



Appendiceal stump inversion with a purse-string suture in laparoscopic appendectomy

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Abstract: Purse-string suture and inversion of the stump of the appendix are often omitted in laparoscopic appendectomy. We present a novel procedure to invert the stump of the appendix. The procedure is almost the same as that used in open appendectomy, requires an additional five minutes to invert the stump of the appendix. It is very useful because the procedure is safe and low cost.

Keywords: Laparoscopic appendectomy; stump inversion; purse-string suture; intra-corporeal suturing; sliding knot

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Introduction

In open appendectomy, many surgeons use a purse-string suture to invert the stump of the appendix after excision. In the literature regarding laparoscopic appendectomy, the appendix is divided with an endoscopic linear stapler or with an energy device such as ultrasonic dissector after ligation with an endoloop.

The main reason for omitting inversion of the stump of the appendix during laparoscopic appendectomy may be that intracorporeal suturing is complicated. However, intracorporeal suturing is an essential procedure in laparoscopic surgery.

The procedure of purse-string suturing and inverting the stump of the appendix during laparoscopic appendectomy often takes time, because the operative maneuver is performed by one operator alone. We present a novel procedure to invert the stump of the appendix. The procedure is almost the same as used in open surgery. The procedure requires an additional five minutes to invert the stump of the appendix.

Operative procedure

The laparoscope is inserted through the umbilicus, and two 5 mm ports are inserted, one in the left lower quadrant and one slightly to the right of the midline above the symphysis

pubis. The mesentery of the appendix is divided with an energy device, and the vessels are divided after clipping. The neck of the appendix should be exposed about 1 cm for double ligation and safe division. The neck is then ligated intracorporeally with a 15 cm suture inserted through a 5 mm port (*Figure 1A,B*). After double ligation, the neck is divided with an energy device (*Figure 1C*). The cutting point should be about 5 mm distal to the ligation site to prevent slipping of the ligatures.

A 2-0 or 3-0 absorbable suture with an attached needle is inserted through the port at the umbilicus. The purse-string suture is started at the mesenteric side to make ligation easy (*Figure 1D*). At the dorsal site of the appendiceal stump, reverse suturing is required (*Figure 2A*). The tissue at the stump of the appendix is grasped with forceps in the left hand, and is moved to adjust the angle of the needle. The suturing point should be about 5 mm or more away from the stump of the appendix to definitively invert the stump. This usually requires three or four insertions of the needle around the stump. At the purse-string ligation site, a loose square knot is made first (*Figure 2B*) and changed to a sliding knot by pulling the long tail of the suture (needle side). The short tail is grasped with forceps in the left hand, and the stump of the appendix is inverted to the cecum using the same forceps. At the same time, only the long tail is pulled but not the short tail (*Figure 2C*). If the short

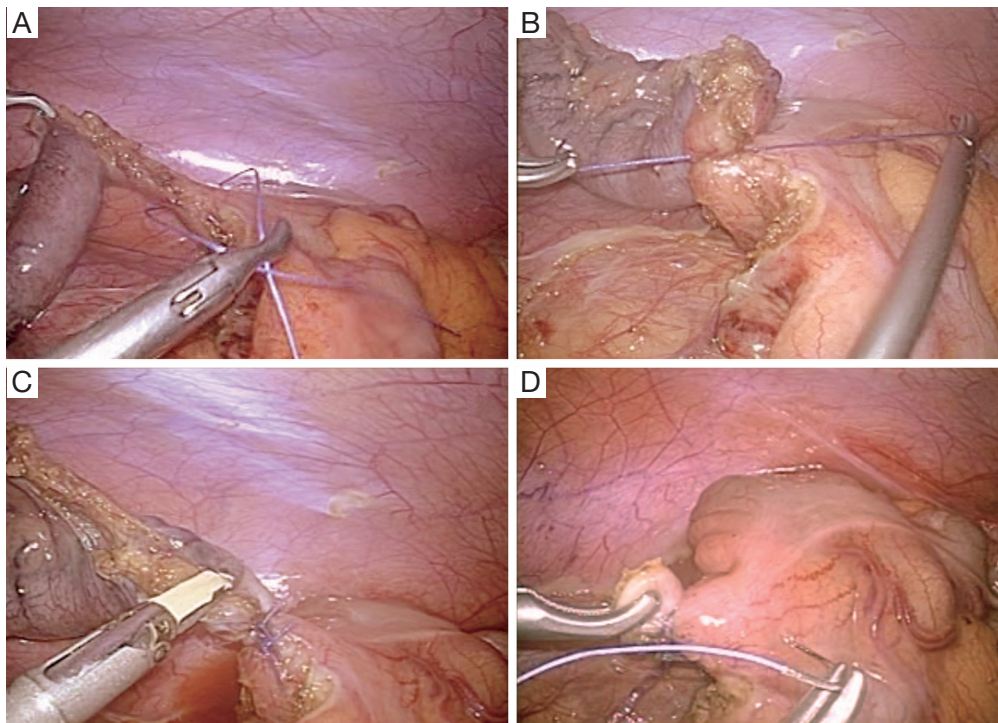


Figure 1 Ligation and division of the neck of the appendix. (A) Grasp the suture as a loop to adjust the ligation point; (B) the neck of the appendix is ligated by intracorporeal ligation; (C) the appendix is divided with an energy device about 5 mm distal to the ligation site after double ligation; (D) the purse-string suture is started on the mesenteric side.

tail is pulled simultaneously, the knot becomes secured and will not slip. After inversion of the stump of the appendix, the short tail is pulled to return the sliding knot to a square knot for locking (*Figure 2D*). Two more throws are added to tighten the knot (*Figure 3*). When inversion is incomplete and the mucosa of the stump of the appendix is still exposed, the serosal suture of the cecum should be added to cover the stump.

Results

We have performed this procedure in 38 patients during recent three years. There is no leak, residual abdominal abscess, wound infection or other complications after surgery.

Discussion

Appendectomy for acute appendicitis is a common procedure performed by many young surgeons. They learn basic surgical procedures such as needle movement to

create a purse-string suture and how to invert the stump of the appendix. Even during laparoscopic appendectomy, placement of a purse-string suture and ligation can be performed using the procedure described here. It is suitable to demonstrate skills learned by practice in a training box and educational benefits are also expected.

Several procedures for dividing the appendix during laparoscopic appendectomy are reported in the literature (2), such as a comparison of suturing and metallic clip (3), single versus double ligation using endoloops (4), endostapler versus endoloop, stump inversion versus endoloop alone (5), and so on. According to these reports, there is no difference in the incidence of complications among these procedures (6). Double ligation can be performed by intracorporeal ligation with sutures, and endoloop is not always necessary. Longer operating time is needed to place a purse-string suture, but the procedure described above requires only about five minutes. At the completion of this procedure, there is a sense of security by reinforcement as in open appendectomy. To date, there have been no complications related to this procedure.

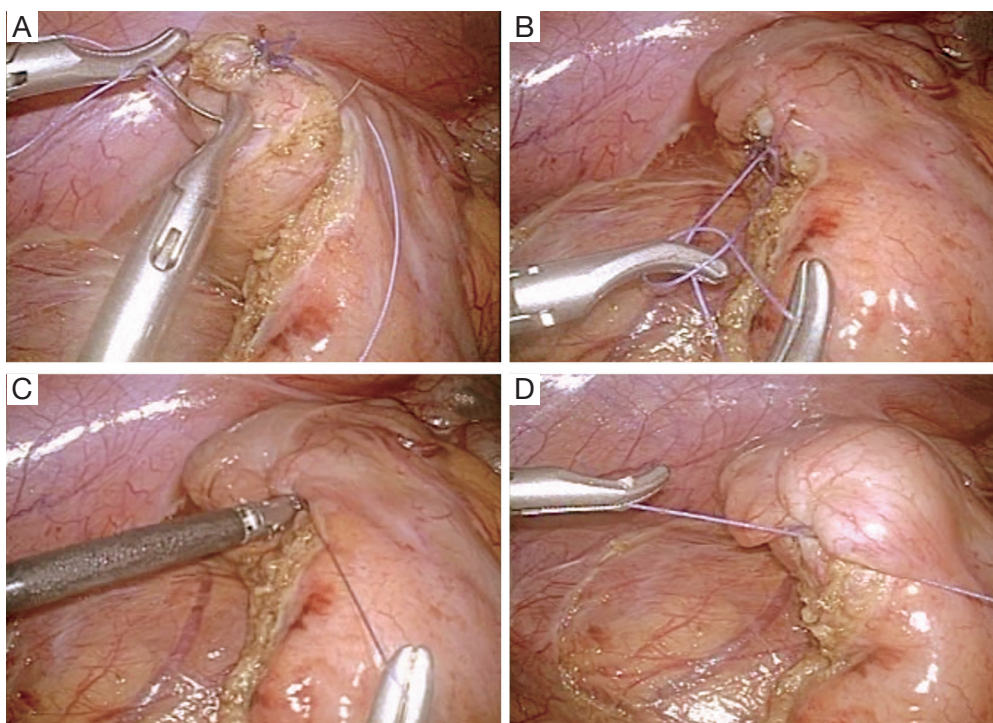


Figure 2 Purse-string suture and inversion of the stump of the appendix. (A) At the dorsal site of the stump of the appendix, reverse suturing is required; (B) a loose square knot is made first and is changed to a sliding knot by pulling the long tail of the suture; (C) the short tail is grasped in the left hand, and the stump of the appendix is inverted to the cecum using the same forceps; (D) after inversion of the stump, the short tail is pulled to convert the sliding knot to a square knot for locking.



Figure 3 The procedure for suturing and inversion of the stump of the appendix (in real time with minor edits) (1).

Available online: <http://www.asvide.com/articles/1473>

Conclusions

Inverting the stump of the appendix with a purse-string suture in laparoscopic appendectomy is possible using a simple procedure, similar to open appendectomy. This can

be done in a short time with no special equipment required. The procedure is safe and low cost.

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Footnote

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/ales.2017.03.13>). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional

and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this manuscript and any accompanying images.

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