



IJMARD 2014; 1(7): 473-476
www.allsubjectjournal.com
Received: 13-11-2014
Accepted: 05-12-2014
E-ISSN: 2349-4182
P-ISSN: 2349-5979
Impact factor: 3.762

Dr. S Vengal Reddy
Associate Professor,
Department of General
Surgery, Mamata Medical
College, Khammam,
Telangana, India

Dr. U Ramakrishna
Associate Professor,
Department of General
Surgery, Mamata Medical
College, Khammam,
Telangana, India

Skin suture versus skin stapler in abdominal surgery: A randomized comparative study

Dr. S Vengal Reddy, Dr. U Ramakrishna

Abstract

Aim: The aim of the present study was to assess the efficacy between skin suture versus skin stapler in abdominal surgery.

Methods: The present study was conducted on 80 patients, who presented to the in-patient Department of General Surgery, Mamata Medical College. A total of 80 patients were categorized into 2 groups i.e., group A which was conventional suture group and group B which was staple groups with 40 cases in each group. In group A, wound closure was done with Prolene 2-0 cutting body (Lotus) using interrupted sutures. While in group B, wound closure was done with Covidien stapler.

Results: The mean age among staples group was 36.54 years and among sutures group was 34.66 years. Majority of the patients belonged to the age group 30-40 years followed by 40-50 years. In the present study, out of 80 patients, 42 (52.5%) were male and 38 (47.5%) were female. In the present study, out of 80 cases, the commonest type of incision for surgical wound creation was McBurney's incision: 16 in staplers and 18 in suture group. Midline incision was given in 11 cases in staplers and 14 cases in suture group, inguinal incision was given in 8 cases in staplers and 5 cases in suture group, sub-costal incision was given in 2 cases in each group, and paramedian incision was given in 2 cases in staplers and 1 in suture group. We observed that in staples group, 4 cases presented with clear discharge with grade (III) and 3 cases with purulent discharge with grade (IV) whereas in suture group, clear discharge with grade (III) was seen in 8 cases and purulent discharge with grade (IV) in 6 cases, rest of the cases healed normally or by with mild bruising. Pain while removal of staples or sutures is tabulated by using pain score with <2 and >2 in both the groups. In staples group, pain score was <2 in 90% of patients and in sutures group, it was 10%.

Conclusion: The results indicated that skin closure by stapler can be preferred over conventional skin suture as it is easy to apply, easy application and easy to remove with less pain on removal, easy on pockets of the patients and aesthetically acceptable.

Keywords: Abdominal surgery, Skin stapler, Suturing

Introduction

Any surgical intervention will result in a wound in order to get access to and deal with the underlying pathology. Wound complications are one of the most common causes of morbidity and mortality [1]. 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. Surgical wound closure aims to achieve rapid wound healing and a satisfactory cosmetic result, and also to reduce the risks of complications [2].

The principle aims of tissue repair of surgical skin incisions are rapid acquisition of strength and minimum tissue damage, with minimum inflammation and a good scar. Many factors including the choice of suture materials and its placement influence these and of particular relevance is the accurate co-optation of dermal edges; eversion or inversion leads to sub optimal healing [3]. Historically, there were few surgical options for wound closure. From catgut, silk, and cotton, there is now an ever-increasing array of sutures, approximately 5269 different types, including antibiotic-coated and knotless sutures [4]. The key principles involved to achieve perfect healing are preservation of blood supply, minimal tissue damage, approximation of edges without tension, correct suture spacing and suture bites with proper selection of suture materials [5]. In this modern era various materials and gadgets for approximation of tissues like a sutures, staples or clips, glues, steritapes etc. has been used by surgeons but the secret to achieve a good wound healing lies in meticulous tissue dissection followed by selection of suture material, methods of wound closure and postoperative complications [6]. Stapling method of wound closure has been shown to be an excellent option in many situations [7]. Rapid and aesthetic healing of skin incisions requires accurate reapproximation of wound margins [8]. No technique can supersede standard suturing methods for closing wounds requiring the most meticulous repair. However, for most linear, non-facial

Corresponding Author:
Dr. U Ramakrishna
Associate Professor,
Department of General
Surgery, Mamata Medical
College, Khammam,
Telangana, India

lacerations, staples have been found to have the advantage of being faster, less damaging to host defenses, and useful in the management of potentially contaminated wounds [9]. As staples are being commonly used for incision wound closure in abdominal surgery, there is a need to validate their efficacy in this specialty. So, a prospective trial was carried out to investigate the merits and demerits of stapled skin closure when compared with conventional sutures. Hence, the aim of the present study was to assess the efficacy between skin suture versus skin stapler in abdominal surgery.

Materials and methods

The present study was conducted on 80 patients, who presented to the in-patient Department of General Surgery, Mamata Medical College. A total of 80 patients were categorized into 2 groups i.e., group A which was conventional suture group and group B which was staple groups with 40 cases in each group. In group A, wound closure was done with Prolene 2-0 cutting body (Lotus) using interrupted sutures. While in group B, wound closure was done with Covidien stapler.

Institutional Ethical Committee (IEC) clearance was taken for conducting present study and Patient consent was also taken before including him/her to present study.

Inclusion criteria

- Patients undergoing abdominal surgeries with clean and clean contaminated wounds
- Patients undergoing both elective as well as emergency surgeries
- Patients willing to participate in the study

Exclusion criteria

- Immunocompromised patients like malignancies, AIDS and uremia
- Contaminated and dirty wounds
- Patients unwilling to participate in the study

All patients were randomized into 2 groups on the basis of chit system, which is given to patient before surgery and based on that patient sequentially divided into two groups i.e. group A: conventional suture group and group B skin stapler group. Each group contains twenty-five patients respectively. All investigations and surgical procedures were carried out with proper informed written consent as appropriately. Following selection of subjects and after obtaining informed consent about proposed study, data was collected from: 1) operating surgeon after operation regarding time taken for surgery, ease of surgery and surgical procedure done, 2) patients post operatively regarding pain, cosmetic outcome, pain at suture or stapler removal, regarding wound infection etc., 3) follow up of patients in outpatient department after hospitalization.

The data regarding patient profile, diagnosis, investigations, and surgical procedures were collected in a proforma and tabulated to a master chart using Microsoft Excel sheet.

Statistical analysis

Unpaired t test was used for analysis of continuous data. Pearson’s χ^2 test was used for analysis of categorical data. Differences were considered statistically significant if $p < 0.05$. IBM SPSS Statistics for Windows, version 24 (IBM Corp., Armonk, N.Y., USA) software program was used for statistical calculations.

Results

Table 1: Demographic data and Type of incision

Age group (in years)	Staples (n=40) N%	Sutures (n=40) N %
<20	4 (10)	6 (15)
20-30	10 (25)	4 (10)
30-40	12 (30)	14 (35)
40-50	8 (20)	10 (25)
50-60	6 (15)	6 (15)
Sex		
Male	24 (60)	18 (45)
Female	16 (40)	22 (55)
Incision		
Midline	12 (30)	14 (35)
Inguinal	8 (20)	5 (12.5)
Subcostal	2 (5)	2 (5)
McBurney’s	16 (40)	18 (45)
Paramedian	2 (5)	1 (2.5)

The mean age among staples group was 36.54 years and among sutures group was 34.66 years. Majority of the patients belonged to the age group 30-40 years followed by 40-50 years. In the present study, out of 80 patients, 42 (52.5%) were male and 38 (47.5%) were female. In the present study, out of 80 cases, the commonest type of incision for surgical wound creation was McBurney’s incision: 16 in staplers and 18 in suture group. Midline incision was given in 11 cases in staplers and 14 cases in suture group, inguinal incision was given in 8 cases in staplers and 5 cases in suture group, sub-costal incision was given in 2 cases in each group, and paramedian incision was given in 2 cases in staplers and 1 in suture group.

Table 2: Classification based on length of wounds

Group	Group A <5 cm	Group B 5- 10 cm	Group C >10 cm	Total (%)
Stapels	18	12	10	40 (100)
Suture	19	10	11	40 (100)

Wounds are classified based on the length of incision as group A, <5 cm with 18 cases in staples and 19 cases in sutures group: group B, 5-10 cm with 12 cases in staples and 10 cases in sutures group and group C, >10 cm with 10 cases in staples and 11 cases in sutures group.

Table 3: Time required for closure and Cosmetic outcome

	Staples (n=40)	Sutures (n=40)
Time required for wound closure (minutes)		
<5	40 (100%)	0
5-10	0	22
10-15	0	6
>15	0	12
Type of scar/ Cosmetic outcome		
SBSE>3	30 (75%)	26 (65%)
SBSE<3	10 (25%)	14 (35%)

Time required for skin closure was classified as <5 minutes, 5-10 minutes, 10-15 minutes and >15 minutes. In staples group, time required for skin closure was <5 min in all the cases whereas in sutures group, no case completed skin closure in <5 minutes, 22 cases in 5-10 minutes, 6 cases in 10-15 minutes and 12 cases in >15 minutes. Stony brooks scar evaluation system (SBSE) was used in this present study and we observed that, in staples group, SBSE score >3 was seen in 75% of cases and in sutures group, SBSE >3 was seen in 65% of cases.

Table 4: Post-operative complications and Pain score during removal of staples/sutures

Complications	Staples (n=50)	Sutures (n=50)
Clear discharge	4 (10%)	8 (20%)
Purulent discharge	3 (7.5%)	6 (15%)
Pain score		
<2	36 (90%)	10 (25%)
>2	4 (10%)	30 (75%)

Southampton wound assessment scale was used for post-operative complications in this study. We observed that in staples group, 4 cases presented with clear discharge with grade (III) and 3 cases with purulent discharge with grade (IV) whereas in suture group, clear discharge with grade (III) was seen in 8 cases and purulent discharge with grade (IV) in 6 cases, rest of the cases healed normally or by with mild bruising. Pain while removal of staples or sutures is tabulated by using pain score with <2 and >2 in both the groups. In staples group, pain score was <2 in 90% of patients and in sutures group, it was 10%.

Discussion

In this modern era broadly speaking the materials or gadgets for approximation of tissues are the sutures, staples or clips, glues, steritapes etc., the secret to achieve a good wound healing lies in meticulous tissue dissection selection of suture material, methods of wound closure and post-operative complications. The key principles involved to achieve perfect healing are preservation of blood supply, minimal tissue damage, approximation of edges without tension, correct Suture spacing and suture bites with proper selection of suture materials. The principle aims of tissue repair of surgical skin incisions are rapid acquisition of strength and minimum tissue damage, with minimum inflammation and a good scar. Many factors including the choice of suture materials and its placement influence these and of particular relevance are the accurate co-optation of dermal edges; eversion or inversion leads to sub optimal healing.

The mean age among staples group was 36.54 years and among sutures group was 34.66 years. Majority of the patients belonged to the age group 30-40 years followed by 40-50 years. In Chavan *et al* study, the youngest patient was aged 2 years and the oldest was 62 years, with a median age of 30 years in staple group; while in the suture group youngest patient was aged 3 years and the oldest was 75 years of age [10]. In Naireen *et al* study, age of the patients ranged from 35-99 years for stapled group, with a mean age of 58.92 years and 30-80 years for suture group, with a mean age of 60.04 years [11]. In the present study, out of 80 patients, 42 (52.5%) were male and 38 (47.5%) were female.

In the present study, out of 80 cases, the commonest type of incision for surgical wound creation was McBurney's incision: 16 in staplers and 18 in suture group. Midline incision was given in 11 cases in staplers and 14 cases in suture group, inguinal incision was given in 8 cases in staplers and 5 cases in suture group, sub- costal incision was given in 2 cases in each group, and paramedian incision was given in 2 cases in staplers and 1 in suture group. In Chavan *et al* study the commonest incision was inguinal, 22 cases in staplers and 20 in suture group [10].

Time required for skin closure was classified as <5 minutes, 5-10 minutes, 10-15 minutes and >15 minutes. In staples

group, time required for skin closure was <5 min in all the cases whereas in sutures group, no case completed skin closure in <5 minutes, 22 cases in 5-10 minutes, 6 cases in 10-15 minutes and 12 cases in >15 minutes. Stony brooks scar evaluation system (SBSE) was used in this present study and we observed that, in staples group, SBSE score >3 was seen in 75% of cases and in sutures group, SBSE >3 was seen in 65% of cases. Stockley 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 [12]. 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 [13]. 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 [14]. 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 [15].

We observed that in staples group, 4 cases presented with clear discharge with grade (III) and 3 cases with purulent discharge with grade (IV) whereas in suture group, clear discharge with grade (III) was seen in 8 cases and purulent discharge with grade (IV) in 6 cases, rest of the cases healed normally or by with mild bruising. Pain while removal of staples or sutures is tabulated by using pain score with <2 and >2 in both the groups. In staples group, pain score was <2 in 90% of patients and in sutures group, it was 10%. Karbhari *et al* [16] in their study found that pain was significantly less during staple removal between both groups with $p < 0.0001$ and they were also same in studies done by dos Santos *et al* [14]. Study by MacGregor FB *et al.* in 1989, Scotand [17] said that the meantime for stapler repair is 18.6 sec & for suture is 124 sec and the cost of repair and the complication rate were almost same. Patient compliance with stapler is good than sutures & no local anesthesia applied for stapling. Orlinky Metal in 1995, USA [9] studies stated that the average speed of stapling is 8.3 seconds per cm wound for staplers & 63.2 seconds per cm wound for sutures.

Conclusion

The outcomes showed that skin closure with a stapler can be favoured over conventional skin suture since it is simple to use, simple to apply, simple to remove, easy on the patient's pockets, and visually pleasing. However, since staplers are not always readily accessible, every surgeon should be familiar with the fundamental skin closure method. We come to the conclusion that skin staplers can be employed in surgically incised elective clean and clean contaminated wounds across the abdomen. However, more research with a large sample size and a multicenter study are needed to determine the function of staplers in approximate skin approximation.

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