

Hanging the appendix to the abdominal wall using ties during laparoscopic appendectomy: a technique report and preliminary results

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Introduction

Laparoscopic appendectomy is an effective and safe procedure for acute appendicitis. The cost of laparoscopic appendectomy is higher in both simple and complex cases. In this study, we aim to present a new technique to be used during laparoscopic appendectomy with the aim of reducing the cost. We also present the preliminary results.

Patients and methods

The technique entails hanging the appendix to the abdominal wall using ties applied through the abdominal wall to inside the peritoneum and back to outside the abdomen. The technique was used on 50 patients during laparoscopic appendectomy.

Results

The mean operative time was 51.8 min. In three cases, the tie caused a tear in the mesoappendix of the distal appendix. In one case, minimal trauma to the small intestines occurred. In a fifth case the very short and inflamed mesoappendix necessitated the use of a harmonic blade to secure it.

Conclusion

Within the limitation of this study, we can conclude that laparoscopic appendectomy with hanging of the appendix to the abdominal wall using ties is a technically safe, feasible, and cheap method that can be adopted when facilities and funds are limited.

Keywords:

cheap method, mesoappendix, tying

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Introduction

Approximately 6% of the population develops appendicitis in their lifetime, with a peak incidence between the ages of 10 and 30 years, thus making appendectomy the most frequently performed abdominal operation [1].

Despite the longer operative time, laparoscopic appendectomy results in less postoperative pain, faster postoperative rehabilitation, a shorter hospital stay, and fewer postoperative complications than open appendectomy. Therefore, laparoscopic appendectomy is recommended as an effective and safe procedure for acute appendicitis [2–4].

The cost of laparoscopic appendectomy is higher in both simple and complex cases. The decision analysis demonstrated an economic advantage to the hospital with open appendectomy. In contrast, laparoscopic appendectomy represents a better economic choice for the patient [5–7].

In this study, we aim to present a new technique to be used during laparoscopic appendectomy, which entails hanging the appendix to the abdominal wall using ties, with the aim of reducing the costs of laparoscopic

appendectomy. The preliminary results are also discussed.

Patients and methods

This study was conducted in Menoufia University Hospital, Shebin El-Kom, Egypt, between January 2013 and June 2015. It was conducted on 50 patients diagnosed with acute appendicitis. The study was approved by the ethical committee of the hospital. Informed consent was obtained from each patient. We excluded from this study patients who were below 18 years and patients with frank peritonitis.

Description of the technique

To our knowledge, we are the inventors of this technique. The technique requires the insertion of three ports, one for the camera at the umbilicus, one

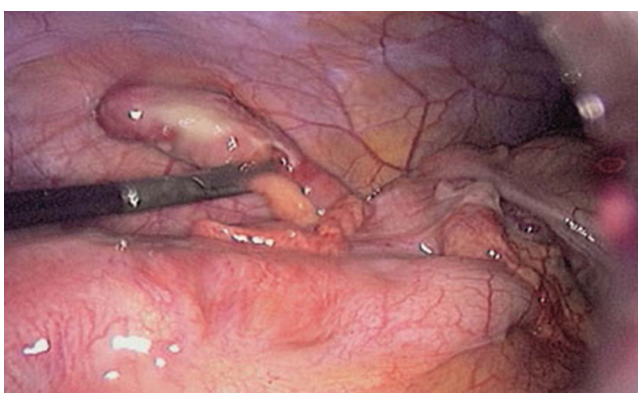
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5 mm in the suprapubic region, and one 5 mm in the left iliac fossa.

After routine exploration using the two graspers inserted through the two 5-mm ports, we start the procedure by finding the ileocecal junction where the appendix is lying. After mobilization of the appendix, a needle with 2/0 vicryl suture material is inserted into the right iliac fossa through the abdominal wall. A curved needle is routinely used, unless the abdominal wall is judged to be thick, in which case we use a straight needle. Once in the peritoneal cavity, the needle is grasped with a needle holder and passed through the mesoappendix of the lateral third of the appendix, close to the wall of the appendix. Then the needle is passed again to the outside through the abdominal wall, thus creating a loop around, and hanging the appendix to the abdominal wall. The two edges of the vicryl loop are secured on an artery outside the abdomen, which is used to adjust the degree of tension needed to hang the appendix and display its base. On occasion, more than one loop may be needed. The precise point of passing through the abdominal wall varies according to the position of the appendix and other factors such as the length of the appendix and the bulk of the mesoappendix. One should keep in mind the anatomy of the inferior epigastric artery and avoid it. The surgeon places the loop in the abdominal wall so as to encircle the appendix and avoid tearing the mesoappendix from the appendix.

Once the appendix is elevated, a window is made at the mesoappendix near the base of the appendix through which we pass a 2/0 vicryl tie to secure the mesoappendix using the intracorporal tying technique. Another similar tie is taken for security. The surgeon tries to slide the ties as low on the mesoappendix as possible so as to place the tie on the narrow base of the mesoappendix rather than just below the appendix (Figs. 1–5). Sometimes more than one window is needed to secure the whole mesoappendix.

Figure 1



Hanging of the appendix.

Once the mesoappendix is secured, similar intracorporal tying is used to secure the base of the appendix, which is subsequently amputated and retrieved in a retrieval bag through the suprapubic port. Irrigation and drain insertion are applied as needed.

The following data were collected:

- (1) Demographic data including age, sex, and BMI.
- (2) Intraoperative data including operative time (from skin incision to wound closure), technical difficulties encountered, costs, and conversion to open appendectomy.
- (3) Postoperative data including wound infection, intraperitoneal collection, visual analogue pain score (12 h postoperative), time of starting oral fluids, and length of hospital stay.

Results

The mean age of the patients in this study was 22.58 ± 14.83 years (range 18–61 years). Thirty patients were male (60%) and 20 were female. The mean BMI was 26.41 ± 7.62 (range 21–43). Table 1 shows the operative time.

The technical difficulties encountered included the following: in three cases (6%) the loop we passed cut through the mesoappendix so as to separate the distal end of the appendix from its mesoappendix. This was noted to occur if the loop is passed too distal on the mesoappendix and if the surgeon passed the loop too medial in the abdominal wall, so that the stretch on the loop was not on the body of the appendix. We dealt with this by passing the loop twice around the bare appendix.

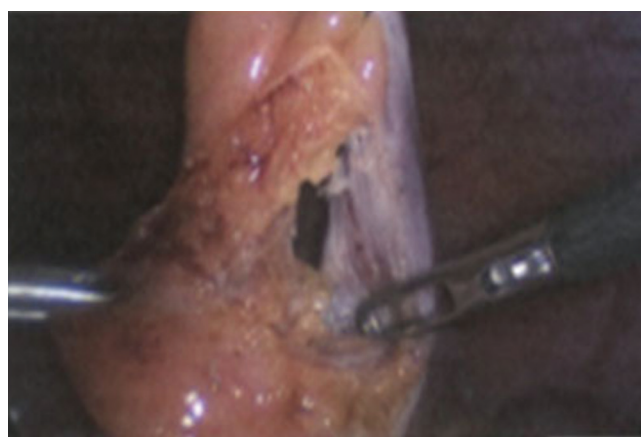
Another mishap was puncturing the small intestines, which occurred in one case (2%). Given the very small size of the puncture, no further management was needed.

Figure 2



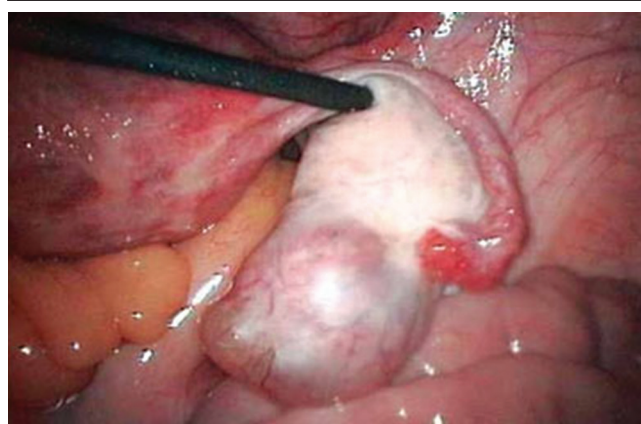
Laparoscopic exploration of the peritoneal cavity.

Figure 3



Laparoscopic appendiceal dissection.

Figure 4



Right ovarian cyst detected by a laparoscope.

Figure 5



Tying of the appendix hung to the abdominal wall.

In a fifth case we employed the harmonic sealing device because of a very short and inflamed mesoappendix, both of which made tying very difficult.

The costs were very low. In most of the cases we used two vicryl ampoules, which cost less than 10 USD. We understand that there are indirect costs (e.g. that of

anaesthesia, instrument wear and tear, etc.), but these were difficult to estimate.

We converted to open appendectomy in three cases (6%), but all the conversions were due to findings not related to the technique. In one case it was the associated pathology (ruptured ectopic pregnancy). In two cases, the conversion was because the appendixes were subserous and retrocaecal, and the caeca were oedematous and fixed.

Regarding the wound infection rate, two cases (4%) were noted. Both cases were mild and were treated on outpatient basis with oral antibiotics. No case of postoperative intra-abdominal complication was noted. The average time of starting oral fluids was 22.51 ± 11.55 h.

The length of hospital stay is shown in Table 2.

The results of visual analogue pain score 12 h after surgery is shown in Table 3.

Discussion

Laparoscopic appendectomy is a safe and effective method of appendectomy [2–4]. It inherently carries all the advantages of laparoscopic surgery. However, the issue of high cost is still an obstacle for its routine use, at least in developing countries [6]. In this study, we present this technique to be used during laparoscopic appendectomy with the aim of reducing the costs without compromising the safety of the procedure.

The advantages of the technique are:

- (1) Avoiding the use of clips, staplers, endoloops, and expensive thermal coagulation devices (e.g. harmonic blade) for securing the mesoappendix or the base of the appendix.
- (2) Typically, intracorporeal tying will need four ports: one for the camera, two for the needle holders used for tying, and a fourth port for a grasper to hang the appendix. Employing our technique will avoid the insertion of a fourth port, thus causing fewer traumas and saving the costs of the port and the grasper.

This will maximize the usage of the already established laparoscopy units and simultaneously will minimize the ongoing costs of staplers or endoloops. The ongoing cost will be that of vicryl sutures. One disadvantage of the technique is the relatively long operative time (51.8 min) (Table 1). The crucial step in the technique (i.e. passing the ties to create loops) did not consume time. Intracorporeal tying consumed most of the time, especially when multiple windows were created to secure bulky mesoappendices. Injury to the intestines (or

Table 1 Operative time

Study group	Mean	SD	Median	Minimum	Maximum
50 patients	51.8202	10.85044	54.3000	41.00	82.00

Table 2 Length of hospital stay

Parameter	Mean	SD	Minimum	Maximum	Median
Hospital stay (days)	1.2000	1.05259	0.75	4.00	1.5500

Table 3 Visual analogue pain score 12 h after surgery

Parameter	Mean	SD	Minimum	Maximum	Median
Visual analogue pain score (12 h after surgery)	4.4724	2.84741	3	7	4.2

to other intra-abdominal structures) by the passing of the needle occurred once. Care must be taken, especially if the needle is a straight one. Tearing of the mesoappendix from the distal appendix occurred in 6% of cases. This can be avoided by making sure that the loop is made around the appendix rather than around the mesoappendix. The wound infection rate (4%), visual analogue pain score, time to start oral fluids, and hospital stay (Tables 2 and 3) are comparable to data from other studies. Katkhouda *et al.* [8] reported operative time between 60 and 105 min (average 80 min), time to liquids 23.5 h, and length of stay 2–4 days (average 2 days). Comparable results were reported by Long *et al.* [9].

Conclusion

Within the limitations of this study, we can conclude that laparoscopic appendectomy with hanging of the appendix to the abdominal wall using ties is a technically safe, feasible, and cheap method that can be adopted when facilities and fund are limited.

Level of evidence

Level IV, therapeutic case series.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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