

SKIN STAPLED OR SUTURED: A COMPARATIVE STUDYVeerendra Kumar H. M¹, Souparna M²**HOW TO CITE THIS ARTICLE:**

Veerendra Kumar H. M, Souparna M. "Skin Stapled or Sutured: A Comparative Study". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 09, January 29; Page: 1414-1422, DOI: 10.14260/jemds/2015/199

ABSTRACT: BACKGROUND: The choice of wound closure after a surgical procedure has been a surgeon's dilemma. The concerns have been as to how fast, uneventful, less painful, with minimal complications and comfortable will the patient's recovery be. A well-known technology is surgical staples which are easier to use, less time consuming and a needle free method of wound closure. **OBJECTIVE:** To compare skin staples with non-absorbable skin suture for skin closure in surgical laparotomy procedures for the following character: wound infection, dehiscence, cosmesis and postoperative pain. **METHODS:** This is a comparative study conducted on 100 patients divided in two groups randomly at Bapuji Hospital for cases undergoing surgical laparotomy procedures. Skin closure was done with 2-0 polyamide skin sutures in one group and skin closure was achieved with skin staples in the other group. The outcome of wound was assessed on 3rd, 5th and 7th postoperative days using ASEPSIS score. Wound cosmesis was assessed on the 7th postoperative day and followed up at 1st month and 3rd month, using modified Hollander cosmesis scale. Postoperative pain was assessed using the visual analogue scale on the 1st, 3rd and 7th postoperative days. **RESULTS:** The mean wound ASEPSIS scores on day 3 for skin staples and sutured group was 0.28 and 0.36 (p=0.7) respectively. The score on day 5 for staples and sutured group was 0.12 and 0.28 (p=0.4) respectively. The results in both the groups were the same, 0.08 on day 7 (p=0). Wound cosmesis mean score assessment on day 7 for skin staples suturing group was 5.84 and 5.68 respectively (p=0.3). The mean score for cosmesis assessment at 1 month, and 3rd month for skin staples and suturing group was 5.92 and 5.68 (p=0.1) and was 6.00 and 5.92 (p=0.36) respectively which was not statistically significant. The visual analogue scale score for postoperative pain on 1st day, 3rd and 7th day for skin staples and suturing group 54.0 and 68.57 (p<0.0001); 24.86 and 34.7 (p <0.0017) and 12.57 and 19.43 (p<0.0009) respectively **CONCLUSIONS:** Skin staples provides an effective, quicker and reliable means of skin closure and yields similar cosmetic results as with skin sutures but have less postoperative pain. The advice as to which method is used for closure of wound may come down to the cost factor, economics and surgeons preference.

KEYWORDS: Skin staples, 2-0 polyamide skin suture, wound ASEPSIS score, modified Hollander cosmesis scale, visual analogue scale.

INTRODUCTION: Wound closure techniques have evolved a great deal from the earliest development of suturing materials. These evolutions have provided us variety of suture materials, absorbable ones, staples, tapes and adhesive compounds.¹

In the nineteenth century prototypes of mechanical suturing instruments (Staplers) were developed. They were introduced into clinical practice in the early decades of the 20th century. The greatest progress in wound suturing started after World War II with the introduction of advanced semiautomatic stapler machinery and with the manufacture of synthetic non resorbable and resorbable fibres.

ORIGINAL ARTICLE

The engineering of sutures in synthetic material along with standardization of traditional materials (eg, catgut, silk) has made for superior aesthetic results. Similarly the creation of natural glues, surgical staples and tapes to substitute for sutures has supplimented the armamentarium of wound closure techniques. Aesthetic closure is based on knowledge of healing mechanisms.

The advantages of staples include rapid speed of closure,² a decreased risk of infection as there is less chance of bacterial migration into the wound and also the capillaries in the sub-cuticular layers are not damaged during placement of staples,³ improved wound eversion without strangulation of tissue and result in minimal cross hatch scarring⁴ and less foreign body reaction⁵. Several studies in favour of sutures have shown that they are used to obtain a meticulous wound closure with greatest tensile strength and lowest likelihood of dehiscence.⁶

Wound closure by sutures has shown to be better than staples in context of being less painful⁶, yielding a much improved cosmetic result⁶, being significantly cheaper², having lower rate of superficial wound complications⁷, and not requiring a special device for its removal as one is needed for staple removal.

METHODOLOGY: 100 patients undergoing laparotomy surgery admitted in the department of general surgery in Bapuji Hospital and Chigateri General Hospital were considered of which 50 patients wound were closed with ethilon 2-0 and 50 patients were closed with metallic skin staples.

In both the groups the outcome of wound was assessed at 3rd, 5th, 7th post-operative days using ASEPSIS score as shown in Table 1.

Wound characteristics	Proportion of wound affected %					
	0	< 20	20-39	40-59	60-79	> 80
Serous exudate	0	1	2	3	4	5
Erythema	0	1	2	3	4	5
Purulent exudate	0	2	4	6	8	10
Separation of deep tissues	0	2	4	6	8	10

Table 1: ASEPSIS score based on the proportion of wound involved

The wound was assessed for cosmesis on 7th Post-operative day and at the end of 1st and 3rd month using Modified Hollander cosmesis scale.⁸:

1. Step off the borders, (0 for yes, 1 for no).
2. Contour irregularities – puckering, (0 for yes, 1 for no).
3. Wound margin separation, (0 for yes, 1 for no).
4. Wound edge inversion, (0 for yes, 1 for no).
5. Excessive wound distortion, (0 for yes, 1 for no).
6. Good overall appearance (0 for poor, 1 for acceptable).

Wounds with a score of 6 were considered to have an optimal cosmetic appearance and others suboptimal appearance.

ORIGINAL ARTICLE

The post-operative pain was assessed at 24 hrs, 3rd day and 7th day using a visual analogue scale (VAS) of 0 to 100. "0" being "no pain" and "100" being the "worst pain" possible as rated by the patient themselves.

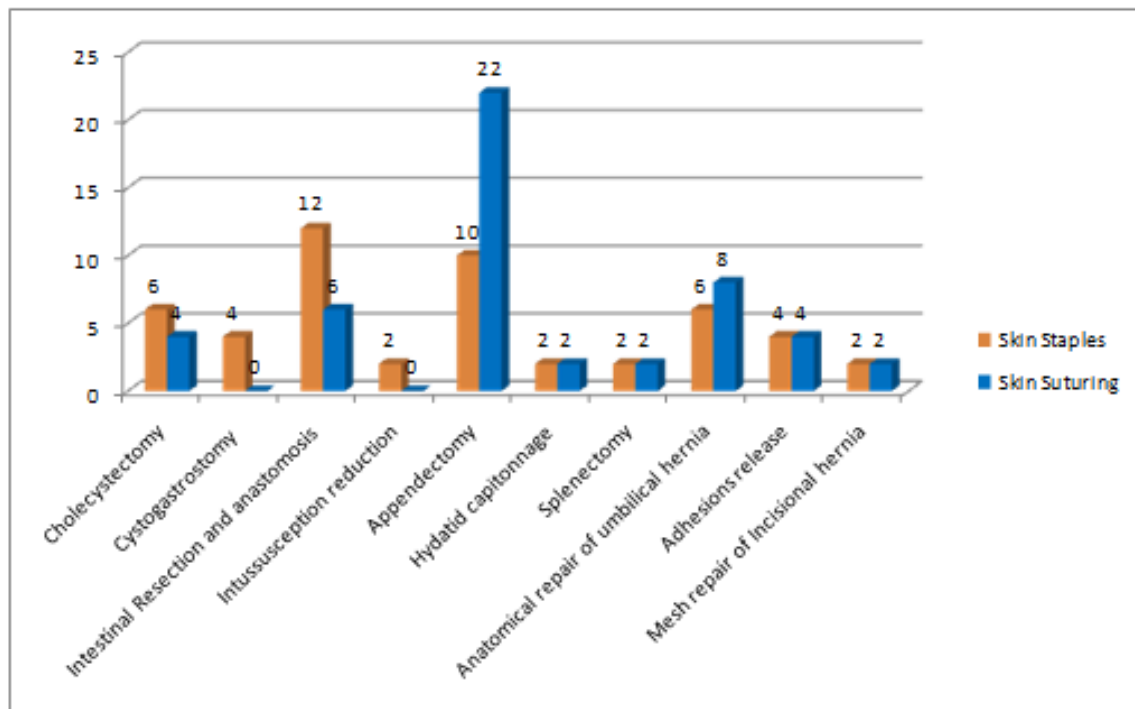
Cases undergoing laparotomy surgical procedure and skin closure with ethilon skin suturing or with skin staples under same antibiotic coverage were included.

Patients requiring Surgical Incisions to be closed under tension, traumatic wounds, Patients with diabetes mellitus, known personal or family history of Keloid formation or scar hypertrophy and Patients not coming for follow-up on 7th post-operative day or 1st month or 3rd post-operative month were excluded.

Univariate analysis of the dichotomous variables encoded was performed by means of the Chi-Square test with Yates correction when required. And P value less than 0.05 was considered statistically significant. The data was analyzed using SPSS package

RESULTS: Different surgical procedures were performed in each study group. The split up of the surgical procedures in each group is indicated in graph 1.

Graph 1: Distribution of surgical procedures according to type of material used.



Graph 1

Wound Asepsis Score: The outcome of wound is assessed on 3rd, 5th and 7th post-operative days using asepsis score. Wound is scored from 0 to 10 according to the proportion of wound involved and presence of i) serous collection ii) Erythematous changes iii) Purulent exudates and iv) separation of deep tissues. Table1 shows the incidence of each of the four parameters of ASEPSIS score.

Interval (days)	Type of Material	No complication	Seroma	Erythema	Purulent exudates	wound separation	Total
3rd Day	Skin stapling	44	4	2	0	0	50
	Skin Suturing	40	6	4	0	0	50
	Total	84	10	6	0	0	100
5th Day	Skin stapling	46	2	0	2*	2*	50
	Skin Suturing	44	4	0	2+	2+	50
	Total	90	6	0	4	4	100
7th Day	Skin stapling	48	0	0	0	2*	50
	Skin Suturing	48	0	0	0	2+	50
	Total	96	0	0	0	4	100

Table 2: Incidence of ASEPSIS score parameters at different intervals in the two study groups.

*and + same patient in staple group and suture group had purulent discharge and wound separation.

It is observed from Table 2, that on day 3, in staples group there were 4 seromas (8%), 2 erythemas (4%) amounting to 12% of the group. In skin suturing group on day 3, there were 6 seromas (12%), 4 erythemas (8%), amounting to 20% of the group. On day 3 staples group has a clear advantage over the skin suture group.

On day 5, there were 2 seromas (4%) and 2 purulent discharges with wound separation(4%) amounting to a total of 8% of the staples group, where as in skin suturing group there were 4 seromas (8%) and 2 purulent discharges with wound separation(4%) amounting to 12% of the group. On comparing the day 5 results with day 3 results the difference in the outcome between the two groups narrowed.

On day 7, the incidence of complication in staples group is 2 wound separation (4%) and in skin suturing group also 2 wound separation (4%) indicating a similar outcome at the end of 7 days.

After going through the data of Table 2 it can be concluded that though there existed a difference in the outcome of wound between the two study groups in the initial part of the post-operative period, there existed no difference in the outcome of the wound between the two groups at the end of 7 days.

It is observed from table 3, that on day 3 mean ASEPSIS score for staples group is 0.24 and for the skin suturing group is 0.36(P=0.72). Though there is a numerical difference in favour of the staples group, this difference is found to be statistically insignificant.

The ASEPSIS score on 5th day shows a mean score of 0.13 for the staples group and a mean score of 0.28 for skin suturing group (P=0.43). Here again there is a numerical difference in favour of skin staples group which is statistically insignificant.

ORIGINAL ARTICLE

Mean ASEPSIS score on 7th day for skin staples group was 0.08 and skin suturing was 0.08 implying similar out come in the end.

Time interval (days)	Type of material	Seroma	Erythema	Purulent discharge	Wound separation	Total score / mean	t Value	p Value
3rd Day	staples	8	6	0	0	14 (0.24)	0.41	0.72
	Skin suture	10	8	0	0	18 (0.36)		
5th Day	staples	2	0	4	0	6 (0.13)	0.806	0.43
	Skin suture	6	0	8	0	14 (0.28)		
7th Day	staples	0	0	0	4	4 (0.081)	0	0
	Skin suture	0	0	0	4	4 (0.081)		

Table 3: ASEPSIS scores of the study groups on 3rd, 5th and 7th days

The above score is calculated on the basis of the proportion of wound involved and presence of serous collection, erythematous changes, purulent exudates and separation of deep tissues. The wound is scored from 0 to 10 as per the following Table 1.

Wound Cosmesis Score: Wounds of patients in both the groups were assessed for cosmesis on 7th day, 1st month and 3rd month using Modified Hollander Cosmesis Scale which has 6 clinical variables as step off borders, edge inversion, contour irregularities, excess inflammation, wound margin separation and good overall appearance. A total cosmetic score was derived by adding the scores of the variables. A score of 1 is given to each variable if not present in the wound. So a score of 6 was considered as optimal while 5 or less as suboptimal. Any complications if present were observed in both the groups. Table 4 shows the comparison of wound cosmesis between Skin staples group and skin suturing group.

Time Days/ Months	Type of material used	No	Mean	Std. Deviation	Min. Score	Max. Score	t Value	p Value
7th Day	Staples	50	5.86	0.4724	4	6	1.0955	0.32
	Skin suturing	50	5.69	0.5568	4	6		
1 Month	Staples	50	5.91	0.27674	5	6	1.6134	0.12
	Skin suturing	50	5.67	0.6902	4	6		
3 Month	Staples	50	6	0	6	6	1	0.35
	Skin suturing	50	5.91	0.27677	5	6		

Table 4: Comparison of post-operative wound cosmesis score

ORIGINAL ARTICLE

It is observed from table 4, that the cosmesis score on 7th day in both the groups is spread between a minimum of 4 and a maximum of 6. The Mean score for skin staples group was 5.86 and the same for skin suturing group was 5.69 which is marginally less than the skin staples group. It is found that the values are statistically insignificant with a p value of 0.32.

The mean cosmesis score at the end of one month was 5.91 for the skin staples group and 5.67 for the skin suturing group. Compared to the 7th day scores the difference between the two groups is further widened and infers a cosmetically better outcome for the skin staples group. But again even this difference is not statistically significant with a p value of 0.12. At the end of 3 months the mean cosmesis scores of skin staples group was 6.00 and skin suture 5.91 (P=0.35).

WOUND COMPLICATIONS:

Complications	3rd Day		7th Day	
	Type of material used		Type of material used	
	Skin stapling (N=50)	Skin Suturing (N=50)	Skin stapling (N=50)	Skin Suturing (N=50)
Seroma	4	6	0	0
Erythema	2	4	0	0
Purulent	0	0	2*	2*
Wound separation	0	0	2*	2*
Total	6 (12%)	10 (20%)	2 (4%)	2 (4%)

Table 5: Total complications observed in each group

*same patient in staple group and suture group had purulent discharge and wound separation.

As shown in table 5 Complications noted on 3rd day for the skin staples group are 4 seromas, 2 erythemas amounting to 12% of the group. At the same time complications noted for skin suturing group are 6 seromas, 4 erythemas amounting to 20% of the group.

This indicates that incidence of complications on 3rd day was 8% more in skin suturing group than in skin staples group. However as the post-operative period progressed to 7th day all the seromas and erythemas resolved leaving behind 2 purulent wound in each group amounting to 4% in each group indicating similar outcome in both the groups.

POST-OPERATIVE PAIN:

Time	Type of material used	No.	Mean	Std. Deviation	Min.	Max.	t Value	p value
1st day	Skin staples	50	54.1	13.97	20	80	-4.74	<0.00012
	Skin sutures	50	68.56	11.67	40	90		
3rd day	Skin staples	50	24.89	15.02	0	40	-3.27	0.0018
	Skin sutures	50	34.71	9.62	20	50		
7th day	Skin staples	50	12.61	8.52	0	20	-3.47	0.00091
	Skin sutures	50	19.44	8.02	0	30		

Table 6: Comparison of post-operative pain VAS score

The post-operative pain is measured in both the groups using visual analogue scale by patients themselves. VAS is calibrated from 0 to 100. 0 is marked for being no pain and 100 being sense of worst pain. (Table 6)

At 24 hrs the mean in skin staples group visual analogue score is 54.1 and that of skin suturing is 68.56. This difference is of significance with p value of <0.00012.

At 3rd day the mean in skin staples group was 24.89 and that of skin suturing was 34.71. the p value was of significance of <0.0018.

At 7th day the mean of skin staples group was 12.61 and that of suturing was 19.44 with <0.00091 p value.

DISCUSSION: The wound closure is a vital step for producing a healthy and strong scar and also for ensuring aesthetically pleasing physical appearance. The skin staples are alternative to skin sutures which have been intended for the rapid closure of abdominal surgical wounds. But both sutures and staples placement have their own advantages and drawbacks.

Traditionally, needle skin suturing with suture material is the commonest method of surgical wound closure that is being practiced by surgeons because of its cost effectiveness. No doubt the cost consumed by suture material to close one unit of surgical incision is cheaper than the one consumed by skin staples. But, In addition, nowadays surgeons are looking for faster, comfortable and cosmetically best technique for skin closure and this obviously has thrown attention on skin staples for wound closure.

This being a needle free method, guards against blood borne viral infections like HIV, HBV etc. The time taken for wound closure with staples placement is much less in comparison to suture placement as shown in studies by CT Ranabaldo et al.⁹

Wound Asepsis Score: The outcome of wound was assessed on 3rd, 5th and 7th Post-operative days using ASEPSIS score. Mean ASEPSIS score on 3rd day was numerically in favour for skin staples but statistically insignificant. For the 5th day there was a larger separation of the two means than on the 3rd day but statistically insignificant.

This difference in the mean ASEPSIS score can be attributed to (i) suture materials facilitate microbial colonization and (ii) decreased risk of infection as there is less chance of bacterial

ORIGINAL ARTICLE

migration into the wound and also the capillaries in the subcuticular layers are not damaged during placement of staples. This finding was also observed by Alderice F, Mckenna D, Dornan J³ in their studies. On 7th day there was one case of wound separation in each group and the mean ASEPSIS score for both the groups was the same.

Wound Cosmesis Score: Patients in both the groups were assessed for the cosmetic outcome of the wound on the 7th post-operative day, 1st month and 3rd month using Modified Hollander Cosmesis scale. On the 7th Post-operative day the mean cosmesis score for both the groups was numerically in favour of skin staples but this difference was statistically not significant. At the end of one month the mean cosmesis score showed numerical widening between the two groups under study. At the end of 3 months the mean cosmesis scores for the two groups were very close, as close as 6 for the skin staples group and 5.96(P=0.36) for the skin suturing group. At this stage even the numerical difference between the mean scores is not pleasing and can be ignored and concluded as similar outcome. Comparative studies by Gaertner et al¹⁰ and BI Singh et al¹¹ have shown similar results of either no difference in wound cosmesis or a poorer cosmetic outcome for wound closure with sutures.

Wound Complications: On day 3 wound complications were 12% in staples group compared to 20% in the sutures group. By day 5 in the post-operative period, the percentage difference came down to 8% in staples and 12% in sutures group. By the end of 7 days both skin staples group and skin suturing group ended up with two wound separation each. Hence in spite of the initial difference in the post-operative outcome of the wound complications, there existed no difference in the outcome of the wound between the two groups by the end of 7th day.

Post-Operative Pain: Post-operative pain was assessed through the visual analog scale by the patients themselves. The present study showed comparatively less post-operative pain in the staples group than in the skin suturing group as measured at 24hrs, 3rd day and 7th day interval. Similar studies conducted by Gaertner et al¹⁰ and BI Singh et al,¹¹ which have shown that abdominal wounds closed with sutures have been associated with increased post-operative pain, support the outcome of this present study.

At the end of this discussion, we can say that among the healthy individuals undertaken in this study, skin staples is a quicker way of laparotomy wound closure with comparatively lesser wound complications, better tolerated post-operative pain and arguably better cosmetic outcome. Hence making it a better alternative to skin sutures.

CONCLUSION: In conclusion to the present study, apart from the cost factor or the speed of closure, staples seem to have a lesser wound complication rate with better patient toleration towards pain in the post-operative period and a similar or better cosmetic outcome than the skin sutures. Ultimately it comes down to the financial feasibility and the operating surgeon's preference, as to which method he or she would prefer for closure of laparotomy wounds.

REFERENCES:

1. www.emedicine.com. Materials of wound closure: April, 12, 2005.
2. Margaret Terhune, MD, Private Practice, Richmond Dermatology and Laser Specialists. Materials for wound closure. Updated: Nov 10, 2009.
3. Alderdice F, McKenna D, Dornan J. Techniques and materials for skin closure in caesarean section (review). Cochrane database of systematic reviews 2003, issue 2. Art. No.: CD003577. DOI:10.1002/14651858.CD003577.
4. Julio Hochberg, MD, Kathleen M. Meyer, MD, Michael D. Marion, MD. Suture choice and other methods of skin closure. Surg Clin N Am 89 (2009) 627-641.
5. Jeremy D. Lloyd, MD, Melvin J. Marque III, MD, Robert F. Kacprowicz, MD. Closure techniques. Emerg Med Clin N Am 25 (2007) 73-81.
6. Mr. A Subramanian, Mr. A Hayes, Miss N Eze, Mr. P Sains and Professor P E M Jarrett. A Prospective randomized Control Trial comparing the use of skin staples with subcuticular prolene ® suture in inguinal hernia incisions. The journal of one day surgery. Vol. 15, No. 1 (2006) 61-63.
7. AA Shetty, VS Kumar, C Morgan-Hough, GA Georgeu, KD James, JE Nicholl. Comparing wound complication rates following closure of hip wounds with metallic skin staples or subcuticular vicryl suture: A prospective randomised trial. Journal of Orthopaedic Surgery 2004; 12 (2): 191-193
8. Quinn.J, Wells. G, Sutcliffe. T, Jarmuske. M, Maw. J, Siell. I, Johns. P. Tissue adhesive versus suture wound repair at 1 year: randomized clinical trial correlating early, 3-month and 1-year cosmetic outcome. Annals of Emergency Medicine. 1998;32(6): 645-9.
9. Ranaboldo CJ, Rowe-Jones DC; Closure of laparotomy wounds Skin staples v/s sutures, Br. J. Surg, 2007 Nov; 70(11): 1172-3.
10. Gaertner I, Burkhardt T, Beinder E. Scar appearance of different skin and subcutaneous tissue closure techniques in caesarean section: a randomized study. Eur J Obstet Gynecol Reprod Biol 2008; 138:29-33.
11. BI Singh, C MCGarvey. Staples in skin closure in surgery are quicker than sutures, but may increase complications. BMJ2010; 340:c403doi:10.1136/bmj.

AUTHORS:

1. Veerendra Kumar H. M.
2. Souparna M.

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of General Surgery, JJM Medical College, Davangere.
2. Post Graduate, Department of General Surgery, JJM Medical College, Davangere.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Souparna M,
1801, 20th Main,
13th Cross, Sector 1,
HSR Layout, Bangalore-560102.
E-mail: souparnamanjunath@gmail.com

Date of Submission: 07/01/2015.
Date of Peer Review: 08/01/2015.
Date of Acceptance: 19/01/2015.
Date of Publishing: 27/01/2015.