for the preparation of 2 bags. The assembled retrieval bag is folded and sterilized with ethylene oxide (Fig. 1). The bag is prepared in 2 sizes, 5×4 in. and 5×7 in. The smaller bag can be used for adrenalectomy and prostatectomy specimens and the larger for kidney specimens. The material used for the bag is low-density polyethylene. The thickness of the polyethylene is 200-300 gauge. The bag required an average of 9.6 ± 5 minutes to prepare, provided the material was readily available. A set of 20 bags was made in advance by the operating room technicians under the direct supervision of the surgeon. The most arduous step in the creation of the bag is the tunneling of the ureteral catheter with the nylon thread.

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Submitted: June 18, 2008, accepted (with revisions): September 25, 2008

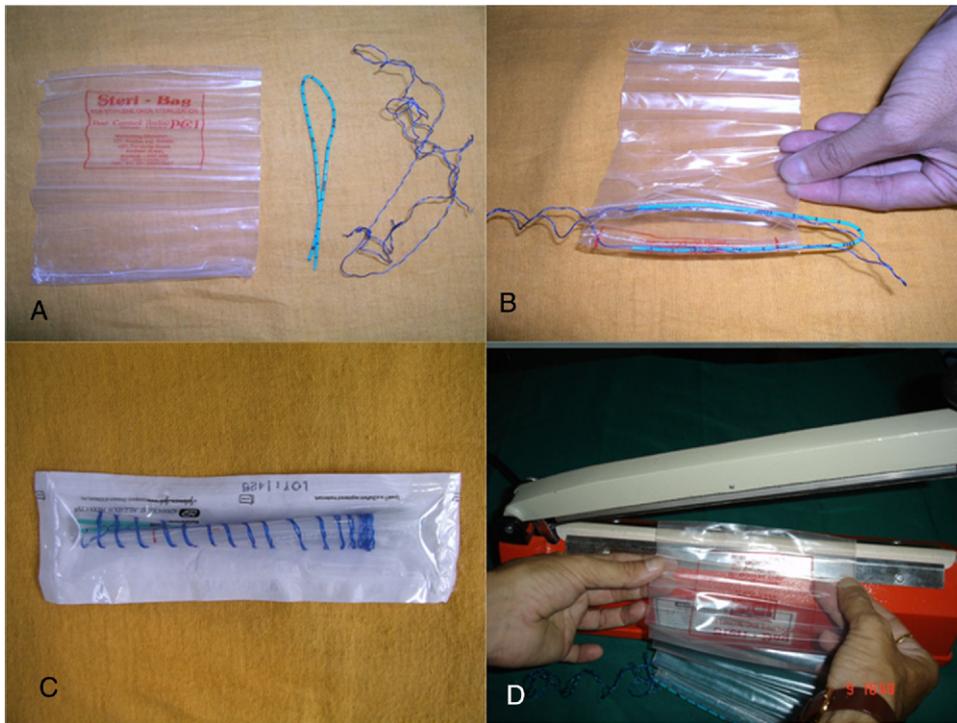


Figure 1. Components of retrieval bag. **(A)** Components of retrieval bag: 5F ureteral catheter, plastic sheet, and nylon thread. **(B)** Assembled retrieval bag. **(C)** Retrieval bag sterilized with ethylene oxide. **(D)** Sealing device.

Figure 2. Ureteral catheter is key component of bag. Retrieval bag retrieved with help of 2 graspers introduced through 5- or 10-mm ports.

During deployment of the retrieval bag, the bag is inserted through the working port, and the mouth of the bag is kept open with forceps (Fig. 2). The ureteral catheter is the key component of the bag. The stiff ureteral catheter helps to keep the mouth open. Once the specimen is placed into the bag, the

ureteral catheter is pulled out through 1 of the ports and the threads tightened and knotted. The knot is cinched down to prevent the specimen from being released (Fig. 3). The retrieval bag with the entrapped specimen is pulled out of the abdomen by extending 1 of the ports, if required. The nylon thread acts

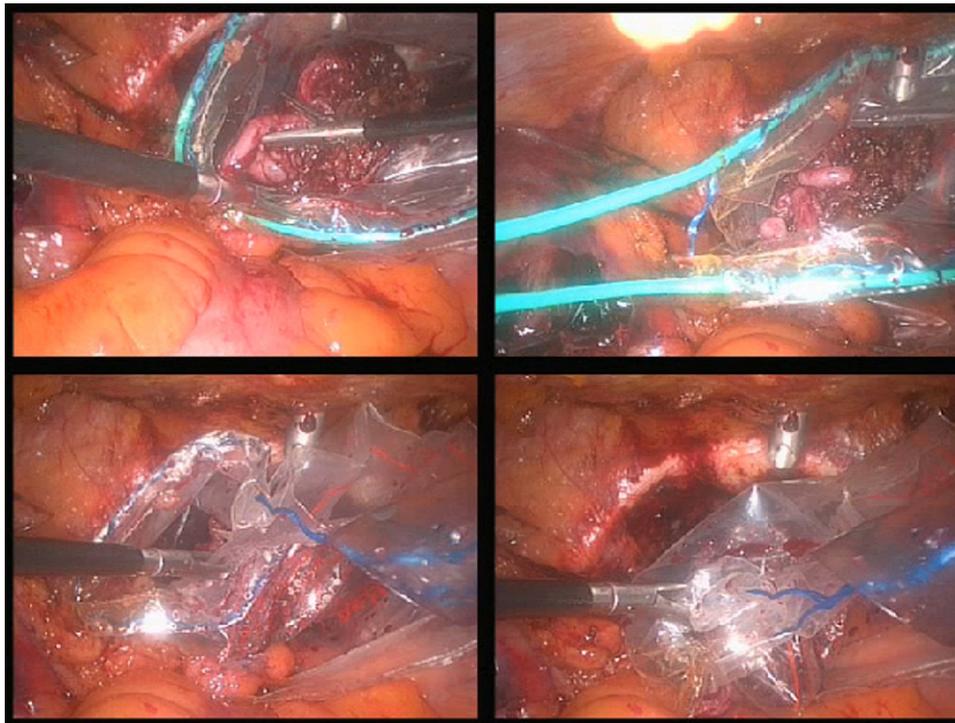


Figure 3. Ureteral catheter helps to keep mouth of bag open for organ entrapment. Once ureteral catheter is withdrawn, thread helps to close mouth of bag.

Table 1. Comparison of cost of different retrieval system currently available

Bag	Company	Cost (\$)
Endopouch	Ethicon	35
Endocatch bag	Ethicon	75
Pleatman sac	Abbot Medicals	28
Ponsky Endosac	U.S. Endoscopy	60
Our retrieval bag	—	2

Table 2. Itemization of bag cost

Item	Cost Involved
Ureteral catheter (Devon Innovations, Bangalore, India)	40 Rs
Nylon string	1 Rs
Steribag (PCI, Kandivali, Mumbai, India)	2 Rs
Autoseal device and other overhead expenses	5 Rs
Total	48 Rs (\$1.20)

\$US1 equivalent to approximately 40 Rs.

a handle to remove the retrieval bag from the abdominal cavity. During specimen extraction, the thread is pulled out of the port, and the port incision is extended, if required.

We focused, during the analysis, mainly on the running cost and the handling of the device, taking into consideration the introduction, opening, and positioning of the retrieval bag, and entrapment and extraction of the specimen. The time required for insertion and entrapment of the specimen was recorded.

RESULTS

The retrieval bag was used in 40 cases, including radical prostatectomy in 7, simple nephrectomy in 18, nephroureterectomy in 11, and adrenalectomy in 4.

The significant advantage of the retrieval bag is its inexpensive cost. The cost of most entrapment sacs is \$30-\$150 (Table 1). We have itemized the cost involved in the preparation of the bag (Table 2). The cost of our product is approximately \$2 and is the most inexpensive of those available.

The bag had good laparoscopic visibility in all cases. Two laparoscopic instruments were required to open the

bag. The permeability of the bag was tested using 2 methods: first, once the bag was prepared, the bag was filled with 1000 mL of water and the seams were checked for any leak; and, second, the used bags were inspected after use for any rents using the saline test.

Organ entrapment required a certain learning curve. The additional operating room time required for entrapment decreased as the surgeon completed the learning curve. The overall entrapment time was 7.6 ± 3.4 minutes. We found that by the first 5 cases, the operator was comfortable in entrapping the specimen in the bag. To overcome this learning curve, the operator must master the step of entrapping the specimen by holding the mouth of the bag open. Also, once the ureteral catheter has been withdrawn, the knot should be cinched properly to prevent unentrapment.

The retrieval time differed, depending on the type of specimen retrieved. The retrieval time for kidney, pros-

tate, and adrenal specimens was 8 ± 3 , 3 ± 2 , 3 ± 1.3 , respectively.

COMMENT

The various options available for specimen retrieval include direct specimen retrieval, morcellation with specimen retrieval, and retrieval by bag extraction.

Apart from the cost, the currently available bags have a few shortcomings. The Pleatman Sac has a continuously open mouth or opening that could allow the specimens put into it to slip or fall out. The Endocatch bag (U.S. Surgical, Norwalk, CT) has a pursestring that, once activated, tears the plastic bag off a spring and closes the bag permanently. The retrieving ability of the bag is terminated after closure of the bag. In a comparative study comparing the various retrieval bags, the investigators concluded that the Lapbag, extraction bag, and Endocatch bag offer advantages in terms of the handling of the bag, and the Endobag and Endopouch have a low resistance to tearing forces.²

Plastic retrieval systems are less likely to burst than are fabric systems when subjected to simulated retrieval and require less force for withdrawal. Plastic systems might therefore be associated with less tumor seeding as a consequence of bag disruption.⁶

Direct specimen retrieval requires a larger incision and the risk of an incisional hernia. Other than cosmesis, the narcotic requirement, hospital stay, and time to return to normal activity have not been significantly different from the same with direct specimen removal.^{6,7}

The LapSac (Cook Urological) is the most commonly used entrapment sack for morcellation of nephrectomy specimens. Extraction with this bag is often difficult, with additional port placement or maneuvering sometimes required. Because most benign specimens can be retrieved with or without morcellation, the disadvantages of morcellation can be obviated by extending the port incision to retrieve the specimen.

We designed the retrieval bag as an inexpensive alternative for specimen extraction. Although experimental and under investigation, the present study can be con-

sidered a preliminary report. The efficacy of the retrieval bag could be improved further by finding an alternative to the ureteral catheter that would be easier to use and could keep the mouth of the bag open for placement of the specimen. Also, deployment of the bag is sometimes difficult, which could be overcome by the development of an introducer system. Third, additional permeability tests and stability tests are required to ascertain the use of the bag in morcellation. Finally, although the entrapment time was longer than that for presently marketed bags, our data suggest that the entrapment time decreases as the experience increases.

CONCLUSIONS

Although experimental, the newly devised retrieval bag is easy to make, with minimal cost, and can be easily deployed without the help of an introducer sheath. The ureteral catheter is the key component in the bag that helps the bag to remain open during entrapment.

Acknowledgment. To Sanjay Bhagat, OR technician, MPUH, Nadiad, for his help in developing the bag.

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