

A Comparative Study of Single Layer Closure and Conventional Layered Closure of Laparotomy Wounds.

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Abstract: Traditionally, a laparotomy wound closure and intestinal anastomosis are done by co-opting the various layers anatomically by separate layers of suture. The newer method of closure is known as single layer closure (mass closure) technique has come into vogue. We have undertaken this study to find out the immediate and late complications in both the types of closures. In this retrospective study, we have taken 1000 cases of each of the closure techniques from the theatre register and the case records of K J Hospital, Chennai over a period of seven years from 2007 – 2014. During this period, suture material used was vicryl and ethilon since we have discontinued the usage of catgut following the results of our previous study which showed that which catgut reacts with the pre formed antibodies in certain individuals who are non vegetarians and predominantly mutton eaters. In the present study, we observed that the incidence of seroma, wound infection, burst abdomen and incisional hernia were more in layered closure and practically zero incidence was observed in single layer closure.

INTRODUCTION

The anatomic planes of the abdominal wall are made up of multiple muscular and fascial layers that interdigitate and unite to form a sturdy, protective musculofascial layer that protects the visceral organs and provides strength and stability to the body's trunk. This anatomy varies with respect to the different topographic regions of the abdomen. The general anatomic layers of the abdominal wall are skin, subcutaneous tissue, superficial fascia, muscle, extra peritoneal fascia and peritoneum.

Once the surgeon makes an incision in the body for access to internal organs the incision necessarily has to be closed. It is one of the most common procedures practised in operative surgery. Abdominal wound closure is very important with regard to the region of interest and the incision. There are two types of closures i.e., single layer closure (SLC) or mass closure and conventional layered closure (CLC) which is an anatomical closure. The technique of repairing the incision varies in these two procedures.

Mass closure or single layer closure (Figure-1) is the en masse closure of all the layers by individual sutures. This method allows the even distribution of tension across the entire length of the suture, resulting in minimization of tissue strangulation. The goal is approximation of tissue edges to allow healing by scar formation.

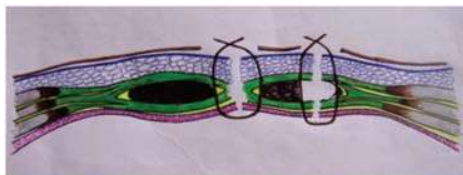


Figure 1 : Diagram of single Layer Closure technique in midline incision and rectus muscle splitting incision

Conventional Layer Closure (Figure–2) is the sequential closure of each tissue layer separately by continuous interlocking of running stitches. This method recreates the anatomical planes.

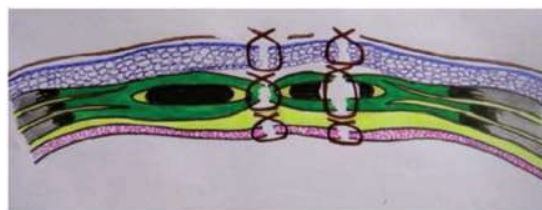


Figure 2 : Diagram of conventional Layer Closure technique in midline incision and rectus muscle splitting incision

The usage of suture materials has undergone a revolutionary change for the better. Originally catgut was the material of choice because it got absorbed in a short period of time depending on whether it is plain or chromic. The basic constituent of catgut is collagen derived from the submucosal layer of the small intestine of healthy sheep/goats¹. Suture material revolution has brought newer materials into practice with better results. Healing is the inherent property of all living tissue and is always preceded by inflammatory response which brings cellular and humeral components to the wound site. There must be sufficient space to accommodate these binding materials which are prerequisite for the formation of fibrous tissue. This in turn contributes to the tensile strength of the healed wound.

The complications of surgery became common with increase in number of surgeries performed. This led to advent of synthetic and natural, absorbable and non absorbable suture materials. Use of various combinations of suture materials for closure of laparotomy incisions, did not bring down the rate of complications of laparotomy to an appreciable level. This led to changes in the technique of closure of laparotomy incisions. The conventional closure of incision layer by layer was given up and all the layers were closed en masse². Until recently, layered closure of abdominal wall was considered better, with great emphasis particularly on closure of peritoneal layer. It is now fully realized, both from clinical and laboratory animal studies that the healing

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of an incision takes place by formation of a dense fibrous scar that unites the opposing faces of the laparotomy wound en masse. The purpose of sutures is to co-apt wound edges, and to act as a splint, while this dense fibrous scar deposits and matures. The ideal method of wound closure should be, technically simple, free from complications of burst abdomen, incisional hernia and persistent sinuses, comfortable to the patient and leave a reasonably aesthetic scar.

MATERIALS AND METHODS

This retrospective study included 2000 patients who were admitted in the Department of Surgery in KJ Hospital Research and Postgraduate Centre, Chennai over a period of seven years from 2007-2014 for abdominal problems which needed either elective or emergency surgery. The age group of patients ranged from 9-82 years with mean age of 45.5 years. The female to male ratio was 1:3. The patients were equally divided into 2 groups. Out of these 2000 patients, 1000 had their abdominal walls closed by single layer closure technique and the remaining 1000 patients by conventional layered closure and they were designated as Group 1 and Group 2 respectively. All single layer closures were done by the same surgeon whereas different surgeons performed conventional closures. In this study, 20 cases were of intestinal anastomosis by single layer closure which were done with the help of Mischel's clamp (Figure 3). Conventional intestinal anastomosis is serosa to serosa. The next layer is through and through stitches covering all the layers at the cut end of the intestine taking special care to make the corners leak proof. The application of Mischel's clamp help in apposition of the cut ends and prevents suture line leak.



Figure – 3: Mischel's clamp for single layer intestinal anastomosis

In Group I the abdomen was closed using the single layer closure technique in which all layers of the abdominal wall except the skin and subcutaneous tissue were sutured separate. In Group II, the abdomen was closed in layers. Types of suture materials used for the surgeries in this study included vicryl, and ethilon as we have discontinued the usage of catgut following our previous study which showed catgut reacts with preformed antibodies in certain individuals who are non vegetarians and predominantly mutton eaters³. Skin was closed with non absorbable material and drains were used wherever necessary, through a separate stab incision.

All patients received suitable antibiotics generally parenterally for 2-3 days and orally for 5-7 days. Antibiotics were continued only whenever indicated upto 10 days. Types of antibiotics given included: ciprofloxacin, taxim, amikacin and gentamycin. The wounds were examined on 3rd, 5th, 7th and 9th or 10th post operative days and the condition of the wounds were noted. Drains wherever employed were removed on 2nd or 3rd day unless required. The sutures were removed between 7th and 10th day in both the groups

and they were examined for abdominal distension, vomiting, hiccup and chest infection. The occurrence of seroma and wound infection was also noted. Regular examination of the wounds for signs of wound gaping and burst abdomen was done. The patients were followed up post operatively for a period of seven years.

RESULTS & ANALYSIS

The study of post operative complications that occurred in two groups showed that 126 patients (12.6%) of the conventional layered closure group had post operative complications like wound infection, wound gaping, and incisional hernia whereas no complications were observed in patients of single layer closure group. (Tables 1,2,3)

Table 1: Type and number of surgeries by Single Layer Closure & Conventional Layer Closure

Type of surgery	Type of closure		
	Single layer	Conventional	Total
Appendectomy	207	124	331
Cholecystectomy	153	84	237
Nephrectomy	38	103	141
Ureterolithotomy	12	7	19
Renal Transplant	78	0	78
Hernia repair	199	110	309
Gastric surgery	90	55	145
Exploratory laparotomy	121	83	204
Adhesion repair	23	0	23
Splenectomy	6	2	8
Intestinal repair	73	32	105
LSCS	0	138	138
Sterilization/ Reversal	0	101	101
Total Abdominal Hysterectomy +/- Bilateral Salpingo-oophorectomy	0	161	161
Total	1000	1000	2000

Table-2 : Complications in single and conventional layer closure

Complications	Single Layer Closure	Conventional Layer Closure	Percentage
Wound infections	0	60	6
Wound gaping	0	26	2.6
Burst abdomen	0	0	0
Incisional hernia	0	40	4
Total	0	126	12.6

Table – 3: Comparison of post operative complications in earlier studies with the present study.

Study	Wound Infection		Wound Gaping		Burst Abdomen		Incisional hernia	
	SLC	CLC	SLC	CLC	SLC	CLC	SLC	CLC
Jones et al 1941	-	-	-	-	0%	3.9%	-	-
Togart 1967	17%	29%	0.87%	3.4%	-	-	-	-
Shukla et al 1981	0.5%	16.9%	2%	13%	-	-	0%	3%
Singh et al 1981.	6.6%	16.6%	0%	10%	-	-	0%	6.6%
Bucknall TE et al 1982	-	-	-	-	0.8%	3.8%	-	-
Sharma et al 1986	-	-	-	-	4.7%	12.3%	-	-
Banerjee & Chatterjee 1989	-	-	-	-	3.6%	7.27%	-	-
Choudhary&Choudhary 1994	22.5%	47.5%	-	-	0%	3.75%	-	-
Dr.K.Jagadeesan et al 2014	0%	6 %	0%	2.6%	0%	0%	0 %	4%

DISCUSSION

The present study was geared towards comparing two different techniques of laparotomy wound closure. The technique of laparotomy wound closure is one of the important factors in preventing post-operative complications like wound infection, burst abdomen and incisional hernia. Different workers have studied the merits and demerits of these two methods for the past 5 decades. Ischemic necrosis in relation to a suture is the outcome of devascularisation of the suture site and continued pressure exerted by any disruptive forces at the suture-tissue interface. In mass closure (Single Layer Closure), a deep bite of tissue provides more cushioning effect and therefore less strangulation of tissue. The introduction of this technique produced quite dramatic improvements in the results observed by Bucknall TE, Cox PJ and Ellis H⁴. According to them mass closure was superior to layered closure. Study by Banerjee and Chatterjee⁵ showed, single layer closure took about 10 minutes lesser time than conventional layered closure. Reduction in operative time prevents anesthetic hazards, reduces the cost of anesthetic agent and saves the time of the surgeon. Different studies have reported postoperative complication rates which are definitely less in single layer closure than in conventional layered closure. Irvin et al⁶ found that wound infection was responsible for tenfold rise in the incidence of burst abdomen and incisional hernia. Tearing through the weak infected tissues with intact suture is the main cause for wound dehiscence. Our study indicated that in the conventional layered closure group, the incidence of wound infection was 6%, wound gapping was 2.6%, burst abdomen was 0% and incisional hernia was 4% whereas none of these complications were observed in the single layer closure group (Table- 3). In the present study no incisional hernia occurred in single layer closure group (0%) and in conventional layered closure group the incidence of incisional hernia was 4%. The patients who developed incisional hernia in the present study had a strong history of having their previous surgery done with conventional closure. It was concluded that the single layer closure has got definite advantage over conventional layered closure. Single layer closure is time saving, cost effective, reduced anesthesia time which helps in faster recovery, post operative morbidity is minimized and tissue strangulation is minimized, i.e. the thickness of the suture material (No.1 ethilon). Whereas in the conventional layer closure, the entire suture line gets strangulated and became avascular. Vascularity is essential for the supply of inflammatory products -

cellular and humeral. This in turn leads to perfect wound healing with better tensile strength.

Incisional hernia is common after wound infection. Fischer and Turner reported that 88% of patients requiring repair of incisional hernia had wound infection in their study⁷. Grace and Cox⁸ found that burst abdomen was an important predisposing factor for the occurrence of incisional hernia. No incisional hernias occurred in the single layer closure study group of Shukla et al⁹ and Singh et al¹⁰. However in conventional layered closure group Shukla et al⁹ had 3% and Singh et al¹⁰ had 6.6% of incisional hernias. The present study proves single layer closure is free from all the above complications.

CONCLUSION

Single layer closure technique offers certain definite advantages over the conventional layer closure technique with respect to the time required for closure of the incision, incidence of wound dehiscence and incisional hernia. It is cost effective and has reduced anesthesia time hence faster recovery. It minimizes postoperative morbidity and tissue strangulation thus increased vascularity and better supply of inflammatory products that will help perfect wound healing with better tensile strength.

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LITERATURE REVIEW

ATTITUDE OF MEDICAL PROFESSIONALS REGARDING CONTROVERSIAL ISSUES IN KIDNEY DONATION/TRANSPLANTATION N Almeida, RF Almeida, K Almeida, A Almeida Indian J. Nephrology 2016 ; 26; 393-397

There is a dire need to evaluate new strategies to bridge the wide kidney demand-supply gap. The current study examined the attitude of medical professionals regarding controversial issues pertaining to transplantation. A questionnaire, presenting controversial issues related to kidney transplantation, in an agree-disagree format with supporting reasons, was employed. The research was exploratory. Data were analyzed quantitatively and qualitatively. The sample comprised 140 doctors from Mumbai (mean = 38.1 years, standard deviation = 17.95; Males = 44.3%, Females = 55.7%). Whereas 47.1% of the participants felt that live donors should be given incentives for kidney donation, others (52.9%) disagreed, fearing commercialization and illegal activities. The eligibility of patients with HIV/hepatitis for a transplant was denied by 52.9% because of poor outcomes, with the others (47.1%) maintaining that these individuals too had a right to live. A substantial majority (90.7%) of the participants maintained that organ donors should be given priority in the event of a future need for an organ because their previous humane act should be rewarded (47.1%). Most of the participants (91.4%) felt that individuals from the higher socioeconomic strata should not receive preference for kidney transplantation. A majority (77.1%) of them were also against kidney selling getting legalized. Compulsory possession of a donor card elicited mixed responses, with some accepting (56.4%), but others rejecting (43.6%) this idea as donation was perceived to be a voluntary act (33.6%). While compulsory kidney donation found favor with 44.3%, it found disfavor with others (55.7%). This study will benefit transplant healthcare personnel to formulate new policies in relation to kidney donation/transplantation.