

Surgical glove use for specimen removal in laparoscopy, the cheapest available: a prospective study

Shariful Islam^{1,2} , Vinoo Bheem³, Anthony Maughn⁴, Patrick Harnarayan^{1,5}, Dilip Dan^{1,6} and Vijay Naraynsingh⁷

Abstract

Despite the proven benefits of laparoscopic surgery, it is indeed very costly. The aim of our study was to show an effective way to reduce one of the costs. Between January 2012 and December 2018, we used sterile unpowdered latex-free surgical gloves for specimen retrieval in 243 selected cases of laparoscopic cholecystectomy and appendectomy. The mean retrieval time was 6.7 ± 3.6 min. All procedures were performed safely. Minor wound infection was noted in three patients but there was no case of port site hernia in our series. We conclude that specimen retrieval using sterile, unpowdered, latex-free surgical gloves is safe, effective and cheap. No special additional preparation is required.

Keywords

Laparoscopic cholecystectomy, laparoscopic appendectomy, surgical glove, specimen retrieval bag, cutting of cost of surgery

Introduction

Laparoscopy has replaced the open method as standard in many abdominal surgical procedures, particularly for both acute and chronic cholecystitis, as well as for most cases of acute appendicitis. Retrieval of the excised specimen from the abdominal cavity, however, still presents a formidable challenge for the surgeon. Surgical site infection for elective laparoscopic cholecystectomy is in the range of 2.4–3.2%.¹

Several methods of specimen retrieval from the abdominal cavity after laparoscopy have been documented. No one method has been shown to be superior to another.² In an attempt to reduce costs, we began to use sterile, unpowdered, latex-free surgical gloves for retrieval. We found no disadvantage to their use.

Design and methods

Ours was a prospective study conducted in our tertiary teaching hospital between January 2012 and December 2018. The sterile, unpowdered, latex-free surgical gloves were used in 243 selected cases of laparoscopic cholecystectomy and appendectomy. The operation was performed either by specialist registrars or by consultants. We used this glove in all patients who underwent emergency

laparoscopic cholecystectomy and in selected cases of elective laparoscopic cholecystectomy with bile leaks from gall bladders or any other suspicious lesion. We also used this glove selectively in patients who underwent emergency laparoscopic appendectomy where the appendix could not be safely removed through the 12-mm port. Type of surgery, specimen retrieval time, accidental rupture or tear of the gloves, use of commercial endoscopic retrieval bag, wound infection and port site hernia were

¹Consultant, Department of Surgery, San Fernando Teaching Hospital, San Fernando, Trinidad and Tobago

²Consultant, Department of Clinical Surgical Science, University of the West Indies

³Head of the Department of Surgery, San Fernando Teaching Hospital, San Fernando, Trinidad and Tobago

⁴Registrar, General Surgery, San Fernando Teaching Hospital, San Fernando, Trinidad and Tobago

⁵Senior Lecturer, Department of clinical Surgical Science, University of West Indies, St. Augustine. Trinidad and Tobago

⁶Head of the Department of Clinical Surgical Science, University of West Indies, St. Augustine. Trinidad and Tobago

⁷Professor of Emeritus, Department of Clinical Surgical Science, University of West Indies, St. Augustine. Trinidad and Tobago

Corresponding author:

Shariful Islam, Associate Lecturer, Department of Clinical Surgical Science, University of the West Indies, St Augustine, Trinidad and Tobago. Emails: sssl201198@yahoo.com; shar_islam7@hotmail.com

prospectively recorded. Ethical approval was obtained from the institutional review board to conduct the study.

We used size 6–8 unpowdered, sterile, latex-free surgical gloves. No additional materials or sutures were used. The fingers of the glove were neither excised nor were any purse string suture used. The glove was inserted through the 12-mm port holding the fingers of the gloves by an atraumatic grasper until it was

fully delivered inside the peritoneal cavity (Figures 1 and 2). While keeping an eye on the ring of the gloves, the specimen was placed inside the ring (Figures 3 and 4). The ring was then slowly lifted up while keeping the specimen inside (Figure 5). Once the placement of the specimen inside the glove was confirmed; the neck of the glove under the ring was grasped with an atraumatic grasper (Figure 6). The specimens were



Figure 1. Introduction of sterile, latex-free, unpowdered surgical glove through the 10-mm or 12-mm port.

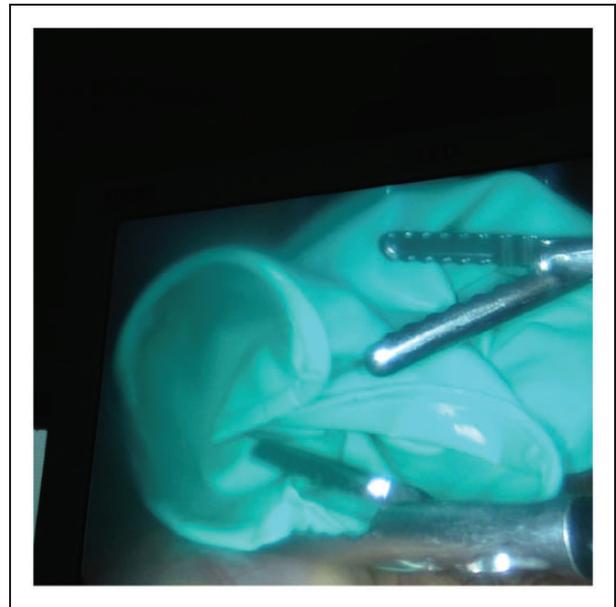


Figure 3. Identifying either side of the glove's ring.



Figure 2. Further delivering the glove into the peritoneal cavity.

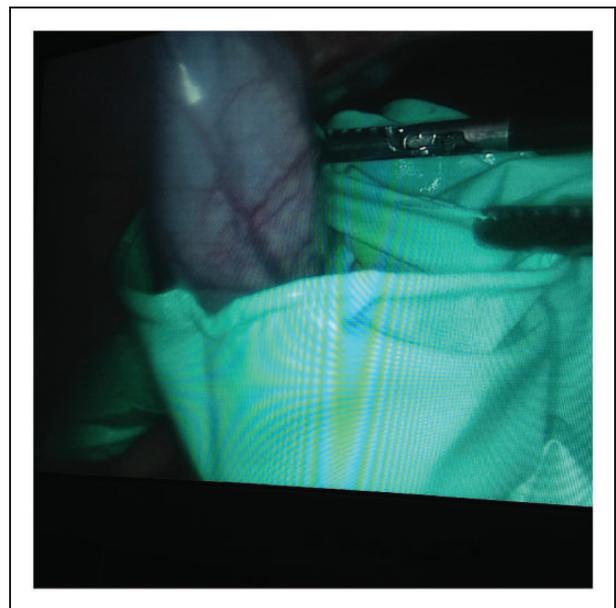


Figure 4. Dropping the gallbladder into the glove while lifting up the glove by two graspers.

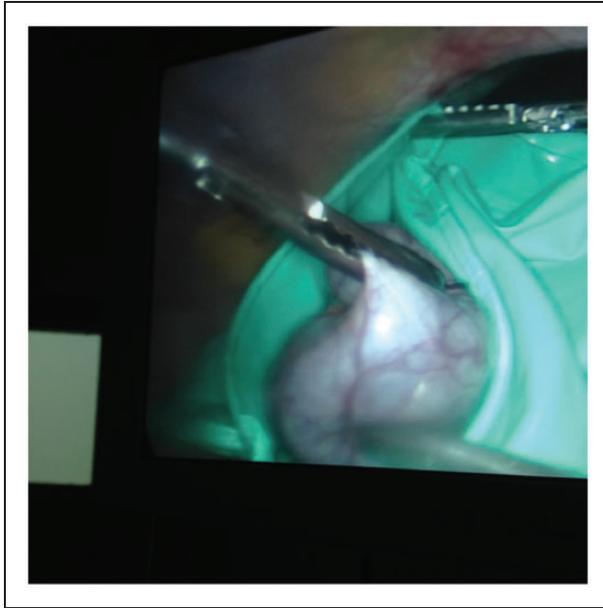


Figure 5. Pushing the gallbladder further inside the glove.

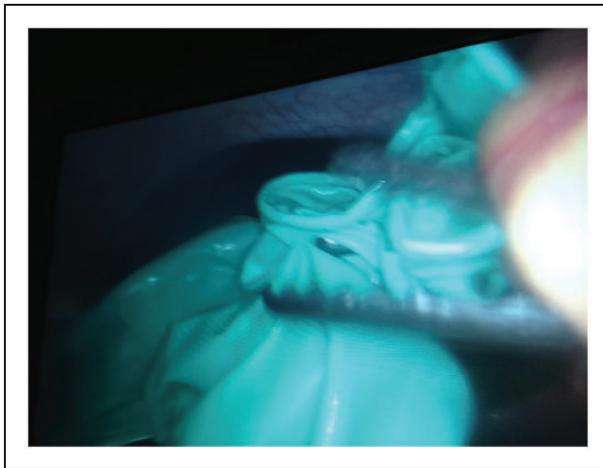


Figure 6. Removal of gallbladder via the umbilical port, while holding the neck of the glove by a grasper.

then removed through the peri-umbilical wound (Figures 7–9). In selected cases, trans-fascial wounds were extended, to allow safe removal of the specimen. In cases where a large specimen was expected to require significant force for its removal, the ring of the glove was opened outside the abdomen, the specimen then grabbed with sponge holding forceps and removed safely by a side-to-side movement.

The sterile surgical glove was used where there was intraoperative gallbladder perforation or suspected carcinoma, in all cases of emergency laparoscopic cholecystectomy and in acute appendicitis where the appendix was fragmented or too large to remove via the 10-mm or 12-



Figure 7. Intact glove with in situ gallbladder (outside the peritoneal cavity).



Figure 8. Picture of gallbladder protruding through the surgical glove.

mm port. We did not use surgical gloves for incidental appendectomy or in acute appendicitis where the appendix could be easily passed through the 12-mm port.

Ethical approval was obtained from the institutional review board to conduct the study.



Figure 9. The inflamed gallbladder.

Table 1. Types of procedures in which surgical gloves are used.

Types of procedure	Patients (n)	Total patients (%)
Emergency laparoscopic Cholecystectomy	98	40.32
Elective laparoscopic Cholecystectomy	110	45.26
Emergency laparoscopic Appendectomy	45	18.51
Total	243	100

Results

A total of 243 selected cases of laparoscopic cholecystectomy and appendectomy were included in our study, of which 98 (40.32%) were for acute cholecystitis, 110 (45.26%) for acute appendicitis and 45 (18.51%) for elective gall bladder disease (Table 1).

The learning curve in our series was 5–7 cases. The overall entrapment time was 7.6 ± 3.4 min. However, this obviously varies depending on the type of specimen to be retrieved and also on the level of expertise of the surgeon.

All appendectomy patients had proven acute appendicitis but only 29% had localised pus on exploration.

The rate of surgical site infection (SSI) in our series was 1.23%.

In one patient, the glove was accidentally opened while extending the trans-facial opening by a surgical resident; however, retrieval of specimen was successful. Minor wound infection was noted in 3 (1.23%) cases. There was no documented case of port site hernia in our series (Table 2).

Table 2. Outcomes of surgical glove technique.

Outcomes	Patients (n)
Spontaneous rupture of glove	0
Accidental tear or perforation of glove	1
Bile leakage	0
Need to use any endo bag	0
Success of specimen retrieval (%)	100
Wound infection (minor) (n (%))	3 (1.23)
Port site hernia	0

Discussion

Laparoscopic surgery has gained popularity and has become the procedure of choice for most elective and emergency abdominal surgery because of its proven cosmetic and postoperative benefits. However, it is costly and systems in many low- and middle-income countries struggle to meet these costs. Cost reduction, therefore, in any aspect of this type of surgery, be it stapler use or specimen retrieval bag, contributes to reducing the overall expense. The specimen retrieval bag is one of the items where cost can be reduced drastically. The key demand remains how to remove the specimen safely from the peritoneal cavity without any spillage, contamination or wound complication. There is no unique consensus on this. Surgeons in many countries have already begun to use alternative homemade retrieval bags.^{3,4}

Different techniques have been described to facilitate retrieval without the need of enlarging the abdominal incision. Specimen extraction in laparoscopic surgery is obviously more time-consuming than in open procedures and thus tissue removal must be performed expeditiously if the time efficiency of laparoscopy is to be maintained. Needless to say, the method and route of retrieval must not compromise patient safety, either intra- or postoperatively.

Routine use of specimen retrieval bags for elective laparoscopic cholecystectomy is not recommended. Recent meta-analysis documented a SSI rate of 4.2% where a retrieval bag was used but 5.9% without in elective laparoscopic cholecystectomy patients; however, there was no statistically significant reduction either way.^{1,5} In all suspected cases of malignancy or organ rupture use of a specimen retrieval bag is obligatory.

The SSI rate in emergency laparoscopic cholecystectomy is not well documented. It is also not documented where some of the recently described, less expensive, home-made specimen retrieval bags are used.^{3,4} However, the overall complication rate and SSI rate for emergency laparoscopic cholecystectomy seems to be in the range of 5.1–7.4% and 1.7–2.8%, respectively.^{6,7}

Table 3. Cost of different retrieval systems.

Currently available bag	Company	Cost US\$
Endopouch	Ethicon	35
Endocatch bag	Ethicon	75
Ponsky Endosac	U. S. Endoscopy	60
Pleatman sac	Abbot Medicals	28
Ureteral catheter retrieval bag (Nadia bag)	Nadiad, India	2
Homemade specimen retrieval bag		1.25
Sterile surgical glove		0.2–0.5

For optimal introduction and removal of the specimen bag, a 10-mm or 12-mm port is usually required. However, the wound can be enlarged, if necessary, to remove the specimen safely without any rupture or intraperitoneal spillage. Several impermeable endoscopic specimen retrieval bags for the removal of the excised mass are on the market. The cost of these retrieval systems varies considerably.⁴ A pair of sterile surgical gloves cost us US\$0.20–0.50 (Table 3).

Expensive, commercially made bags come with a frame and are easier to apply.^{8–11}

Homemade bags are made from surgical glove fingers, zipper type plastic bags or condoms, and have no frame. Although these are simple to make, available in different sizes and inexpensive, they are not as resilient as commercial bags and can tear with heavy traction. This can be reduced or avoided with the addition of a purse-ring suture, which allows easy pulling as well as easy closure and reopening.^{4,12–14}

On the other hand, the sterile, latex-free, unpowdered surgical glove is the cheapest, most readily available in any operating theatre and does not require any additional preparation. It can be safely used for the removal of the majority of small to medium size specimens. A usual, but unproven, fear among surgeons is that the surgical glove is not strong enough, easy to rupture and technically difficult. However, this is not based on evidence.^{15,16}

Surgical gloves have been used to retrieve specimens from the abdominal cavity for many years. Several studies have shown their efficacy.^{16,17}

Our results clearly show that, in experienced hands, using due precaution, specimens can be removed safely within the surgical gloves without any added risk of perforation or spillage. Caution is nonetheless advised and all manoeuvres should be performed under direct vision, without excessive traction. If the specimen is too big and benign, it can be decompressed further to facilitate removal either piece-meal or with a morcellator, scissors or with a sponge holding forceps.^{18,19} The

instrument tip should always be kept under vision in order to avoid inadvertent perforation.

Conclusion

In our experience, the sterile, unpowdered, latex-free surgical glove can be easily and safely used by experienced surgeons to extract specimens from the abdominal cavity. It is the cheapest method available. It is readily available in all theatres and does not require any additional preparation. The learning curve is minimal and the risk of rupture is negligible. We strongly recommend this method to all laparoscopic surgeons for retrieval of small- to medium-sized specimens.

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ORCID iD

Shariful Islam  <https://orcid.org/0000-0002-0011-760X>

References

- Overby DW, Apelgren KN, Richardson W, et al. SAGES guidelines for the clinical application of laparoscopic biliary tract surgery. *Surg Endosc* 2010; 24: 2368–2386.
- Regina DL, Mongelli F, Cafarotti S, et al. Use of retrieval bag in the prevention of wound infection in elective laparoscopic cholecystectomy: is it evidence-based? A meta-analysis. *BMC Surg* 2018; 18: 102.
- Stavroulis A, Memtsa M and Yoong W. Methods for specimen removal from the peritoneal cavity after laparoscopic excision. *The Obstetrician and Gynaecologist* 2013; 15: 26–30.
- Ganpule AP, Gotov E, Mishra S, et al. Novel cost-effective specimen retrieval bag in laparoscopy: Nadiad bag. *Urology* 2010; 75: 1213–1216.
- Majid MH, Meshkat B, Kohar H, et al. Specimen retrieval during elective laparoscopic cholecystectomy: is it safe not to use a retrieval bag? *BMC Surg* 2016; 16: 64.
- Geraedts ACM, Sosef MN, Greve JWM, et al. Is nighttime really not the right time for a laparoscopic cholecystectomy? *Can J Gastroenterol Hepatol* 2018; 2018: 6076948.
- Phatak UR, Chan WM, Lew DF, et al. Is nighttime the right time? Risk of complications after laparoscopic

- cholecystectomy at night. *J Am Coll Surg* 2014; 219: 718–724.
8. Kôchli OR, Schnegg MP, Müller DJ, et al. Endobag extractor to remove masses during laparoscopy. *Obstet Gynecol* 2000; 95: 304–305.
 9. Chatzipapas IK, Hart RJ and Magos A. The “remote control” laparoscopic bag: a simple technique to remove intra-abdominal specimens. *Obstet Gynecol* 1998; 92: 622–623.
 10. Pillai R and Yoong W. Posterior colpotomy revisited: a forgotten route for retrieving larger benign ovarian lesions following laparoscopic excision. *Arch Gynecol Obstet* 2010; 281: 609–611.
 11. Steiner RA, Wight E, Tadir Y, et al. Electrical cutting device for laparoscopic removal of tissue from the abdominal cavity. *Obstet Gynecol* 1993; 81: 471–474.
 12. Yao CC, Wong HH, Yang CC, et al. Liberal use of a bag made from a surgical glove during laparoscopic surgery for specimens retrieval. *Surg Laparosc Endosc Percutan Tech* 2000; 10: 261–263.
 13. Kao CC, Cha TL, Sun GH, et al. Cost-effective homemade specimen retrieval bag for use in laparoscopic surgery: experience at a single center. *Asian J Surg* 2012; 35: 140–143.
 14. Weber A, Vázquez JA, Valencia S, et al. Retrieval of specimens in laparoscopy using reclosable zipper-type plastic bags: a simple, cheap, and useful method. *Surg Laparosc Endosc* 1998; 8: 457–459.
 15. Holme JB and Mortensen FV. A powder-free surgical glove bag for retraction of the gallbladder during laparoscopic cholecystectomy. *Surg Laparosc Endosc Percutan Tech* 2005; 15(4): 209–211.
 16. Rolton DJ, Lovegrove RE and Dehn T. Use of a sterile glove as a retrieval bag in laparoscopic surgery. *Ann R Coll Surg Engl* 2009; 91: 440.
 17. Hiroshi Y, Kazuyuki O, Masakatsu K, et al. Use of non-powder surgical glove for extraction of gallbladder in laparoscopic cholecystectomy. *Digest Endosc* 2003; 15: 315–319.
 18. Miller CE. Methods of tissue extraction in advance laparoscopy. *Curr Opin Obstet Gynecol* 2001; 13: 399–405.
 19. Wai SL, Ng PS and Yuen PM. Morcellation inside a zipper bag pouch: an efficient and safe way to retrieve a large, solid ovarian mass laparoscopically. *J Gynecol Surg* 2007; 23: 31–36.