

## JuRoLap: A Resilient and Economical Home-made Specimen Retrieval Bag

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**Objective:** Specimen retrieval bags were used to remove cysts and masses in minimally invasive urologic surgeries for more than 3 decades. This study aims to describe the steps in making a home-made specimen retrieval bag named JuRoLap and its safety and resiliency.

**Materials and Methods:** The bag's name was taken from the initials of the institution combined with the department's short-name (uro) and laparoscopy (Lap). The bag is composed of a non-toxic polyvinyl chloride (PVC) urine bag custom fitted according to the expected specimen size. The sides were sealed using an impulse sealer leaving one side open. The bag was rolled and introduced intracorporeally via the 12mm port. It was opened followed by specimen placement using standard laparoscopic instruments. Purse-string suture at the one-side opening was tightened and extracted through the umbilical port extending the incision as necessary.

**Results:** JuRoLap was used in 33 cases removing various organs such as adrenals, kidney, ureter, bladder and prostate. It was easily prepared, safe, resilient and economical costing approximately USD 0.68. It was essential to routinely check its durability by doing a leak test prior to sterilization. Proper rolling, transparent plastic component of the bag and the use of two laparoscopic graspers provided ease in bag deployment and specimen entrapment. It was also observed that smaller incision on extraction site as compared to the specimen size was needed due to the resiliency of the bag. Despite the required learning curve in organ entrapment and extraction, there were no complications and specimen leakage noted.

**Conclusion:** JuRoLap specimen retrieval bag is organ size specific, safe, resilient and low cost specimen retrieval bag innovation.

**Key words:** laparoscopy, specimen retrieval bag

### Introduction

#### *Significance of the Study*

Specimen retrieval bags have been used in minimally invasive urologic surgeries for more than 3 decades. These bags were used to remove cysts and masses through the laparoscopic

incisions while avoiding spillage of their content in the abdominal cavity. The fluid is drained and suctioned in a contained manner after placement into a specimen retrieval bag. This was routinely done due to concerns regarding spillage of a malignant cyst/mass, which may be associated with dissemination of malignancy and upstaging of the disease. In addition, intra-abdominal spillage

of benign cysts may also be hazardous, and in rare cases has been associated with chemical peritonitis. Hence, a resilient specimen retrieval bag is needed to avoid these complications.

JuRoLap is an easily produced resilient specimen retrieval bag used to extract differently sized organs for various minimally invasive urologic surgeries. The name JuRoLap was taken from the initials of the institution (JR) combined with the department's shortname (uro) and laparoscopy (Lap).

This study aims to describe the steps needed in making an easily reproducible JuRoLap and to describe its safety and resiliency profile.

## Review of Related Literature

Laparoscopic techniques developments had led to near extinction of several traditional open urologic procedures. The techniques offer multiple advantages such as smaller incisions in the abdomen, less post-operative pain and faster post-operative recovery. Minimally invasive surgical procedures also have drawbacks. One of which is the removal of the specimen, which usually requires an organ retrieval system.

The first minimally invasive urologic surgery retrieval bag (Lapsac, Cook Urological, Spencer, IN) used for laparoscopic nephrectomy<sup>1</sup> was first described by Clayman, et al. (1990) Currently marketed [EndoCatchbag (Ethicon), Endopouch (Ethicon); Pleatman Sac (Abbott Medicals) and Ponsky Endosac (U.S. Endoscopy)] and homemade [Nadiad Bag (1) and endobags made with surgical gloves<sup>2-6</sup>, zipper storage<sup>7</sup> and condoms<sup>8</sup>] specimen retrieval bags differ in their sizes (i.e., diameter of the bag) and in the technique employed to open and deploy the bag.

The most commonly used specimen bags range from 10cm to 15cm in diameter, and allow for easy removal of specimen. The 10cm bags usually require a 10mm laparoscopic port for introduction into the abdomen, which may be placed in the umbilicus or in the lower abdomen. The advantage of using a 10mm umbilical port for introduction of the bag instead of a lower abdominal port is that the former usually does not require fascial closure. The 15cm specimen bag usually requires a 12mm port for introduction into

the pelvis, necessitating closure of the fascia layer to avoid port-site hernia.<sup>9-10</sup>

Specimen retrieval bags also differ in their opening technique. Some specimen bags have the ability to open automatically after introduction into the abdomen, while others require manual opening by two graspers holding the bag edges. The bags with automatic opening are usually easier to use, but often more expensive than the bags with manual opening.<sup>9</sup> An ideal organ entrapment bag is easy to handle, has provisions for easy entrapment, has clear visibility, stable, resistant and requires minimal number of ports.<sup>1,2</sup>

## Materials and Methods

### *Research Design*

This study was a 5-year retrospective case series study on the novel use of JuRoLap specimen retrieval bag by a single surgeon from January 2011 to December 2015 in this institution. This study was approved by the Institutional Review Board of our institution (IRBPN: 2016-65). Informed consent was given by the patients who underwent minimally invasive surgeries for the use of the innovative home-made retrieval bag in their specimen extraction.

### *JuRoLap Production*

The JuRoLap consists of A. (1) non-toxic polyvinyl chloride (PVC) urine bag (2L) capacity. B. (1) non-absorbable monofilament suture (Nylon 2.0) (Figure 1). The PVC urine bag is 28.5cm by 17cm adjustable accordingly depending on the size of the expected specimen. Sides were sealed with an available impulse sealer.

The organ retrieval bag was prepared using the following steps:

- A. Cut the top and bottom portion of the bag horizontally from end to end.
- B. Measurement of the final bag size and cut it according to the size of the specimen. Seal the bottom portion and the cut side with two

parallel seals using the Impulse sealer leaving the top part unsealed.

- C. Place a purse-string suture at the top unsealed portion of the bag with the non-absorbable monofilament suture. Knot both ends of the thread at least 10 times.
- D. Pour approximately 700ml of water into the 18cm x 15cm bag and 400ml into the 10cm x 7cm bag to check for leaks.

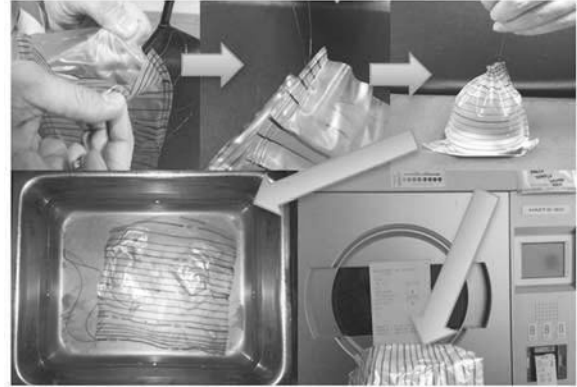


**Figure 1.** Materials for JuRoLap production. A. Urine bag B. Nylon 2-0 suture C. Impulse sealer the organ retrieval bag was prepared using the following steps:



**Figure 2.** JuRoLap specimen size-specific production.

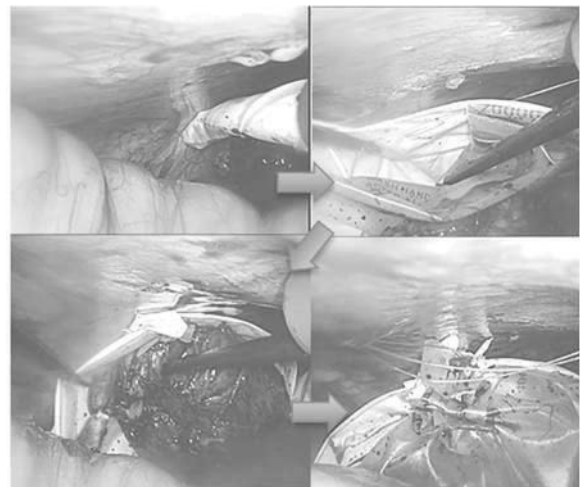
- E. The JuRoLap is then sterilized with activated dialdehyde solution for 30 minutes then rinsed with sterile water or with gas sterilization.



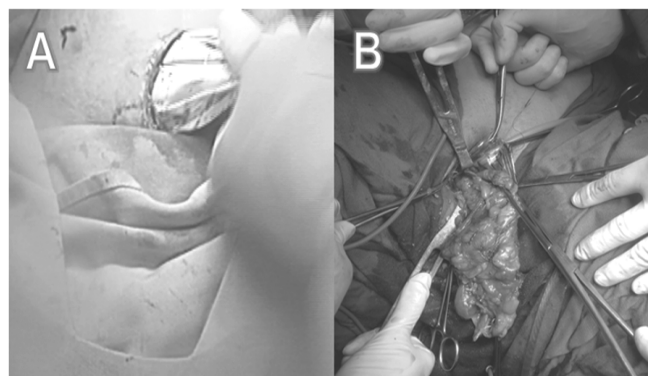
**Figure 3.** JuRoLap sealing mechanism, leak test and sterilization techniques

### *JuRoLap Deployment*

During surgery, the JuRoLap was rolled to fit through the 12mm umbilical trocar site and was manipulated intracorporeally using standard laparoscopic instruments to open the mouth of the bag and to push the specimen in. Once the specimen is secured inside the bag, the knotted suture is then closed by tightening the purse-string. The JuRoLap was then extracted by extending the umbilical port incisional wound as necessary.



**Figure 4.** JuRoLap deployment



**Figure 5.** JuRoLap specimen extraction. A. Trans-abdominal B. Transvaginal

### Data Collection and Processing

The price of the commercial specimen retrieval bag and production cost of the home-made retrieval bag were extracted from the literature. The JuRoLap material cost of production was based on the existing market price during the time of this study.

The data of patients who underwent minimally invasive surgeries with the use of the JuRoLap specimen retrieval bag in Jose R. Reyes Memorial Medical Center from January 2011 to December 2015 were extracted and described. The outcomes such as specimen leakage, bag disruption, injury to adjacent organs, peritoneal nor surgical site infection, intestinal obstruction and loss of specimen within the abdominal cavity in all the cases were noted.

## Results

JuRoLap was easy to prepare, safe, resilient and economical. It was used in 33 cases consist of adrenalectomy (3), simple and radical nephrectomy (17), nephroureterectomy (1), radical-cystoprostatectomy (6), radical prostatectomy (3) and transvaginal hybrid natural orifice transluminal endoscopic surgery (NOTES) nephrectomy (3). Specimen leakage, bag disruption, injury to adjacent organs, peritoneal or surgical site infection, intestinal obstruction and loss of specimen within the abdominal cavity were not noted in all the cases.

**Table 1.** Comparison of cost of different retrieval systems available<sup>1,2</sup>

Retrieval Bag	Company Makers	Cost (USD)
Endopouch	Ethicon	35
EndoCatch Bag	Ethicon	75
Pleatman Sac	Abbott Medicals	28
Ponsky Endosac	U.S. Endoscopy	60

**Table 2.** Reported homemade retrieval bags in literature<sup>1,2</sup>

Retrieval Bag	Specimen Removed	Authors, Origin Year Reported	Cost (USD)
Zipper Storage Bag	Ovarian Cyst	Yuen and Rogers Hongkong, 1994	0.06
Nadiad Bag	Adrenal, Kidney, Ureter, Prostate	Ganpule, et al. Nadiad, India, 2010	2
Glove Bag	Prostate, Adrenal	Kao, et al. Taipei, Taiwan, 2012	1.25

**Table 3.** Cost itemization of JuRoLap bag cost.

Materials	Unit Cost (USD)
Polyvinyl chloride urine bag	0.30
2-0 nylon suture	0.38
Impulse sealer	0
Total Cost	0.68

## Discussion

The significant advantage of JuRoLap among other commercial (Table 1) and home-made (Table 2) specimen retrieval bag was its lower cost of production (Table 3) at approximately 0.68 USD. The resiliency of the JuRoLap was routinely tested for leakage and durability prior to sterilization. The fine rolling of the bag provided ease in deployment. Two standard laparoscopic instruments were required to un-roll and manipulate the JuRoLap for specimen retrieval. The transparency of the bag is important in providing good visibility in all cases. Entrapment

was completed by holding the mouth of the bag open while pushing the specimen with the other grasper. Organ entrapment and extraction required a certain learning curve.

The plastic component of the bag provided resiliency and impulse sealing technique of at least two different rows per side. Earlier designs which failed on the leak test were those sealed only once. It was also observed that smaller incision on extraction site as compared to the specimen size was needed due to the resiliency of the bag. This plastic system is similar to commercially-available bags that might be associated with decreased tumor seeding due to lesser bag disruption tendency.

JuRoLap was initially developed as an inexpensive alternative for retrieval of large kidney specimen. Then, it was further developed to create a size specific bag depending on the expected specimen dimensions. This study is considered a preliminary report on the efficacy of the retrieval bag. Previous studies suggest that the entrapment time decreases as the experience increases. The Nadiad bag had longer entrapment time as compared to commercially-available bags.<sup>1</sup> On the contrary, the zipper storage bag reported to have reduced the operative time as compared to 'purpose designed' bag retrieval system.<sup>7</sup>

## Conclusion

JuRoLap is a safe, resilient and economical specimen retrieval bag innovation that can be used for various organs. However, further prospective study is recommended to compare it with the commercial bags in the ease of specimen entrapment and extraction.

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