International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2014): 5.611

Study of Various Techniques of Appendicular Stump Closure during Laparoscopic Appendectomy

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Abstract: ***Introduction: Stump ligation & burial which was a standard technique in open appendectomy was replaced by knotting of stump in laparoscopic appendectomy. Various techniques of stump management includes Roeder's knot, Endoloop, Knotting at proximal (caecal end) & Bipolar coagulation distally, Bipolar coagulation only, Titanium clips, Endostapplers etc. Our Study is conducted in PDVVPF's Medical College, Ahmednagar where 40 diagnosed patients of appendicitis were subjected to laparoscopic appendectomy in last 6 months & divided in 4 groups. Material and Method: In our series stump was managed by using 1) Endo-loop 2) Intracorporeal knotting 3) Knotting at proximal (caecal end) & Bipolar coagulation distally 4) Bipolar coagulation only. These Four groups were followed for period of 3 months. Inclusion criteria 1 Patients of acute/recurrent appendicitis after valid informed consent. Exclusion criteria1) Patients who are unfit for laparoscopic procedure 2) Patients with appendicular lump. Results: Results were compared on following parameters 1 Operative time 2 Complications 3 Hospital Stay 4 Cost. The result of different groups are compared & it is observed that a feared technique of bipolar coagulation of stump in laparoscopic appendectomy is found to be safe effective, easily performed & reduces cost. Conclusion: Bipolar coagulation when compared with other techniques was found to be highly economical & effective in saving operative time without compromising any safety.***

Keywords: Laparoscopic Appendectomy, Bipolar Coagulation, Endo-loop, Intracorporeal knotting

1. Introduction

Acute appendicitis is one of the most common clinical presentations that require emergency surgery, with a lifetime incidence of about 8%. Surgical operations have evolved over the decades from various techniques of open appendectomies to minimally invasive procedures. However, there is still ongoing discussion as to the most efficacious surgical intervention[1].

Laparoscopic appendectomy is the widely accepted treatment for acute appendicitis. This approach offers the potential of less pain, shorter hospital stay, and quicker return to activities.

In laparoscopic appendectomy various techniques have been used for the management of the appendicular stump, such as Roeder knot, preformed suture loops (Endoloops), endoscopic linear cutting staplers (endo GIA), the Liga-Sure System, the Harmonic scalpel, and even bipolar coagulation[2].

The use of Bipolar Coagulation for appendicular stump has not been reported widely. Bipolar coagulation has been effectively employed in obstetrics and gynaecologic procedures same has also been used in general laparoscopic surgery for haemostasis[3].
The basic principle underlying Bipolar Coagulation is slow heating (45°–60°C) over a period of seconds that denatures the tissue proteins, causing them to lose their quaternary structure and solidify. The current only flows through the target tissues while the adjacent tissue is protected due to which depth of cauterization is limited to the area between the 2 electrodes[4].

2. Aims and Objectives

The aim is to analyse the results of various techniques for appendicular stump closure.

3. Material and Methods

In our series stump was managed by using
1) Endo-loop
2) Intracorporeal knotting
3) Knotting at proximal (caecal end) & Bipolar coagulation distally
4) Bipolar coagulation only.

These Four groups were followed for period of 3 months.

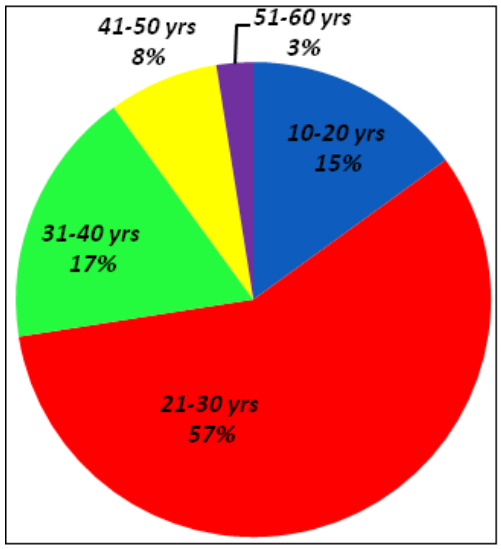
Inclusion criteria
1 Patients of acute/recurrent appendicitis after valid informed consent.

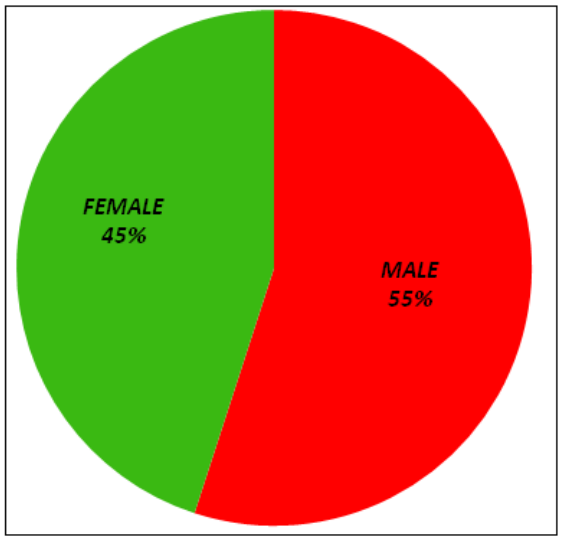
Exclusion criteria
1) Patients who are unfit for laparoscopic procedure
2) Patients with appendicular lump.

4. Results

A) Age Distribution

Out of 40 patients include in study, 57% belong to age group 21-30 years,17% belong to 31-40 years, 15% belong to 10-20 years, 8% in 41-50 years while only 3% in 51-60 years.



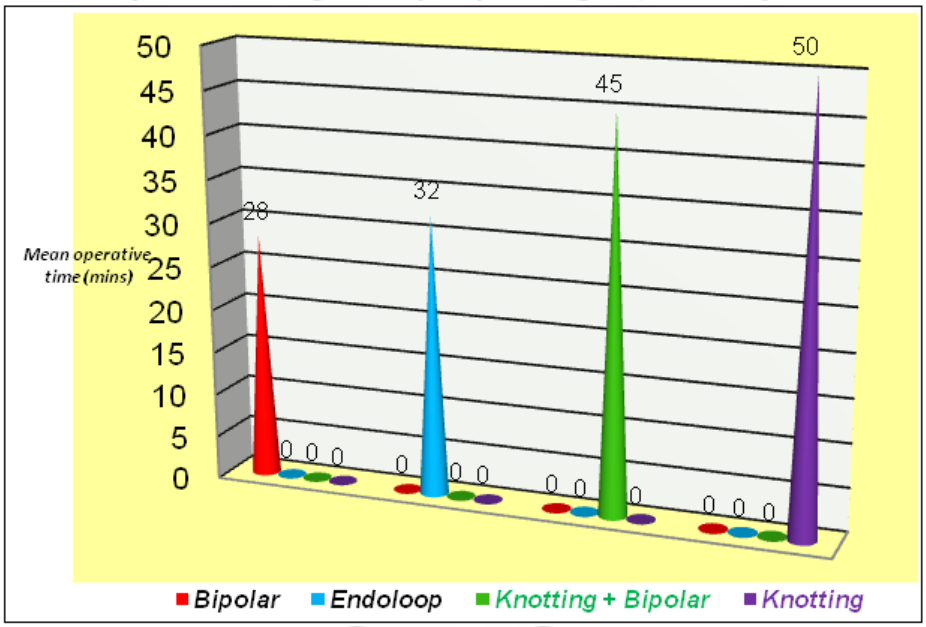


B) Sex Distribution

Out of 40 patients, 55% were male while 45% were female.

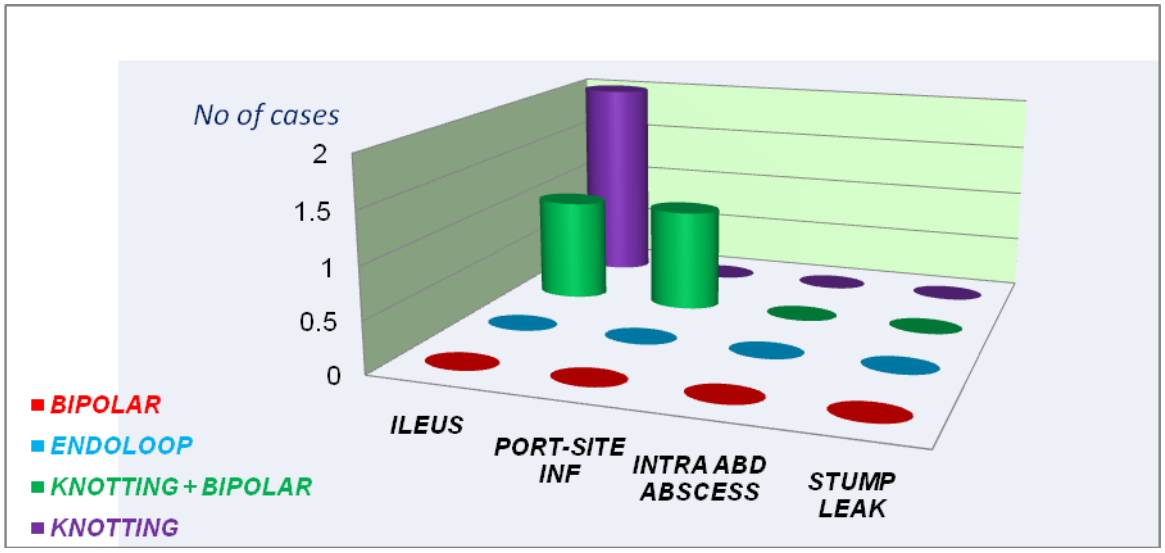
C) Operative Time

The mean Operative time was lowest for bipolar coagulation 28 minutes, for Endoloop it was 32 min, for knotting & bipolar it was 45 minutes while it was 50 minutes for knotting group.



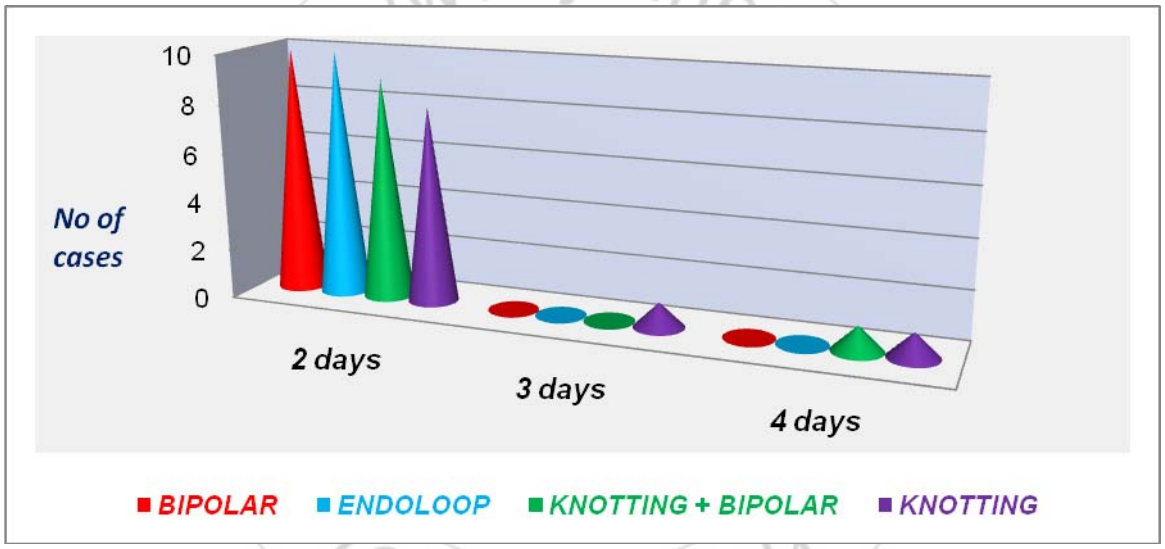
D) Complications

Out of 40 patients only 1 patient developed surgical site infection while 3 patients developed post operative ileus, none of the patient developed stump leak or intra abdominal abscess.



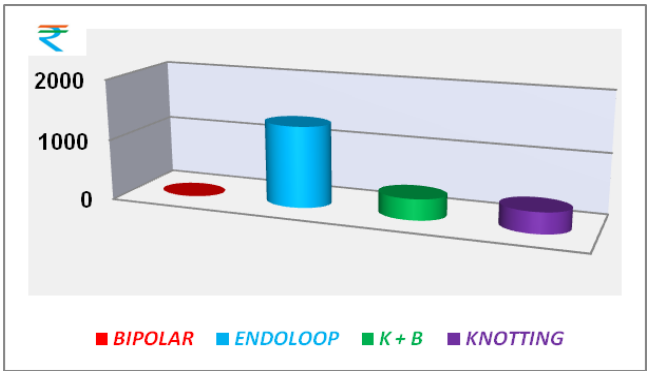
E) Hospital Stay

Hospital stay was 2 days for most of the patients, while for 3 patients it was more than 2 days as a result of post operative ileus.



F) Cost

In cost comparison Bipolar coagulation cost is zero, while that of endoloop cost around Rs 1000, while for knotting purpose a vicryl cost around Rs 250.



5. Discussion

A) Mean operative time

The mean Operative time was lowest for bipolar coagulation 28 minutes, for Endoloop it was 32 min, for knotting & bipolar it was 45 minutes while it was 50 minutes for knotting group. This is comparable with other studies as given below.

Sr No.	Study	Technique of Stump Ligation	Mean Operative Time (Mins)
1	Khanna Et Al[3]	Bipolar Coagulation	25
2	Naiditch J Et Al[5]	Endoloop	52.2
3	Ates M Et Al[6]	Intracorporeal Knot-Tying Suture	62.81

B) Post operative complications

In our study out of 40 patients 3 had paralytic ileus, while 1 patient had port site infection, while none of the patient had stump leak, intra-abdominal abscesses, fever. In our study none of the patient was converted to open surgery.

This was comparable with the study of Khanna et al[3] in which out of 60 patient complications observed in 3 patient where 1 patient was converted to open surgery due to excessive adhesions, while 2 patients had port site infections.

In our study paralytic ileus was related with excessive handling of gut which later was reduced with precise dissection & less bowel handling. Also the incidence related to port infections reduced with use of strict aseptic precautions and appropriate sterilization technique.

C) Duration of hospital stay

Hospital stay was 2 days for most of the patients, while for 3 patients it was more than 2 days as a result of post operative ileus. Which is comparable with other studies.

Sr No	Study	Method of Stump Ligation	Hospital Stay (days)
1	Khanna Et Al[3]	Bipolar Coagulation	3
2	Naiditch J Et Al[5]	Endoloop	3.7

D) Cost Comparison

In cost comparison Bipolar coagulation cost is zero, while that of endoloop cost around Rs 1000, while for knotting purpose a vicryl cost around Rs 250. Which can be compared with other studies.

S No.	Study	Method of Stump Ligation	Cost
1	Khanna Et Al[3]	Bipolar Coagulation	NIL
2	Kiudelis M Et Al[7]	Intracorporeal Knot-Tying Suture	€80
4	Delibegović S Et AL[8]	ENDOLOOP	€88.5

6. Conclusion

- The technique of laparoscopic appendectomy by bipolar coagulation is very simple and economical.
- The duration of surgery is lesser than standard technique of laparoscopic appendectomy; no clip applicators, needle holders or knot pushers are required, and no foreign materials like ligatures or clips are used.
- It is important to realize that this should be carried out by surgeons experienced in the use of bipolar cautery.
- It has shown good results in our study.
- This technique is versatile and needs to be explored further.

In a present era, Laparoscopic surgery is demanded by patients

a) In Rural areas at affordable cost,
b) In places like Medical colleges where patients expect surgery at low budget.

Bipolar coagulation when compared with other techniques is Effective in Saving Operative Time Without Compromising Safety and Economical.

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