# **Comparative Study between Stapler and Suture for Wound Closure in Midline Laparotomy patients in Emergency Ward**

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**ABSTRACT:-** Surgical wound closure is done for proper closure, minimal wound infection and minimise surgical scar. There are various techniques of closure. Here we studied 100 patients in the emergency ward who underwent midline laparotomy. Skin closure time is dramatically less in the group of staplers. Wound infection rate of both the groups are comparable, although lesser in staplers. Wound infection rate increases with increased thickness of the skin and subcutaneous tissue. Ugly scar is the consequence of wound infection. Stapler do not form ugly scar in no infected midline laparotomy wounds.

**KEYWORDS:-** skin stapler, non-absorbable suture, skin thickness, wound infection, ugly scar.

### I. INTRODUCTION

Any surgical intervention will result in a wound in order to get access to and deal with the underlying pathology. In this situation, the surgeon's task is to minimize the adverse effects of wounds, remove or repair the damaged structures and harness the process of wound healing to restore function.

The principle aims of tissue repair are rapid acquisition of strength with minimum tissue damage, minimum inflammation and finally a good scar. Many factors including the choice of suture materials and its placements influence these aims; of particular relevance is the accurate co-optation of dermal edges; eversion or inversion leads to sub optimal healing.

For many years sutures have been used to approximate the skin edges, and also to hold the cut tissues together until the wound has healed sufficient enough as to be self supportive. Throughout antiquity many materials have been used to approximate the skin edges. Suture technology and suture sterilization have kept pace with advancement in surgical techniques and provided the surgical fraternity a wide range of sutures in different size as fine as 30 microns. Now the surgeon has at his disposal a wide variety of suture materials like natural and synthetic, non absorbable and absorbable, monofilament to poly filament. However, sutures have the disadvantage of consuming more time in applying and with a cosmetically inferior scar. The use of other methods to approximate the wound edges like stapling devices, glue or adhesive tapes have becoming more popular of late to overcome these disadvantages.

We have undertaken a comparative study of 100 cases between suture and stapler in midline laparotomy patients to compare the merits and demerits of the techniques.

#### II. MATERIALS AND METHODS

Aim of the Study: To compare two skin closure techniques - suture and stapler in midline laparotomy patients in emergency ward. 100 cases were included in the study with prior informed consent.

Study Duration: December 2015 to December 2017. Patients underwent surgery in the period December 2015 to December 2016. Next one year is the follow up period. Study Design: Prospective, observational and comparative study.

Patient selection: All patients admitted in the emergency ward and planned for midlinelaparotomy.

Closure technique: Skin closure commences once abdominal wall is closed and hemostasis of sub-cutaneous tissue is achieved. Skin is closed either with skin stapler or non-absorbable suture (ethilon-polyamide) 2-0. Skin stapler is used in 50 cases in patients at 5 mm distance. Non-absorbable suture used at a distance of 1 cm, skin closed with simple suture. Data were put on excel chart and were analysed.

### **III. OBSERVATION AND RESULTS**

This comparative study was done over a period of 2 years from December 2015 to December2017 in our hospital. 100 cases were studied and were randomly divided in two groups each of 50 cases: Group A -Skin closed in skin staplers

Group B -Skin closed in non-absorbable suture.

#### Age Distribution

Maximum number of patients were between 21 to 30 years( 26%).

Table 1. Age Distribution							
Age(years)	Non absorbable suture		Stapler(=50)		Total=100		
	n	%	n	%	n	%	
<20	7	14	5	10	12	12	
21-30	12	24	14	28	26	26	
31-40	11	22	13	26	24	24	
41-50	13	26	10	20	23	23	
>50	7	14	8	16	15	15	

#### Sex Distribution:

Maximum number of patients were male( 63%).

Table 2. Sex Distribution					
Sex n %					
male	63	63			
female	37	37			

#### Skin closure time:

Skin closure time is less than 5 minutes in all cases of skin closure with staplers.

Table 3. Skin Closure time					
time suture stapler					
<5 mins	0	50			
>=5mins	50	0			

#### Skin and subcutaneous tissue thickness:

As measured by a sterile slide caliper it is grossly divided into two categories - one with less than 1 cm and other group with 1cm or more. 53 % were with skin thickness < 1 cm.

Table 4. Thickness of skin						
Skin thickness n %						
<1cm	53	53				
>= 1 cm	47	47				

#### Wound infection rate:

Wound infection rate is 36% in case of staplers and 40 % in case of sutures

Table 5. Wound infection rate						
Wound infection n %						
Stapler(total=50)	18	36				
suturer(total=50)	20	40				
Total(=100)	38	38				

#### Table 6. Use of closure materials in different skin thickness:

•••••	Material used	Suture	Stapler	
Skin & subcutaneous tissue thickness				
<1cm		26	30	
>=1 cm		24	20	

Wound infection	n	%	With stapler	%	With suture	%
<1cm	12	22.64	5	9.43	7	13.21
>=1cm	26	55.32	13	27.66	13	27.66
Total	38	38				

Table 7. Wound	l infection rat	e with skin	thickness:
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Wound infection is lesser with skin thickness < 1 cm(22.64%). Wound infection is lesser with staplers in groups with lesser skin thickness(9.43%).

#### Wound scar:

Scar may be linear thin, hypertrophic or without any definitive pattern. Any scar other than linear scar is considered as ugly scar in the study.

All the infected wound, be it with staplers or sutrures had ugly scar in the follow-up period. 17.74% of non infected wound had ugly scar during follow-up.

Table 8. Wound scar					
Ugly scar in the follow	n	%			
up period					
Infected wound	38	100			
Non-infected wound	11	17.74			

## Ugly scar in non-infected wound:

Ugly scar in non-infected wound is associated with non-absorbable suture.

Ugly scar in non-infected wound	n	%(out of all non- fected wound) [n=62]	% (out of individual closure technique, suture or stapler)[n=50]	%(out of suture or stapler in non-infected wound)[n=24 for suture]
Stapler	0	0.00	0.00	0.00
Suture	11	17.74	22	45.83
Total	11	17.74		

#### Table 9. Ugly scar with respect to material used for closure

#### When ugly scar is compared with skin thickness:

Maximum ugly scars were found to be associated with skin thickness >=1 cm.

Table 10. Ugly scar with respect to skin thickness							
Ugly scar	n	%	With stapler	%	With suture	%	
<1cm	16	30.19	5	9.43	11	20.75	
>=1cm	33	70.21	13	27.66	20	42.55	
Total	49		18		31		

#### Table 10 Hale • • • 4 4 . . 1 . . . 41 . . 1

Wound infection increased with increased thickness of the skin and subcutaneous tissue. However wound infection has not increased much when the thicker tissue is closed with non absorbable suture material. Overall all infected wound resulted in ugly scar in the follow-up period. However ugly scarring in non infected wound is not seen in that of staplers.



### IV. DISCUSSION

Wound closure is a vital step for producing a healthy and strong scar and also for ensuring aesthetically pleasing appearance. Surgical stapling was developed in 1908 by a Hungarian surgeon, Humer Hult[1]. The original instrument was massive as compared to what we use today. Modifications made by Von Petz provided a lighter and simpler device. In 1934 Fredrick of Ulm designed an instrument that was almost like the modern linear stapler. In 1958, Ravich, refined it more to their current state and is commonly used today[2]. Staplers are made up of stainless steel. They are virtually inert. They have uniform shape and constant staple depth providing even wound tension. Rectangular shape design minimizes the trauma and minimizes the tissue compression thereby causing minimal tissue reaction and trauma and leads to wound healing with minimum scar. The development of disposable skin staplers has made this method of wound closure an increasingly popular technique. Skin staplers are quick and easy to use and numerous studies have confirmed the speed and efficacy of staping compared with suture repair. Eldrup et al (1981) analysed 137 patients undergoing abdominal or thoracic surgeries, and concluded that the main advantage of using staples was the time saved, as closure with mechanical suture took one third of the time than that required for the conventional method. On the other hand closure with staples resulted in the major disadvantage of additional expenses, as the cost was forty seven times higher than that of the suture [3]. Meiring et al (1982) reported slightly better cosmetic results in a group of 40 patients undergoing laparotomy with an 80% in time saving. They also concluded that the final cost of the stapler was crucial [4]. Gatt et al (1985) concluded from a controlled trial of staples for wound closure that the speed and convenience of the skin staples outweigh the extra cost[5]. Lubowski and Hunt (1985) considered staple closure as a suitable and faster method for vertical abdominal wound compared to sutures[6]. Stockey and Elson (1987) compared the results of closure with staple and nylon sutures found a higher incidence of inflammation, discomfort on removal and spreading of the healing scar with staples. The only advantage of staples was speed of wound closure[7]. Ranabaldo and Rowe-Jones (1992) compared staple with subcuticular sutures in 48 patients undergoing laparotomy and concluded that the difference in time was significant, nevertheless, the cost was five times greater with staples[8].Luiz R Medina dos Santos et al (1995) in their study of 20 patients concluded that the use of skin staplers speed up closure by 80%, with better cosmetic results[9].John T Kanagaye, Cheryl W Vance, Linda Chan, and Nancy Schonfeld (1997) at the Children hospital, Los Angeles, USA, reported that staple closure was safe, rapid and cost effective and resulted in a cosmetically acceptable scar[10]. Iavazzo et al (2011) from a meta analysis of randomized controlled trials comparing sutures with staples for the management of surgical wounds reported that staples

were faster, with fewer wound infections but associated with more pain compared with sutures. Cosmetic results were comparable[11].

In our study we had 100 patients, maximum number of patients were between 21 to 30 years( 26%), maximum number of patients were male( 63%). Skin closure time was less than 5 minutes in all cases of skin closure with staplers. As measured by a sterile slide caliper it was grossly divided into two categories - one with less than 1 cm and other group with 1cm or more. 53 % were with skin thickness < 1 cm. Wound infection rate was 36% in case of staplers and 40 % in case of suture, in gupta et al, ijbr 2015 it was found to be 10-14 % with staplers, 16-28% with sutures[12].

Wound infection is lesser with skin thickness < 1 cm(22.64%). Wound infection is lesser with staplers in groups with lesser skin thickness(9.43%). All the infected wound, be it with staplers or sutrures had ugly scar in the follow-up period. 17.74% of non infected wound had ugly scar during follow-up, in gupta et al. 12-15% developed rail road scars in cases of staplers an 27-32% developed rail road scars in cases of studies of sutures and the non-absorbable suture. Maximum ugly scars were found to be associated with skin thickness >=1 cm.

#### V. CONCLUSION

Wound infection was less with less skin thickness and groups in which skin was closed with staplers. Skin closure time was dramatically less in the group of staplers. Wound infection rate of both the groups were comparable, although lesser in staplers. Wound infection rate increased with increased thickness of the skin and subcutaneous tissue. Wound infection rate did not increase much when skin and subcutaneous tissue of thickness >=1cm was closed with sutures. Ugly scar was the consequence of wound infection whatever the closure material used for closure. Stapler did not form ugly scar in no infected midline laparotomy wounds.

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