Clip Closure of The Appendicular Stump: A Safe Alternative to Endoloops?"

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ABSTRACT

Objective — *To compare the outcome of clip closure versus endoloop closure of appendicular stump.*

Study design — *Randomized controlled trial.*

Place & Duration of study — *Department of Surgery, Rawal Medical and Dental Hospital Islamabad & Dr. Ruth K.M. Pfau Civil Hospital Karachi, from June 2016 to December 2017.*

Methodology — *Patients of acute appendicitis undergoing laparoscopic appendectomy were enrolled and randomized into two groups. One group got closure of appendicular stump done with endoloops and the other group by titanium clips. Both groups were compared in terms of duration of surgery, mean hospital stay and postoperative complications.*

Results — *A total of 70 patients were included and divided into groups of 35 patients each. Of the total 47% of the patients were males. Mean age was 26.2 years. Duration of surgery was 33.5 minutes in the endoloop group and 24.5 minute in the clip closure group which was statistically significant. (p=0.032). Duration of hospital stay was same for both the groups which was statistically insignificant (p>0.05). Postoperative complications were same in both groups (p>0.05).*

Conclusions — *Use of endoclips is a safe and effective alternative to endolopps. It is cost effective without increasing postoperative complications. The duration of hospital stay was same but there was significant decrease in the operating time in clip closure group.*

Key words — *Laparoscopic appendectomy, Appendicular stump, Clip closure, Endoloop.*

INTRODUCTION:

Acute appendicitis is the most common surgical emergency requiring surgical intervention worldwide. It accounts for almost 25% of admissions in surgical wards and round about 40% of the surgeries are carried out in emergency.[1] Initial treatment consists of nil per oral regimen, antibiotics and pain killers with intravenous fluids but the definitive treatment of acute appendicitis is almost invariably surgery.[1] This can be done via open or laparoscopic approach. The laparoscopic approach is nowadays gaining popularity due to less postoperative pain, early discharge and being cosmetically favorable. After the advent of laparoscopy in general surgery, laparoscopic appendectomy has been done since 1983 and is described by many surgeons as the treatment of choice for acute appendicitis.[2] It has the advantage of better visualization of other intra abdominal organs for concomitant pathology or ruling out alternate diagnosis like ovarian cyst, salpingitis, ectopic pregnancy etc especially in females, which is a major advantage over open appendectomy.[2,3]

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Like every procedure it has some drawbacks like increased rate of intra abdominal collection and longer operating time which can be reduced by gaining surgical expertise.

In laparoscopic appendectomy, closure of the appendicular stump is a matter of debate and ongoing research. There are multiple methods tried for this purpose including endoloop, intracorporeal knot tying, use of ultrasonic knife, staplers etc. All methods have their own associated pros and cons. No research has shown that any of the methods is definitely superior to other. The ideal procedure for securing the appendix stump must be reliable, cost effective, easier to adapt and feasible with minimum side effects.[4.] This quest for the best method has compelled many researchers to do research in this field to find the best and comprehensive method of stump closure. In this study we divided the patients of laparoscopic appendectomy into two groups and compared two methods of stump closure i.e endoloop versus clips. Main outcome variables were post postoperative pain, wound infection, need for reoperation due to stump leakage and operating time.

METHODOLOGY:

This randomized clinical trial was carried out in Rawal General and Dental Hospital, Islamabad and Dr. Ruth K.M. Pfau Civil Hospital Karachi from June 2017 to December 2018 on patients of both genders with diagnosis of acute appendicitis on the basis of history and clinical examination supported by laboratory investigations. The sample size was calculated using openepi online sample size calculator for comparing two means keeping confidence interval at 95%. The patients were randomized into two groups of 35 patients each by online research randomizer which is a computer-based "pseudo-random number generator" used for randomization. Group 1 was the endoloop group and Group 2 was the clip closure group. Written and informed consent was taken from all patients. Patients with generalized peritonitis, palpable mass or phlegmon formation were excluded from the study. In all patients surgery was performed by surgeons of similar operative expertise. The patients were observed for postoperative pain on Visual Analogue Scale at 6, 12, 24 and 36 hours, duration of surgery, duration of hospitalization and wound infection. Wounds were examined starting from 2nd postoperative day and graded according to the Southampton wound grading system. Wounds having Southampton Grade II and above were considered to be infected. All the information was entered on a predesigned form. In all patients mesoappendix was sealed by ligasure. Appendicular stump was secured by endoloop in one group and by clips in other group. All the data were entered and analyzed through SPSS version 19. P-value was calculated for each variable. P-value of less than 0.05 was taken as significant. Chi-square and t test were applied where appropriate. All the record was kept confidential.

RESULTS:

In the endoloop group (n=35) 20 patients were females and 15 males. In the clip group (n=35), 19 were females and 16 males. Mean age was 24.6 and 26 years in the endoloop and clip method respectively. No definite statistically different characteristics were seen in both the groups in terms of gender, age, clinical features and duration of symptoms. The detailed demographics of each patient group is summarized in table I.

Among all the variables observed and measured for statistically significant difference, mean operating time was the most significant. It was observed that it was substantially reduced in the clip group as compared to the endoloop group. The p-value was found to be 0.032. No patient from either group required reoperation and no case of stump leak was seen in both groups. Postoperative pain was almost similar in both groups with mean pain score of 3.30±0.11 in the endoclip group and 3.20±0.42 in the endoloop group after surgery. No event of falling or clip cutting through the stump was reported. Wound infection was almost negligible with only 1 case of surgical site infection was reported in the clip group having Southampton Grade II and two cases seen in the endoloop group also falling in Southampton group II. Hospital stay was same in both groups with almost all patients discharged on 1st postoperative day. The key results are summarized in table II.

DISCUSSION:

Acute appendicitis is by far the commonest surgical emergency worldwide resulting in appendectomy which is the most common emergency surgery, specially in the younger age group.[5] Due to the increased number of this procedure multiple developments have been made in the technique. The most experimented and now widely accepted procedure is laparoscopic appendicectomy. Laparoscopic approach is specially feasible technically in elderly and obese patients.[3] It also has the advantage of being cosmetically favourable with a sound recovery. The most important step in this procedure is appendicular stump closure. Securing appendicular stump is critical because of the risk of leakage which can result in peritonitis.[6,7]

Table I: Demographic Distribution			
Variable	**Clips Group**	**Endoloop Group**	**p-value**
Male (n)	16	15	0.6
Female (n)	19	18	0.6
Age (Years)	26 ± 4.84	24.6 ± 4.70	0.2

Table II: Comparison Between Clip Group & Endoloop Group			
Variable	**Clip Group**	**Endoloop Group**	**p-value**
Duration of symptoms	2.6 Days	3 Days	0.35
Wound infection	01	02	--
Postoperative pain (VAS)	3.30 ± 0.11	3.20 ± 0.42	0.879
Per operative complication	None	None	--
Hospital stay	24 hours	28 hours	0.26
Reoperation	None	None	--
Duration of surgery (Minutes)	24.5±3.90	33.5±4.31	0.032*

Multiple methods have been developed and so far none has proven to be absolutely superior. The methods used commonly for this purpose are intracorporeal suturing, extracorporeal suturing, ligasure, harmonic, staplers and clip application etc.[8.]

Several studies have compared one or two methods of securing appendicular stump to indicate the merits and demerits. Commercially available endoloops are expensive but easy to use.[9] The total cost of staplers is also a major concern and thus various studies have suggested limited routine usage but some studies suggest its superiority over other methods in case of inflamed or wide base in terms of safety.[9,10.] It also has an advantage of securing both mesoappendix and appendix stump simultaneously. An alternative to endoloop is the surgeon made loop. This is difficult to construct and has liability to loosen during application at the target. Ligasure and vessel sealing devices are comparatively a newer option in securing the stump and artery so fewer studies are available to date regarding its usage.[10,11.]

Appendix stump can be tied with suture just like in open surgery. Knot can either be prepared within the abdomen (intracorporeal) or outside the abdomen (extracorporeal).This method is almost as safe as other methods and it is also much cheaper to use. The major disadvantage of this method is the increase in the operating time.[12]

Clip usage in laparoscopic appendectomy is widely researched nowadays. Multiple studies have shown its utility in laparoscopic appendectomy. It is technically very easy and it does not need a prolonged learning curve.[13,14] In this study we compared two common methods of appendicular stump closure that is clip closure and endoloop. Commercially available endoloops were used in one group and titanium clips in the other group.

In our study the most striking finding was the difference in operating time of both groups. The mean operating time for the endoclip group was significantly lower than the endoloop method. This finding correlates with other studies comparing different methods of stump closure which suggested markedly decreased operating time in clip closure patients.[15] There was a randomized trial conducted on 40 patients of acute appendicitis which compared clips and staplers. The results of that study showed the operating time of the clip method was 47.8 min. This time was markedly reduced in our study (24.5 min).

Various studies have compared the complications of different methods of stump closure.[9,16.]One prospective study took into account wound infection, reoperation and technical complications as major complications.[3] That study showed that out of 50 patients of endoclip closure, one required reoperation due to stump leakage and 6 patients experienced wound infection. The results of our study contradict with these findings where not a single patient required reoperation and only one patient developed wound infection. So clip method appeared to be safe in our study.

CONCLUSIONS:

Our study corroborates that both endoclip and endoloop can be used by surgeons in securing appendicular stump without expecting any major complication. The clips are technically easier, cheaper than endoloops and decrease the mean operating time.

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