ORIGINAL RESEARCH ARTICLE
Volume - 9 | Issue - 7 | July - 2020 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

COMPARATIVE STUDY BETWEEN USE OF COMMERCIALLY AVAILABLE ENDOLOOP AND HANDMADE LOOP IN CLOSURE OF APPENDICULAR STUMP IN LAPAROSCOPIC APPENDECTOMY

Surgery

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ABSTRACT

Laparoscopic appendectomy is the gold standard treatment of acute appendicitis. Despite many advantages, it has the main disadvantage of higher cost. The objective of our study is to establish the safety, efficacy and cost-effectiveness of handmade loop knotting for securing appendicular base. We conducted this prospective study in ESIC-PGIMSR, Joka, Kolkata from January 2018 to May 2020. 100 patients were evaluated; 50 patients with handmade loop & rest 50 with commercially available endoloop. Upon comparing various parameters like mean operating time, hospital stay, post-operative complications & procedure cost in both groups, no significant statistical differences were found except cost difference. No patient developed appendicular stump blow out or caecal fistula. However, the average cost of endoloops used in a single patient was 12711 INR whereas, for handmade loops it was 635 INR. So, we concluded that handmade loop for securing the appendicular stump is a safe & cost-effective approach for any laparoscopic surgeon.

KEYWORDS

Appendectomy, Endoloop

Acute appendicitis is one of the commonest general surgical entities to be treated as emergency. Open appendectomy has been considered the standard treatment for acute appendicitis, since first described by McBurney [1] in 1894. A meta-analysis based on randomized control trials (RCT) showed that laparoscopic appendectomy (LA) which was initially preferred by Semm [2] in 1983 has a tendency of replacing the open procedure as a standard treatment for acute appendicitis. In comparison to the open procedure, LA has many advantages like less post-surgical pain, earlier bowel function recovery & post-operative oral intake, shorter length of hospital stay, earlier return to normal activities & work, decreased rate of surgical site infection & better cosmetic results [3,4,5]. However, there are certain disadvantages of laparoscopic procedures like longer operating time, higher rate of developing intra-abdominal abscess in some studies & higher cost [6, 7]. The most important reason that contributes largely to the elevated cost of LA is the disposable equipments used in during the procedure. The use of endoloop & endostapler as disposable equipment in LA for securing the base of appendix is common now a days. To decrease the cost, some methods have been tried out like using two ports & closing the stump with clips [8, 9]. Even intra-corporeal suturing & knotting is also a low cost modality though it requires skill which takes time to develop. Another way of lowering costs is to use a handmade loop instead of commercially available endoloop. The objective of our present study is to establish the feasibility of the closure of the appendicular stump by using a handmade vicryl (polyglactin) loop; to establish whether differences exist in the post-operative course, in comparison with those patients in whom appendicular stump was closed with endoloop; to compare the cost of both techniques & evaluate whether the use of a handmade vicryl loop is a safe alternative for laparoscopic appendectomies.

Materials & Methods

This prospective study was conducted in ESIC-PGIMSR, Joka, Kolkata from January 2018 to May 2020. 100 Laparoscopic appendectomies were performed by the same surgical team. The patients were informed about the details, risks & benefits of the technique and consents were obtained under the guidance of institutional ethical committee. The choice of approach was made by the operating surgeon with the approval of the patients. All patients were divided into two groups. Group I included 50 patients who underwent LA with a handmade loop technique for securing appendicular base whereas, group II consisted of the rest 50 patients who underwent LA by using commercially available endoloop. Both endoloop & handmade loop were of the same brand. All patients received the same preoperative antibiotics as per the institutional protocol. Trocars placed were supra-umbilical 10 mm, supra-pubic 5 mm & left lower abdomen 5 mm. In both techniques, we used reusable laparoscopic instruments except the endoloops & vicryl sutures used to make handmade loops. Mesoappendix was coagulated with bipolar cautery & cut with scissors. For group I patients, only one polyglactin (0) suture (vicryl) were used to make three loops. We used handmade Roeder's knot (one hitch, three winds & one locking hitch), as shown in Fig.1. Firstly a loop was made around a post and then a simple knot was made. With the shorter end, three winds were made around both posts & were secured with the last hitch. Knot was tightened & checked for sliding. Knot was held by the laparoscopic grasper & was slided down the trocar into the peritoneal cavity. Once inside the peritoneum, appendix was placed through the loop. Free end of the string was passed through the eye of a knot pusher & knot pusher was slided through the trocar & it was tightened (figure 2). Excess length of the string was trimmed with scissors. Out of the three loops, two were applied on the base of the appendix & tightened. The third loop was similarly placed approximately 5 mm away from the second loop & the appendix cut with scissors in between 2nd & 3rd loop.

Figure 1
Roeder's Knot & its Application

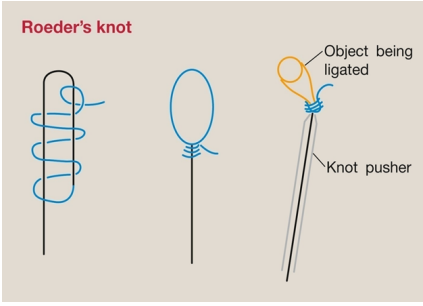
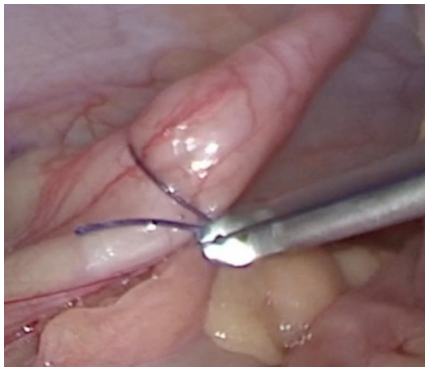


Figure 2
Handmade Roeder's knot being placed at appendicular base with a reusable knot pusher:



Similarly, in group II, 3 endoloops were used for each patient. In both groups, the specimen was retrieved in a finger glove endobag via supra-pubic port. In both techniques, mean operating time, average hospital stay, intra-operative & post operative complications & cost were analyzed.

Result

The results were analyzed with SPSS for windows version 26 & the differences between groups were compared with appropriate statistical test. P-value less than 0.05 were regarded as statistically significant.

During the 28 months period, 100 patients who underwent laparoscopic appendectomy for acute appendicitis were studied. Average age for group I patients was 30 yrs, ranging from (18-60) yrs. Out of 50 patients in group I, 24 were males whereas, 26 were females. In group II, out of 50 patients, 22 were male & 28 were females; average age was 32 yrs. There was no conversion to open procedure in either group. Mean duration of operating time was 44.7 minutes in group I & 44.4 minutes in group II. The time spent for preparing & tying one loop was approximately 15 seconds. No intra-operative complications were found. The average period of hospital stay was 2.1 days in group I whereas, 2.2 days in group II. 2 patients in group I had post-operative complications. One of them developed interloop abscess for which she required laparoscopic drainage. She was discharged after 4 days. The other patient developed wound infection at the umbilical port site, requiring wound exploration & drainage of abscess and was discharged after 3 days of hospitalization & treated on OPD basis. In group II, total 3 patients developed post-operative complications. Two of them developed mild pelvic collections which were managed conservatively. Another patient developed umbilical port-site infection treated on an OPD basis. None of the patients developed appendicular stump blow out or caecal fistula in either group. In all cases of group II, three endoloops were applied on the appendicular stump at a cost of 12711INR (4237 X 03), as shown in figure 3. However, in LA with handmade loop procedure, only a single vicryl (0) was used for making three loops at a cost of 635 INR only, as shown in figure 4. Table 1 shows the demographic details & outcomes in both groups.

Figure 3

Commercially available endoloop made up of vicryl (0): MRP 4237 INR.

Figure 4

Vicryl (0) surgical suture: MRP 635 INR.

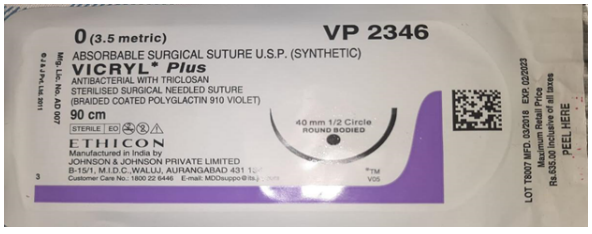


Table 1

Demographics & outcomes

Variables	Group I (n=50)	Group II (n=50)	p-value
Mean operating time (minutes)	44.7	44.4	0.326
Average hospital stay (days)	2.1	2.2	0.196
Morbidity	2	3	0.647
Note: no significant statistical differences in between groups			

Discussion

Laparoscopic appendectomy is now a day an important choice of treatment for acute appendicitis, after widespread use of laparoscopy. It has certain advantages like less wound infection, less requirement of post –operative analgesia, earlier discharge from hospital & return to normal activities & better cosmetic result [10, 11]. However, the cost of laparoscopic procedures is still on the higher side & this is one of the main drawbacks [12]. The cost of LA is based on the use of disposable equipments like endostapler, endoloops & trocars. In our study, we used three commercially available endoloops for securing the stump of appendix in group II patients at a cost of 12711 INR. In group I patients, only a single vicryl (0) was used for closing the appendicular base by making three loops, at a cost of 635 INR. So, it is obvious that the cost was a significantly different between the groups. In some studies, it is concluded that one endoloop was as safe as using 2 or more; if the appendix is minimally inflamed [13]. But in most of the studies, 2 endoloops were placed at the base of appendix & another endoloop or ligature was used to close the appendicular lumen distal to the endoloops before dividing the appendix [14, 15]. In our study, we also preferred putting two ligatures in the proximal portion of the appendicular base & another one a few millimeters distally. There were no significant differences noted in mean operating time, average length of hospital stay & complication rates in both groups. We also noticed no slippage of ligatures in both groups during intra-operative or postoperative periods. No patient in either group developed stump blow out or caecal fistula which indicated comparability of techniques in securing the stump. The small number of study population is the main limitation of this study. However, significant cost advantage makes the use of handmade loop the preferred operative technique.

Conclusion

Securing the appendicular stump with handmade endoloop during laparoscopic appendectomy is a cost-effective technique, without any impact on surgical outcome.

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