

## Use of percutaneous thread loop to hold the vermiform appendix during laparoscopic appendectomy

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### Abstract

**Introduction:** Laparoscopic appendectomy, although not as widely performed as laparoscopic cholecystectomy, it has got definite advantage over the conventional open procedure. Controversy exists regarding the closure of stump. Our institute practices intracorporeal knot tying using 3 ports. Difficulties are observed in three port technique to hold the appendix during knot tying. We use a percutaneous thread loop. Advantage of the use of loop was evaluated.

**Patients and method:** Prospective study was carried out during 18 months. Total cases were randomly divided in non-loop and with loop group. Operative procedure was same. Cases were compared in terms of operating time, post-operative hospital stay and complications.

**Results:** Total patients were 66. Thirty two in non-loop group and 34 in with loop group. Mean age was 27.89 yrs. Most of the cases were females (62%). Mean operating time was less in loop group although statistically not significant. There was no difference in post operative hospital stay. Use of loop was not associated with added complications.

**Conclusion:** Use of percutaneous loop to hold the appendix reduces the operating time and replaces the need of fourth port. It is safe and effective without any increased morbidity.

**Key words:** Laparoscopic appendectomy, Intracorporeal knot, Percutaneous loop

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The treatment of acute appendicitis had remained essentially unchanged since its first description by Charles McBurney in 1889 to the New York Surgical society<sup>1,2</sup>. In 1983, Kurt Semm offered an alternative, 'laparoscopic appendectomy' prior to the description of laparoscopic Cholecystectomy<sup>3,4,5</sup>. It was only in 1990 that Pier et al. reported on the first large series of laparoscopic appendectomies for acute appendicitis<sup>6</sup>.

Laparoscopic appendectomy has been shown in several randomized controlled trials to be superior to open appendectomy where post operative pain or use of analgesia<sup>7,8,9,10,11</sup>, number of post operative complications<sup>7,10,11,12</sup>, hospital stay<sup>7,11,12,13</sup>, and return to normal activities<sup>7,8,9,10,11</sup> are concerned. However, various technical aspects still need to be evaluated and standardized.

Although the surgical technique of laparoscopic appendectomy has been well established, controversy exists regarding closure of the appendiceal stump. In the early days of Laparoscopic appendectomy, the stump was closed with pre-knotted loops (Roeder loops or endoloops)<sup>14,15,16,17</sup>. After the introduction of laparoscopic linear staplers, it became "en vogue" to apply these in laparoscopic appendectomy, particularly for difficult cases such as perforation at the appendiceal base<sup>14,18,19,20</sup>. Findings have shown

both techniques to be safe, but both entail potential drawbacks. Linear staplers are expensive and are not feasible for our patients and leaving metal staples on the stump and in abdominal cavity can cause adhesion –related short bowel obstruction or formation of pseudopolyps in the cecum<sup>14,21,22,23</sup>. On the other hand, loops can slip, which can potentially lead to more post operative infections. Loops are not safe for closure of the caecum when the base of appendix is perforated if the inflammation of the appendix has involved the caecum as well<sup>24</sup>. If loops are too tight, they also can cut into the tissue or cause local necrosis, predisposing to stump leakage<sup>14</sup>.

In our institute, it is a routine practice to use intracorporeal knot for the appendiceal stump using three ports. With three ports, sometimes, intracorporeal knot tying is cumbersome to apply the knot right at the base as the appendix is not supported and warrants an additional port to hold the appendix. We have used a percutaneous polypropylene loop to anchor the appendix and it has been helpful to avoid those difficulties, need of another port and to save the operating time.

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## Materials and methods

This prospective study was carried out over 18 month period and includes the patients clinically diagnosed with acute appendicitis and operated laparoscopically at Kathmandu medical college. Early appendicular lump, appendicular perforation and converted cases were excluded from the study. The informed consent was taken from patients and their relatives for laparoscopic appendicectomy. The patients were divided into two groups. The first group included the patients undergoing laparoscopic appendicectomy without using anchoring loop, and second group included

laparoscopic appendicectomy with anchoring loop to hold the appendix.

**The anchoring loop** (Fig 1) is a manual made device made by threading the epidural needle with no-1 polypropylene and two ends of the thread are tied together. Its working technique is similar to shoemaker's needle. This loop is introduced into the peritoneal cavity along with the needle puncture in the right iliac fossa just at the level of appendix after the mesoappendix is dissected (Fig 2). Dissected free appendix is stabilized by holding it into the loop (Fig 3). Then the appendicular base is tied with intracorporeal knot (Fig 4).

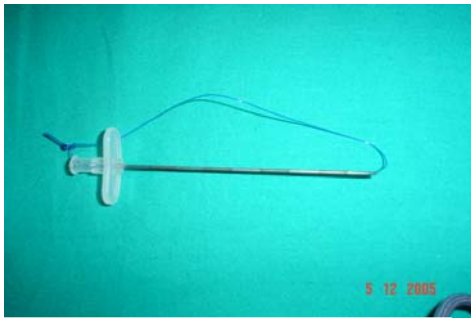


Fig 1: Anchoring loop



Fig 2: Loop being introduced



Fig 3: Appendix being hooked



Fig 4: Appendicular base tied.(intracorporeal knot)

**Operative procedure:** All of the cases are operated with three standard ports. Pneumoperitoneum is created with open technique through infraumbilical 12 mm port. Telescope is introduced. Diagnosis is confirmed and pelvic examination is done. Two other ports made, one suprapubic 5mm or 10mm and third at left iliac fossa 10mm or 5mm vice-versa. Later on camera is introduced through left iliac fossa or suprapubic port. Working ports are other two. Mesoappendix is dissected, appendicular artery clipped and divided. After the completion of

dissection, in group one, appendicular base was tied without holding the appendix whereas in group two, appendicular base was tied after holding the appendix with above mentioned anchoring loop.

The operating time, post-operative hospital stay and complications were compared between two groups. Data were analyzed with  $X^2$  test using SPSS 11.5.  $P$  value of  $<0.05$  was taken as significant.

## Result

During the study period, total 66 consecutive cases were evaluated. Mean age was 27.89years. (6yrs to 72yrs.). Maximum no of patients were in age group 21 to 30yrs. (Fig. 5). Most of the patients undergoing laparoscopic appendectomy were females i.e. 62%. Ratio is given in fig.6. Macroscopic pathological diagnosis by operating surgeon at the time of operation is given in Table 1.

Out of 66 patients, 32 patients were in group 1 i.e. loop was not used and 34 patients were in group 2 i.e. loop was used. (Fig 7). Mean age in group 1 patients was 25.7yrs whereas in group 2 it was 29.9yrs. Mean operating time in group 1 patients was 56.25min while in group 2 it was 43.82min. Post operative stay in both the group was almost same 2.65days Vs 2.14days. (Table 2)

Among all patients, five (7.6%) patients developed minor complications (Wound infection and fever). All had minor infection of umbilical port which settled with removal of stitch and drain. Three among them had fever too. This complication was observed in patients with suppurative appendicitis. There were no major complications although one patient had prolonged pain and discomfort in right iliac fossa. On investigation, her initial USG of abdomen had shown minimal collection suggesting hematoma which had settled spontaneously. Later, we lost the follow up this patient.

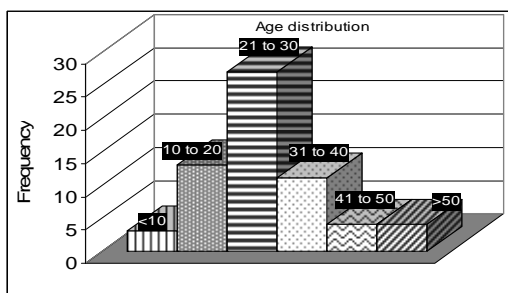


Fig 5: Age distribution

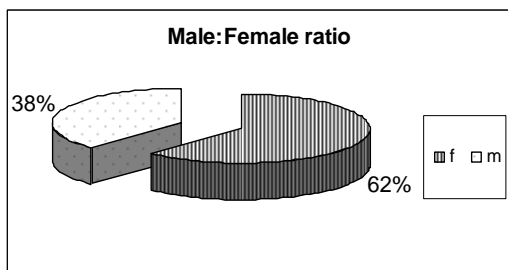


Fig 6: Male Female ratio.

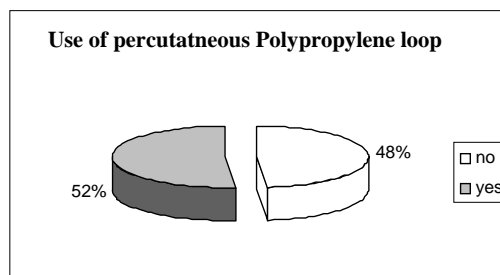


Fig 7: Use of percutaneous polypropylene loop

Table 1: Type of appendicitis

Diagnosis	No. of cases.
Catarrhal	9
Acutely inflamed	37
Suppurative	8
Gangrenous	5
Perforated (local)	3
Apparently Normal	4

Table 2: Comparison between two groups

	No loop	With loop	
No. of patients	32	34	
Mean age.(years)	25.7	29.9	
Mean operating time (minutes)	56.25	43.82	$P=>0.05$
Post op hospital stay (days)	2.65	2.14	$P=>0.05$
Post operative complications	2	3	$P=>0.05$

## Discussion

Reduction of surgical trauma and prevention of post operative morbidity are the pillars to the provision of patient safety. The laparoscopic approach to appendicitis has improved the outcome of appendectomy, but requires laparoscopic skills of the surgical team<sup>25</sup>. Appendectomy is performed by surgical team with varying experience in laparoscopic surgery. The technique was started at our institute by the surgeons after gaining sufficient experience in laparoscopic cholecystectomy and diagnostic laparoscopy. Right iliac fossa pain in children and females are occasionally difficult to confirm the diagnosis. Laparoscopy has an established role in it. This is the reason female to male ratio is higher in our series. Regarding the procedure, Basic principle of surgery is same as open appendectomy but port position varies according to surgeon's preference and experience. In almost all of our cases, we used the above mentioned port position. Mostly the left iliac fossa port which is in the middle of two is used for camera. We find it very convenient as this makes the better ergonomics for the intracorporeal knot tying.

There have been many reports and randomized controlled trials comparing endoloops and linear staplers but there are hardly any reports regarding the use of intracorporeal knot for appendicular base whereas in our institute this has been a routine practice. The experiments (Sedlack JD et al) have shown that laparoscopic square knots are as secure as open knots; removing the operating finger from the knot does not seem to affect the security of a well-tied square knot. The Roeder's and Fisherman's knots were the least secure of all laparoscopic knots in all sutures tested with the exception of polyglactin material<sup>26</sup>. Lopez PJ et al, has evaluated the reliability of intracorporeal knot tying comparing the hand, instrument and laparoscopic techniques and reached to the conclusion that there were no significant changes in suture tension after 5 minutes regardless of material or method of knot tying<sup>27</sup>. Our experience in all 66 cases has also shown that there is no increased risk of complications in laparoscopic appendectomy with intracorporeal knot. Intracorporeal knot tying needs two working ports to hold and tie the suture besides the camera port and there is need of another port to hold and manipulate the organ to be tied. In appendectomy, if fourth port is not made, the dissected appendix remains unsupported and putting the knot precisely at the base is difficult and time consuming particularly retrocaecal appendix. In the initial days, when laparoscopic intracorporeal knot tying was started for appendicular base we had much difficulty in placing the knot at the base and in some cases we had to make fourth port. After we invented the above mentioned loop technique, our operative procedure became much simpler, easier and time saving without any increased morbidity. Table 2 shows the comparison of different parameters we studied. There is not much difference in post-operative stay and complication between two groups and the data is statistically insignificant too. But, regarding the mean operating time, it is noticeably less (56.7min Vs 43.8min) in loop group although statistical significance is not seen. This could be due to small sample size. One greatest advantage of loop technique is that it clearly avoids the use of fourth port for stabilization of the appendix which is sometimes necessary. The fourth port had been used in some of our cases before this study started.

This percutaneous loop technique has been used as a suture passer for laparoscopic incisional hernia repairs to fix the intraperitoneal mesh. But in Medline data base search, we did not find any case report or original article on the use of this loop for appendectomy. Further large scale study is needed to evaluate the advantages of this technique and establish it in routine use. This loop technique

could be helpful for other laparoscopic procedures too.

### Conclusion

Use of percutaneous thread loop to hold the appendix during laparoscopic appendectomy is useful in terms of reduction of operating time, cost, safety and effectiveness. It is also useful to avoid 4<sup>th</sup> port in some difficult cases.

### Acknowledgements

The Acknowledgement goes to different units of department of surgery, department of Anaesthesia.

### References

1. Sweney IKJ, Keane FBV. Moving from open to laparoscopic appendectomy. *BJS* 2003; 20: 257-8.
2. De Utpal. Laparoscopic versus open appendectomy in West Bengal, India. *Chinese Journal of Digestive Diseases* 2005; 6: 165 - 169.
3. Semm K. Endoscopic appendectomy. *Endoscopy* 1983; 15: 59- 64.
4. Dubois F, Icard P, Berthelot G, Levard H (1990). Coelioscopic cholecystectomy. Preliminary report of 36 cases. *Ann Surg* 211: 60 - 62.
5. Kok de A (1983). The laparoscopic mini appendectomy. *Act Endosco.* 13: 5-6.
6. Pier A, Gotz F, Bacher C. Laparoscopic appendectomy in 625 cases: from innovation to routine. *Surg Laparosc Endosc* 1991; 1: 8-13.
7. Attwood SEA, Hill ADK, Murphy PG, Thornton J, Stephens RB (1992). A prospective randomized trial of laparoscopic versus open appendectomy. *Surgery* 112: 497 – 501.
8. Frazee RC, Roberts JW, Symmonds RE, Snyder SK, Hendricks JC, Smith RW, Custer MD, Harrison JB (1994). A prospective randomized trial comparing laparoscopic versus open appendectomy. *Ann Surg* 219: 725 – 731.
9. Hansen JB, Smithers BM, Schache K, Wall DR, Miller BJ, Menzies (1996). Laparoscopic versus open appendectomy: prospective randomized trial. *World J Surgery* 20: 17- 21.
10. Kum CK, Ngoi SS, Goh PMY, Tekant Y, Isaac JR (1993). Randomized controlled trial comparing laparoscopic and open appendectomy. *Br J Surg.* 80: 1599 – 1600.
11. Ortega AE, Hunter JG, Peters JH, Swanstrom LL, Schirmer B. The laparoscopic Appendectomy Group (1995) A prospective randomized comparison of laparoscopic appendectomy with open appendectomy. *Am J Surg.* 169: 208- 213.
12. Mompean JAL, Campos RR, Paricio PP, Aledo VS, Ayllon JG (1994). Laparoscopic versus open appendectomy: a prospective assessment. *Br J Surg* 81: 133-135.

13. Martin LC, Puente I, Sosa JL, Bassin A, Breslaw R, McKenney MG, Ginzburg E, Sleeman D (1995). Open versus laparoscopic appendectomy : a prospective randomized controlled comparison. *Ann Surg* 222: 256-262.
14. G Kazemier, K. H. in't Hof, S. Saad, H. J. Bonjer, S. Sauerland. (2006). Securing the appendiceal stump in laparoscopic appendectomy: evidence for routine stapling? *Surg Endosc.* 20: 1473-1476.
15. al Fallouji M (1993), Making loops in laparoscopic surgery: state of the art. *Surg Laparosc Endosc* 3: 477-481.
16. Houben F, Willmen HR (1998) Vereinfachte Appendektomie ohne stumpfversenkung: Erfahrungen aus 20-jähriger konventioneller und 5-jähriger laparoskopischer anwendung. *Chirurg* 69: 66-71.
17. Shimi SM, Lirici M, Vander Velpen G, Cuschieri A (1994) Comparative study of the holding strength of slipknots using absorbable and non absorbable ligature materials. *Surg Endosc* 8: 1285-1291.
18. Cristalli BG, Izard V, Jacob D, Levardon M (1991). Laparoscopic appendectomy using a clip applicator. *Surg. Endosc* 5: 176-178.
19. Daneill JF, Gurley LD, Kurtz BR, Cambers JF (1991). The use of an automatic stapling device for laparoscopic appendectomy. *Obstet Gynecol* 78: 721-723.
20. Klaiber C, Wagner M, Metzger A (1994). Various stapling techniques in laparoscopic appendectomy : 40 consecutive cases. *Surg Laparosc Endosc* 4: 205-209.
21. Lorken M, Marnitz U, Schumapilick V (1999) Frier intraperitonealer Clip als Ursache eines mechanischem Dunndarmileus. *Chirurg* 70: 1492- 1493.
22. Nottingham JM, (2002) Mechanical small bowel obstruction from a loose linear cutter staple after laparoscopic appnendectomy. *Surg Laparosc Endosc Percutan Tech* 12: 289-290.
23. Petrocelli P, Corsale I, Giannessi S, Cerone M, Colugnat K. Matocci GC (2003) Complicanze da suture meccaniche in chirurgia laparoscopica: occlusione intestinale da clip: Segnalazione di un caso clinico e revisione della letteratura. *Minerva Chir* 58: 591-594.
24. Paik PS, Towson JA, Anthone GJ, Ortega AC, Simons AJ, Beart RW jr (1997). Intraabdominal abscesses following laparoscopic and open appendectomies. *J Gastrointest Surg* 1: 188-193.
25. Sauerland S, Lefering R, Neugebauer E (2004) Laparoscopic versus open surgery for suspected appendicitis (Cochrane Review). In: The Cochrane Collaboration (ed) The Cochrane Database of Systematic Reviews, Vol. IV/2004 (CD-ROM). Update Software, Oxford, UK.
26. Sedlack JD, Williams VM, DeSimone J, Page D, Ghosh BC. (1996). Laparoscopic Knot Security. *Surg Laparosc Endosc.* 6 (2): 144-6.
27. Lopez PJ, Veness J, Wojcik A, Curry J. (2006). How reliable is intracorporeal laparoscopic knot tying? *J Laparoendosc Adv Surg Tech A.* 16(4): 428-32.