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Clinical Study of Abdominal Closure and Their Related Complications Following Midline Laparotomy

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ABSTRACT

BACKGROUND:This study is done to determine the methods and related complications of abdominal closure following elective and emergency midline laparotomy.

METHODS: Prospective study of 80 patients who underwent laparotomy in Department of General Surgery, Tirunelveli Medical College, Tirunelveli, for abdominal surgical problems needing either elective or emergency surgery. Out of these 80 patients, patients underwent laparotomy wound closure by continuous closure in 42 and interrupted closure in 38 patients. Time taken for closure of wound was noted and patients were followed up post operatively for wound complications like seroma, wound infection, wound gaping, burst abdomen and incisional hernia.

RESULTS:Seroma was found in 31 patients(38.8%) in continuous closure as compared to 10 patients (12.5%) in interrupted closure. In emergency procedures, 25 patients had seroma in continuous closure compared to 7 patients in intermittent closure. Wound infection was found in 29 patients (36.2%) of continuous group as compared to 8 patients (10%) in interrupted group. In emergency procedures, 23 patients had wound infection in continuous closure compared to 6 patients in intermittent closure. Wound gaping was noted in 15 patients (18.7%) in continuous group as compared to 2 patients (2.5%) in interrupted group.

CONCLUSION : Intermittent fascial closure is better compared to continuous closure as the postoperative complications following midline laparotomy closure is lesser in intermittent closure than continuous closure especially in emergency procedures.

KEYWORDS : Continuous closure; interrupted closure; seroma; wound infection; gaping

INTRODUCTION

Anterior abdominal wall, is a musculo-aponeurotic structure, attached posteriorly to the vertebral column, superiorly to the ribs and inferiorly to the pelvic bones. It not only protects and restrains the abdominal viscera but also acts indirectly to flex the vertebral column and as a store of fat. The common incisions to explore the abdominal cavity can be classified are Vertical incisions , Transverse incisions and Transeverse Oblique Incisions.The strength of the wound depends on the healing of the tissues and on the method of closure. Closure of abdominal wall can be done by Layered closure of abdominal wall , Mass closure , Double loop closure (continuous or interrupted and Double near and far prolene suture for laparostomy wounds. Fisher and Turner[12] showed that local infection, causes impaired wound healing.

MATERIALS AND METHODS

STUDY SAMPLE:

Patients who underwent elective and emergency midline laparotomy in general surgery ward during the

Study period:

STUDY PERIOD:

The study was conducted for 1 year

INCLUSION CRITERIA:

Patients undergoing elective and emergency midline laparotomy in general surgery during the study period

EXCLUSION CRITERIA:

Patients with previous abdominal surgery, Patients with advanced malignancy(inoperable malignancies), Patients with comorbid conditions like uncontrolled diabetes mellitus, immunocompromised, patients on cancer chemotherapy and on long term steroids.

EVALUATION PARAMETERS:

seroma formation: presence of serous discharge at operated site, Wound infection: was defined as redness, with secretion of either putrid caliginous smelly fluid or requiring antibiotic or surgical intervention,Wound dehiscence: defined as postoperative missing continuity of the abdominal fascia due to splitting along sutured lines, Burst abdomen: postoperative missing continuity of the abdominal fascia with bursting open along sutured lines, Incisional hernia: diagnosed clinically by inspection or palpation of a mass protruding through the abdominal wall or a defect at the site of a surgical scar,

Operative time:

Time of closure was noted from the start of the closure of abdominal fascia to the close of the abdominal fascia,Duration of hospital stay.

STATISTICAL ANALYSIS:

For qualitative data, significant difference between means was computed by using t-test. For quantitative data chi-square test was used.

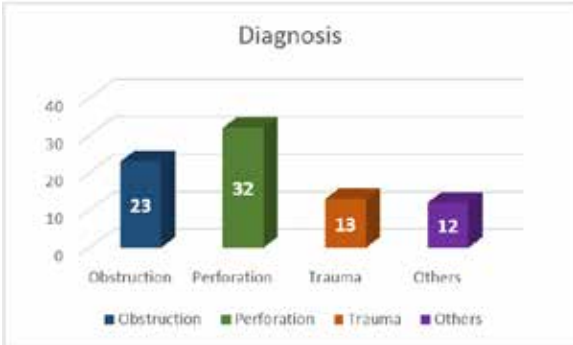
RESULTS

The study was conducted in the Department of surgery, Tirunelveli medical college. The study period was 1 year .Eighty patients were included in the study. Among these 62(77.5%) were males and 18 (22.5% were females. Most common age group was between 41 to 60 yrs. Patients were between age group 13 and 80yrs in the study. Most common age group was between 41-60years (52.5%)(table-1)

Table -1;AGE DISTRIBUTION

Age group	Frequency	Percentage
< 20 years	3	3.8
21-40 years	21	27.5
41-60 years	42	52.5
> 60 years	14	16.3

CHART-1 ; INTRA OPERATIVE DIAGNOSIS



Most common diagnosis was perforation in 30 patients(40%), and intestinal obstruction in 23 patients (28.7%) and trauma in 13 patients (18.8%).(chart-1). Continous fascial closure(fig-1) was done in 42 patients and intermittent closure(fig-2) in 38 patients. Out of these continuous closure was done in 8 patients in elective procedures and 34 patients in emergency procedures. Intermittent closure was done in 10 patients in elective and 28 patients in emergency procedures. Suture matter used was 1 prolene.Seroma was found in 31 patients(38.8%) in continuous closure as compared to 10 patients (12.5%) in interrupted closure. In emergency procedures, 25 patients had seroma in continuous closure compared to 7 patients in intermittent closure.(table-2)

TABLE 2-SEROMA

	Seroma		P Value
Mode of closure	Present	Absent	
Continuous	31 (38.8%)	11 (13.75%)	<0.001*
Intermittent	10 (12.5%)	28 (35.0%)	
Total	41 (51.3%)	39 (48.7%)	

*Chi square test

Wound infection was found in 29 patients (36.2%) of continuous group as compared to 8 patients (10%) in interrupted group. In emergency procedures, 23 patients had wound infection in continuous closure compared to 6 patients in intermittent closure.Wound gaping was noted in 15 patients (18.7%) in continuous group as compared to 2 patients (2.5%) in interrupted group. In emergency procedures, 12 patients had wound gaping in continuous closure compared to 2 patients in intermittent closure.

Burst abdomen(fig-3) in 5(6.3%) patients in continuous closure and none in intermittent closure. In emergency procedures, 4 patients developed burst abdomen in continuous closure compared to none in intermittent closure.1(1.3%) patient developed incisional hernia following continuous closure and none in intermittent closure.

Average time taken for continuous closure was 11.65 mins and 18.47 mins in interrupted closure. Average hospital stay was 14.14 days in continuous closure and 9.63 days in interrupted closure patients.

Fig-1; continuous closure on progress

Fig-2; intermittent closure

Fig-3; burst abdomen

DISCUSSION

The history of surgery is as old as that of human beings on the earth and so is the history of abdominal diseases of mankind. The history of Indian surgeons dates back to the era of Sushruta, who had a great skill in meticulous surgery. Hippocrates Ulus Corneilius, the father of concepts of inflammation, in his book "De Medicina" has described, how hand has a role in curing a disease apart from medicines and diet. He says "the surgeon should be young, with a strong and steady hand, which never trembles, ambidextrous, with a vision sharp and clear, and spirit undaunted, filled with pity, so that he wishes to cure his patient".

In 1941, Jones[1] and associates reported a burst abdomen rate of 11% when incisions were sutured with two layers of catgut, and 7% when sutured with catgut for peritoneum and interrupted steel wire for the anterior rectus sheath. However only one burst abdomen occurred in 81 operations after steel wire closure with interrupted mass far-near sutures incorporating all layers, apart from skinDudley[2] in 1970 observed that ischaemic necrosis in relation to a suture is the outcome of devascularising of the bite and continued pressure exerted by any distractive force at the suture-tissueinterface. In mass closure, a deep bite of tissue provides more cushioning effect and therefore less strangulation of tissue.

Kirk[3] in 1972 had no wound disruption in 186 laparotomies closed with continuous all coat nylon. He also noted that the technique of mass closure with nylon, significantly reduced the rate of wound dehiscence. In paramedian laparotomies, Goligher [4]in 1975 reported one burst abdomen and no incisional hernias among 108 cases, using all coats interrupted steel wire sutures. Martyak and Curtis [5] in 1976 closed 280 midline wounds with all coats continuous nylon, again without a single wound dehiscence and a similar finding was reported by Leaper [6] in 1977 in 120 laparotomies subjected to mass closure using steel wire.

Poole GV et al[7] in 1984 found that simple interrupted suture technique was unaffected by suturetension, but was generally inferior to the running stitch in terms of wound bursting strength. They recommended that closing midline abdominal fascial wounds with a running suture may be a superior method of closure in clean, incised wounds.

Trimbos JB et al[8] in 1992 found that continuous closure of laparotomy wound was faster. They concluded that a running polyglyconate

suture was better choice for closure of abdominal wall following midline laparotomy. Weiland DE, Bay RC and Del Sordi [9] from their meta-analysis study in 1998 suggested that continuous closure with non-absorbable suture should be used to close most abdominal wounds; but however, if infection or distention is anticipated, interrupted absorbable sutures are preferred. According to them mass closure was superior to layered closure.

In 1997, Nigge Brugge et al[10] reported a new technique of Continuous Double Loop Closure (CDLC) in animals which resists high intra-abdominal pressure. In 2001, double near and far prolene suture closure was explained by RA Malik and NA Scott[11] for patients undergoing reconstruction of an abdominal wall laparostomy defect.

The common incisions to explore the abdominal cavity can be classified as:

1. Vertical incisions :A) Vertical Midline Incisions,B) Vertical Paramedian Incisions- Rectus retracting paramedian incision, Rectus splitting paramedian incision,Lateral paramedian incision. They can be Supra umbilical, Infra umbilical or Both
2. Transverse incisions A) Supra Umbilical,B) Infra Umbilical- Maylard's incision, Pfannensteil incision
3. Transeverse Oblique Incisions-A) Kocher's incision,B) Inverted 'V' shaped incision,C) McBurney's incision,D) Rockey Davis incision,E) Lanz incision

Closure of abdominal wall can be done by –

i) Layered closure of abdominal wall: Consists of suturing of peritoneum, layers of rectus sheath separately by using absorbable or nonabsorbable suture material close to edge of the incision. The disadvantage of this method is that the suture can cut out, especially if the tissues are poor.

ii) Mass closure : Jones et al first reported the use of interrupted mass near and far suture technique in 1941. This technique incorporates all the layers of abdominal wall except skin. Wide bites must be taken, a minimum of 1cm from the wound edge, and placed at intervals of 1cm or less. The suture length should measure at least four times the wound length, when suture is placed on tension as may occur during abdominal distention.

For the midline incision, all layers of abdominal wall except skin and subcutaneous fat are incorporated and then the skin is closed. A similar technique is used for the paramedian incision by picking up the anterior and posterior rectal sheaths. The transrectus incision will incorporate the medial sliver of rectusmuscle in suture loop.

Transverse and sub-costal Kocher's incisions also can be closed with this technique. Mass closure is impossible only with the lateral paramedian incision.For this incision, the posterior rectus sheath with the peritoneumand the anterior rectus sheath, are closed separately.

iii) Double loop closure (continuous or interrupted): Jones and colleagues, Abel and Hunt have reported series showing satisfactory healing of vertical incisions when the double loop concept was used. The double loop closure consists of an inner and an outer loop. It enters through all layers of abdominal wall at a distance from wound edges and again enters through anterior fascia, rectus muscle and posterior fascia, and close to the wound edges.

Importance of double loop closure was on increasing the tensile forces on the wound, the outer loop with more tissue than the inner loop, tends to pull the inner loop tight. Thereby achieving perfect opposition instead of divergence. Burleson proposed that because of this mechanism, patients experience less wound pain while coughing, when laparotomy wound is closed with a double loop. Reduced wound pain has been found to reduce the risk of pulmonary complications. But laparotomies closed with double loop technique cannot withstand an increased intraabdominal pressure.

iv) Double near and far prolene suture for laparostomy wounds :Laparostomy, leaving the peritoneal cavity open to heal by granulation is increasingly considered to be safe and effective technique for the management of intraabdominal sepsis. The large cavity produced by laparostomy heals by granulation from omentum and viscera, often leaving a abdominal defect.

The technique of double near and far prolene suture closure should be considered in patients undergoing reconstruction of the abdominal wall laparostomy defect.

Techniques of fascial closure in elective and emergency midline laparotomy differs among surgeons. In this study, postoperative complications seroma, wound infection, wound gaping, burst abdomen ishigher following continuous fascial closure compared to intermittent closure. In emergency procedures seroma, wound infection, wound gaping, burst abdomen is higher in continuous closure patients compared to intermittent group. Time taken for closure is longer in intermittent compared to continuous closure groups. Long term follow up is necessary to assess the occurrence of incisional hernia.

CONCLUSION:

Intermittent fascial closure is better compared to continuous closure as the postoperative complications following midline laparotomy closure is lesser in intermittent closure than continuous closure especially in emergency procedures.

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