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**ABSTRACT... Objective:** An inadequate closure of the appendix stump leads to intra-abdominal surgical site infection. Many studies show that the use of costly high tech instruments such as Endo-loops, Endo-GIA for transaction and closure of the appendiceal stump lowers the risk of infection. The Aim of this study was to evaluate the use of clips for closure of appendix stump as a safe and cost-effective method. **Study Design:** Descriptive Study. **Period:** Oct 2009 to Jun 2010. **Setting:** Shalamar Hospital, Lahore. **Materials and Methods:** Over a period of 9 months 36 patients were selected to have laparoscopic appendicectomy. All patients had stump closure by clips as used for cystic duct and cystic artery in laparoscopic cholecystectomy. No patient had Endo-loop or Endo-GIA for closure of stump. All patients had follow-up at one week and six weeks after discharge from hospital. **Results:** There was no clinical evidence of surgical site infection or leak from appendicular stump by this method. There was no discomfort in handling this instrument both for surgeon and scrub nurse. The price of the clips used was 4.30 Euros as compared to 112.00 and 232.77 Euros for the Endo-loops and Endo-GIA respectively. **Conclusions:** This study shows that clips can be used for stump closure without any additional risk to patient. It is also cost-effective. So appendiceal stump closure using clips is very convenient, an easy, safe, and cost-effective procedure.

**Key words:** Laparoscopic appendicectomy, clips, cost and safety.

**INTRODUCTION**

Acute appendicitis is most common surgical emergency. Although most commonly described as disease of childhood but can affect any age group. Its incidence is roughly 6-12%. It is slightly more common in males as compared to females. The life time risk is about 8%. Clinical presentation of acute appendicitis is very variable because of multiple factors like age, position and degree of inflammation. The classical presentation of acute appendicitis is central abdominal pain which shifts to right iliac fossa. Appendicectomy is one of the commonest general surgical procedures. In 1889 C. McBurney<sup>1,2</sup> presented a report on early operative intervention in acute appendicitis to the New York Surgical Society and five years later he formalized the procedure and described McBurney's incision<sup>2</sup>. The gold standard treatment of acute appendicitis is appendicectomy. First laparoscopic appendicectomy (LA) was reported in 1983 by a German Gynaecologist<sup>3</sup>. With the advancement in surgical techniques laparoscopic appendectomy has attained first

preference by most of surgeons at least in developed countries<sup>4</sup>. The cost of laparoscopic procedure is more than open appendicectomy in most of published studies<sup>5</sup>. The price of Endo-loop and Endo-GIA is one of major contributing factor in cost. The most laparoscopic appendectomies in our country, Pakistan are done in private hospitals and cost is borne by patients<sup>6</sup>. Different techniques have been described by different authors for LA in respect to port placement, handling the base of appendix, division of mesoappendix and removal of appendix. We have looked into an alternative for Endo-loop and Endo GIA i.e., closure of stumps by clips<sup>7,8,9</sup> (Liga clip extra by Ethicon).

**MATERIAL AND METHODS**

All patients who presented to us in 9 months time (October 2009 to June 2010) with acute appendicitis had laparoscopic appendicectomy and all of these had stump closure by clips. All these patients were under single consultant and surgery was performed by same consultant surgeon but these were admitted in different

hospitals. Age and sex of patients was noted in all cases. Operative time was calculated starting from first incision to last stitch. The presence and degree of inflammation was determined by histopathology reports. Clinical evidence of leak from stump and infection at stump site and postoperative complications were noted. Determination of hospital stay included post operative period only.

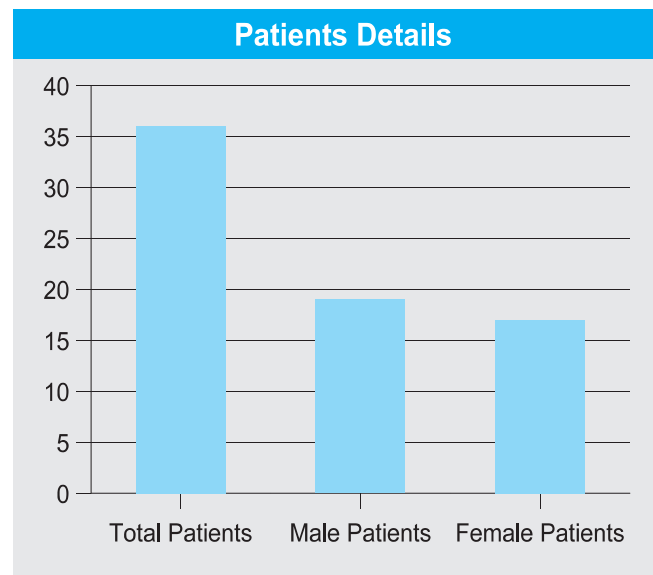
All patients had open laparoscopic technique; 10mm port was inserted just below umbilicus and Pneumoperitoneum created with carbon dioxide. Two additional ports 5mm and 10mm were placed in left iliac fossa and hypogastrium just below pubic hair line respectively. An empty urinary bladder was ensured to avoid injury to bladder. The appendix was identified and the mesoappendix was divided with diathermy hook. Base of the appendix was secured by using clips.

Two clips for proximal part and one at area just distal to point of dissection. If diameter of appendix was bigger, then after applying first clip, half of stump was cut and another clip was applied at remaining part and then divided. The specimens were retrieved through a 10 mm port. If appendix diameter was bigger and was expected not to fit into port then part of surgical glove was cut and used as bag. After retrieval of appendix peritoneal cavity was washed especially RIF area with vigorous amount of normal saline. All patients had three dose regimen of antibiotics. All patients had intravenous co-amoxiclav at time of induction just before incision which was continued. Only those patients had antibiotics for five days who had perforated appendix or abscess formation. The pain control was done by paracetamol infusion. Failure to relieve pain led to narcotic analgesia. Sips of water were started few hours after surgery. Diet was started when patients were fully awake and showed no signs of nausea or abdominal pain, the diet was progressed as tolerated. Patients were discharged home once they were afebrile, had good pain control and tolerated soft diet.

## RESULTS

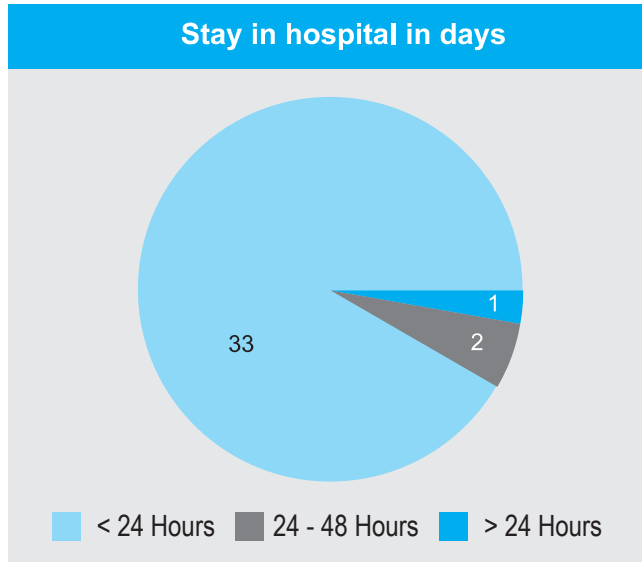
A total of 36 patients had laparoscopic appendicectomy in 9 months time. Out of these 17 patients (47.22%) were females and 19 (52.78%) were males.

Their ages were between 15 to 46 years and mean age was 23.17 years. One patient was converted into open for technical and safety reasons. Out of 36 patients, three (8.33%) had normal looking appendix at time of surgery and rest had acutely inflamed appendix. On histology 34 (94.44%) patients has had evidence of appendicitis. Average time for surgery varied from 22 to 125 minutes and mean time was 39.75 minutes. 33 patients were discharged after 24 hour after surgery. Two needed to stay for 48 hours. One patient stayed for 5 days as he had appendicular abscess at time of surgery and developed ileus for longer period but there was no evidence of collection in peritoneal cavity. One patient had infection at umbilical port site and he was 26 years old male. Two patients had large diameter of appendix. After applying first clip we divided diameter of appendix at middle and applied second clip to cover full thickness of appendix No retrieval bag was used for removal appendix. All specimens were removed through port except one which was put in bag made from surgical glove.



## DISCUSSION

The advent of laparoscopic cholecystectomy opened the floodgates for laparoscopy in all fields of surgery. Minimal surgical trauma, better look of intra abdominal viscera, less pain, better cosmetic results, early return to normal activity<sup>10</sup> have made laparoscopy very popular way of surgery nowadays. The popularity of LA has increased since its conception but it is still far from attaining the



status of "Gold Standard"<sup>11</sup>. Despite all advantages laparoscopic appendectomy has not gained much popularity in Pakistan not only in public hospitals but also on private sector. Husain et al mentioned average operative time from 18 minutes to 110 minutes<sup>12</sup>. Our mean operative time was 39.75 minutes and it is very much comparable with most published series.

Our main aim of study was to detect the safety of clips for closure of stump. Our study have shown that it is safe to use it and further more it is cheap as compared to other options . So it adds significantly to reduce cost of LA. Different authors have reported conversion rates varying from 0.55% to 21.5% Ng et al from Hong Kong<sup>13</sup>. The main reasons for conversion reported in the literature were difficult anatomy and complicated appendicitis (perforation, gangrene and abscess). We converted one case (2.77%) to open appendectomy. This was due to fact that appendix was gangrenous and perforated and anatomy was not clear as well. It means that our conversion rate was very comparable with any other published studies.

Bennett et al demonstrated a statistically significant reduction in hospital stay for LA as compared to open appendectomy<sup>13</sup>. Gilliam et al have shown LA to be safe and effective even in day care setting for selected patients<sup>14</sup>. In our study 33 patients stayed for twenty four hours, two for forty eight hours and one for five days. The mean stay was 2.67 days. This is certainly higher than other published literature. But this is due to reason that

our numbers patients were not high and one patient stayed for five days. Although there is mention of higher incidence of intra abdominal abscesses, but this is probably true about appendix which has perforated. One patient, who developed ileus, had abdominal ultra sound. There was no evidence of intra-abdominal abscess in this patient. None of our patients developed intra abdominal abscess. This may be due to limited number of patients.

Although in present era laparoscopic appendectomy is increasingly being used for by some surgeons, but there are concerns about its safety e.g., securing of the appendicular stump, cost-effectiveness, and the duration of the procedure. No doubt every step in surgery is important but the management of base of the appendix is a crucial step. There are many methods such as Endo-GIA; Endo-loops, Harmonic scalpel, etc can be used<sup>16,19</sup>. Some of these methods are costly and others are cumbersome. We have documented the efficacy, safety and cost-effectiveness of easily available clips which are not much used for closure of appendix stump and not very popular at present.

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Article received on: 15/03/2011

Accepted for Publication: 25/03/2011

Received after proof reading: 16/05/2011

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**Article Citation:**

Laparoscopic appendicectomy; clip-closure of appendix stump. Professional Med J Apr-Jun 2011;18(2): 233-236.