



## “A STUDY COMPARING HEM-O-LOK CLIP VERSUS ROEDER’S KNOT IN BASE CLOSURE DURING LAPAROSCOPIC APPENDECTOMY”

<b>Dr. Ashish Chandak*</b>	Junior Resident in Department of Surgery, Dr. Panjabrao Deshmukh Memorial Medical College, Amravati. *Corresponding Author
<b>Dr. Narayan Umale</b>	Head of Department of Surgery, Dr. Panjabrao Deshmukh Memorial Medical College, Amravati.
<b>Dr. Kaustubh Sarda</b>	Assistant Professor, Department of Surgery, Dr. Panjabrao Deshmukh Memorial Medical College, Amravati.

**ABSTRACT** **Introduction:** Acute appendicitis is one of the most common surgical emergency in clinical practice. Although the surgical technique of laparoscopic appendectomy has been well established, concerns and controversy exists regarding the closure of appendiceal stump, which is a key point in the procedure. This study was designed to assess the ease of use of Hem-o-lok clips compared to Roeder's knot in the appendiceal stump closure and to compare operative time application time and hospital stay among the patients undergoing laparoscopic appendectomy.

**Objective:** To compare roeder's knot with hem-o-lok clip in laparoscopic appendiceal stump closure in terms of operative time, application time and hospital stay.

**Material and methods:** A study was conducted in our tertiary care hospital on 40 patients presented with acute appendicitis in surgery OPD during the period of January 2021 to June 2021. In the group A Hem-o-lok clips was applied at the base of the appendix. In the group B a roeder's knot is used in the same way. The appendix is transected between the ties leaving two loops/clips on the caecal end. **Results:** The mean operative time for group A was 35.55 min whereas it was 43.2 min in group B. The mean application time was 2.4 min in group A whereas it was 3.75 min in group B. Both operative time mean application time and hospital stay was insignificant with p value=0.89, 0.08 and 0.76 respectively.

**Conclusion:** During Laparoscopic appendectomy, appendicular base closure using either hem-o-lok clip or Roeder's knot is effective and there was no significant difference in terms of operative time and application time and hospital stay

**KEYWORDS :** Laparoscopic appendectomy, Acute appendicitis, roeder's knot, hem-o-lok clip

### INTRODUCTION:

Acute appendicitis is one of the most common surgical emergency in clinical practice with an estimated life time prevalence approximately 1 in 7. The incidence is 1.5 to 1.9 per 1000 in male and female with approximately 1.4 greater in men than in women<sup>1</sup>

Since its first description by Fitz in 1886, there have been lot of papers about acute appendicitis and the consequences including that of perforation. Over the years, the surgical management of appendicitis has advanced from open techniques to minimal invasive ones. The gold standard for appendectomy, now, is Laparoscopic Appendectomy (LA) even for complicated appendicitis. Studies have shown that LA has significant advantages<sup>2,3</sup>

These advantages include lesser postoperative pain, shorter hospital stay, faster recovery and return to normal daily activities, and moreover there is a reduced liability to the onset of surgical site infections<sup>4</sup>

Several modifications to the original technique with new materials have been introduced for optimizing and controlling the appendiceal stump closure, such as endoloop, double endoloop, ultrasonically activated scalpel, instrument-assisted knotting, bipolar coagulation, slipknot tying, metal clip, Hem-o-lok clip, and linear endostaplers. Currently, polymeric clips, preknotted loops, and staplers are being used for stump closure. The finest method is not known, and that topic is debatable<sup>5,6,7</sup>

This study was designed to assess the ease of use of Hem-o-lok clips compared to Roeder's knot in the appendiceal stump closure and to compare intra operative and post operative complications, hospital stay among the patients undergoing laparoscopic appendectomy

### MATERIAL AND METHODS:

We conducted our study in tertiary care hospital after ethical clearance and included 40 patients presented to the emergency department or surgical OPD with acute appendicitis during the period of January 2021 to June 2021. From our study, we excluded patients with acute perforated appendicitis and local or diffuse peritonitis and patients unfit/contraindicated for Laparoscopic surgeries. The patients were randomly divided into two groups according to the method used for appendicular base closure; in the first group, hem-o-lok clip was used,

while in the second roeders knot was used.

Operative time was estimated as the time from introducing the laparoscopic camera till extracting the appendix, while the time of application for each method was estimated from the introduction of hem-o-lok clip or roeders knot into the abdomen till transection of the appendix

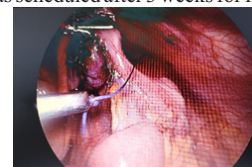
### Surgical Technique:

The patient was placed in a supine position, combined with the Trendelenburg position and left lateral position (10–15°, inclined towards the surgeon). The surgeon and an assistant stand on the left side, and the monitor is on the right side of the patient.

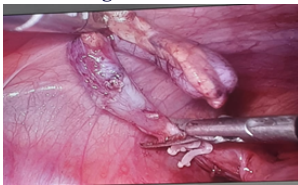
The surgical procedure is performed under general anesthesia. The bladder was decompressed with a Foley catheter to avoid injury during insertion of the suprapubic ports. Through the umbilicus, a 10mm port was inserted and pneumoperitoneum was created & another 5 mm port was inserted in the midline suprapubic region and one 5-mm trocar inserted in the left iliac fossa. After that, the abdominal cavity was inspected. The mesoappendix was skeletonized from the top to the base using cautery placed through the left lower quadrant port. The base of the appendix was then isolated.

In the group A Hem-o-lok clips are passed through the 10mm port and secured at the base of the appendix. Two more clips are placed 5 mm apart & a third one 1cm distal to the two. In the group B through the same port a Roeder's knot is introduced in the same way. The appendix is transected between the ties leaving two loops/clips on the caecal end. After resection of the appendix, it is retrieved through a 10 mm trocar.

Post-operative management was same for both the group. Both group were monitored for any complication till discharge. The skin sutures were removed in between postoperative day 7-10. Patients were followed up after 1 week postoperatively at outpatients' clinic, and another visit was scheduled after 3 weeks for further evaluation



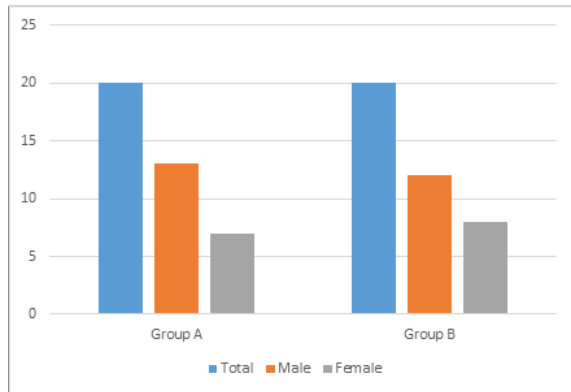
**Fig.1 Roeders knot before ligation of the base**



**Fig 2 Hem-o-lok clips close the appendicular base**

**RESULT:**

During the study period, 40 patients with acute appendicitis were operated laparoscopically. The hem-o-lok clip group (Group A) consisted of 20 patients (13 males, 7 females), while the roeder's knot group (Group B) consisted of 20 patients (12 males, 8 females).



**Figure no. 1: Age wise distribution of cases**

There were no significant differences between both groups concerning age, gender and preoperative clinical data (nausea, vomiting, temperature, RIF tenderness) or investigations (total leukocyte count, C-reactive protein)

**Table no. 1**

PARAMETERS	HEM-O-LOK CLIP	ROEDERS KNOT	p VALUE
AGE (years)	34.2	38.1	0.9452291
GENDER(M/F)	13/7	12/8	
CLINICAL DATA			
NAUSEA	18	19	
VOMITTING	13	14	
FEVER(Celsius)	38.2	38.53	0.7839024
RIF TENDERNESS	18	17	
INVESTIGATION			
TLC(* 1000)	10.13	9.98	0.9452291
CRP(mg/L)	32.05	36.75	0.7299161
SURGICAL DETAILS			
MEAN OPERATIVE TIME(min)	35.55	43.2	0.8916277
MEAN APPLICATION TIME(min)	2.4	3.75	0.0806883
MEAN HOSPITAL STAY(days)	2	1.9	0.7630955
INTRAOPERATIVE COMPLICATION	NIL	NIL	
POSTOPERATIVE COMPLICATION	NIL	NIL	

The mean operative time for group A was 35.55 min whereas it was 43.2 min in group B. The mean application time was 2.4 min in group A whereas it was 3.75 min in group B. Both operative time mean application time and hospital stay was insignificant with p value of 0.89, 0.08 and 0.76 respectively. The intraoperative and postoperative complications in both groups were not statistically different.

**DISCUSSION:**

Acute appendicitis is one of the most common surgical emergencies encountered, especially by junior doctors during on-call duties with emergency appendectomy making up 10% of all emergency abdominal surgeries.<sup>8,9</sup>

Since its first description by Fitz in 1886, there have been lot of papers

about acute appendicitis and the consequences including that of perforation. Over the years, the surgical management of appendicitis has advanced from open techniques to minimal invasive ones. The gold standard for appendectomy, now, is Laparoscopic Appendectomy (LA) even for complicated appendicitis. Studies have shown that LA has significant advantages.<sup>23</sup> The most suitable method for stump closure is still under debate, and actually there is no consensus on one method.<sup>10,11,12</sup>

Hem-o-lok clip is a non-absorbable polymer clip and the safety of its use for ureters and vessels clipping has been obviously declared in previous studies.<sup>13,14</sup> The comparison between hem-o-lok clip and endoloop for appendicular base closure has been documented in several studies in adult and paediatrics.<sup>15,16,17</sup>

This study has compared the application of hem-o-lok clip as a new technique for stump closure in our hospital to the roeder's knot. It is to be noticed that there were no significant differences between both groups regarding operative time, application time and hospital stay.

Hem-o-lok clip is safe, its application is very simple and does not require advanced laparoscopic skills and in addition the locking mechanism provides tactile feedback and secure closure. Although it is slightly more expensive than the roeder's knot. Polymer clips still have a limitation to be used in patients with appendix base more than 10 mm in diameter.<sup>18</sup>

Roeders knot has several advantages as an efficient, safe and simple technique as it was constructed with only a single suture. It also has no limitation or size cutoff regarding the appendicular base diameter.

**CONCLUSION:**

During Laparoscopic appendectomy, appendicular base closure using either hem-o-lok clip or Roeders knot is effective and there was no significant difference in terms of operative time and application time.

**Funding:** none

**Ethics approval:**

The study was approved by the Institutional ethical committee.

**Conflicts of interest:**

There are no conflicts of interest.

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