

## To Compare Outcomes of Stainless Skin Staples and Polypropylene Sutures for Skin Closure in Clean Elective Surgeries

Abdul Basit<sup>1</sup>, Salman Habib Abbasi<sup>2</sup>, Sohaib Haider<sup>3</sup>, Yasir Masood Kiani<sup>4</sup>, Fazal Hussain Shah<sup>5</sup>

### ABSTRACT

**OBJECTIVES:** To compare stainless skin staples and polypropylene sutures in skin closure in clean elective surgeries in terms of wound infection and skin closure time.

**STUDY DESIGN:** Comparative experimental study

**PLACE AND DURATION:** Cantonment General Hospital, Rawalpindi, 1<sup>st</sup> Jan to 26<sup>th</sup> Sep 2017

**METHODOLOGY:** Five hundred patients undergoing clean elective surgery were selected and divided into two equal groups. Skin closure was done with Prolene suture and stainless-steel skin staples in respective groups. Operative time was considered, and wound infection was assessed within 30 days. Both groups were compared in terms of wound infection and skin closure time.

**RESULTS:** Both groups had same number of patients (250 in each group). The mean age was  $31.54 \pm 10.51$  years. Male to female ratio was 245 (49%):255 (51%). The mean hemoglobin level was  $12.42 \pm 1.70$  g/dl. There was no difference between groups in terms of age, gender distribution and hemoglobin levels ( $p$  values 0.592, 0.125, 0.805). There was statistically significant difference between the groups in terms of skin closure time and frequency of surgical site infections (SSIs) i.e.  $251.07 \pm 28.61$  versus  $87.28 \pm 17.20$  seconds ( $p$  value  $<0.0001$ ) and 61.2% versus 38.8% ( $p$  value 0.024) for suture and staples groups respectively.

**CONCLUSION:** Skin staples cause less wound infection than sutures in clean elective surgeries. Moreover, skin staples are quicker for skin approximation than sutures.

**KEY WORDS:** Sutures, Polypropylenes, Surgical Staplers, Wound Infection, Suture Techniques, Wound Healing

### HOW TO CITE THIS:

Basit A, Abbasi SH, Haider S, Kiani YM, Shah FH. To Compare Outcomes of Stainless Skin Staples and Polypropylene Sutures for Skin Closure in Clean Elective Surgeries. *Isra Med J.* 2018; 10(1): 32-35

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

### INTRODUCTION

Infections are more liable to occur in surgical wounds. The chances of infection increase as the wounds become more contaminated. The clean surgical cases are less likely to get infected i.e. 1-2%. Infections due to invasive surgical procedures are generally referred as surgical site infections

(SSIs).<sup>1</sup> These wound infections are associated with significant morbidity and mortality. It is estimated that over half of these SSIs are preventable.<sup>2</sup> These infections range from a minor wound discharge to life threatening sepsis and septic shock. Hospital stay and hospital costs are increased due to these infections.<sup>1,2</sup> There are variety of ways to reduce the SSIs. These factors include optimizing the operating room environment, pre- and postoperative care. Skin closure after surgical procedure is one of the factor which needs further quest to decrease the SSIs to minimum. Sutures like polypropylene are monofilament and relatively inert. These are associated with less chances of infection. Braided sutures like silk are more prone to introduce infection.<sup>3</sup> Metallic skin staples are made from stainless steel and are easy to place. They decrease the skin closure time up to 80% as compared to subcuticular or interrupted suturing techniques. Infection rates may be reduced due to staples because of quick closure and inertness of the material.<sup>4</sup> A metaanalysis by Mackeen et al. showed that skin stapler is better in terms of wound morbidity as compared to conventional suture techniques in cesarean section.<sup>1</sup> Some other studies also supported the staples use.<sup>5</sup> Other studies showed that in emergency cesarean section skin staple is associated with increased hospital stay and infection rates. There was no difference between wound pain or complications.<sup>7</sup> In orthopedic surgery, the skin staples may prove equivalent to sutures or sometimes may cause more pain and infection.<sup>8</sup> The aim of my study was to compare

1. Associate Professor of Orthopaedics and Spine, Al-Nafees Medical College Islamabad
2. Assistant Professor of Orthopaedics, Yusra Medical and Dental College, Islamabad
3. Assistant Professor of General Surgery, Yusra Medical and Dental College, Islamabad
4. Registrar of Orthopaedics, Yusra Medical and Dental College, Islamabad
5. Consultant General Surgery, Brig (R) Memorial Trust Hospital, Darya Khan Road, Bhakkar

### Correspondence to:

Dr. Fazal Hussain Shah:  
Consultant General Surgery, Brig (R) Memorial Trust Hospital, Darya Khan Road, Bhakkar  
E mail: drfazal3@gmail.com

Received for Publication: 19-11-2017

Accepted for Publication: 15-01-2018

stainless skin staples and polypropylene sutures in skin closure in clean elective surgeries in terms of wound infection and skin closure time.

### METHODOLOGY

In this Comparative experimental study, 500 patients with clean elective surgeries were selected from the operation theatre of Cantonment General Hospital, Rawalpindi for 9 months i.e. 1<sup>st</sup> Jan to 26<sup>th</sup> Sep 2017 after the approval from hospital ethical committee. The sample size was calculated from a previous study by Figueroa et al. in 2013, taking expected proportions of wound infection/disruption in suture and staples as 14.5% and 5.9% after 4-6 weeks.<sup>9</sup> The power of test was 80% with level of significance at 5%. The inclusion criterion was all patients with clean elective surgeries. Both male and female patients were included, and the age range was 15 to 50 years. All patients with following conditions were excluded; chronic diseases (COPD, stroke, renal failure, liver disease, hematological disorders, neoplastic disorders), malnutrition, history of radio or chemotherapy, concurrent infections, immunocompromised patients, anemia (Hb <10 g/dl), body mass index (BMI) <18 or >30 kg/m<sup>2</sup>. All patients were randomized and divided into two equal groups via

### RESULTS

In this Comparative experimental study, our target sample size was 500 patients (total 527 patients, 27 lost follow-up) which was achieved at the end of study period. The mean age of the patients was  $31.54 \pm 10.51$  years (mean  $\pm$  SD). The male patients were 245 (49%) while females were 255 (51%). The mean and SD values for the hemoglobin level and skin closure time were  $12.42 \pm 1.70$  g/dl and  $169.17 \pm 85.30$  seconds respectively. The patients from general surgery department were 143 (28.6%), while from orthopedic, gynecology and miscellaneous were 128 (25.6%), 125 (25.0%) and 104 (20.8%) respectively. During the study period, 85 (17%) developed SSIs out of which 38 (7.6%) fell into category of Southampton grade IV while 47 (9.4%) were in grade V. Both groups i.e. A and B, were compared in terms of qualitative and quantitative variables. The results are shown in Table I. There was no difference between groups in terms of age, gender distribution and hemoglobin levels (p values 0.592, 0.180, 0.805). There was statistically significant difference between the groups in terms of skin closure time and frequency of SSIs (p values <0.0001 and 0.024 respectively).

**Table- I: Comparison of variables between suture and staples groups (N=500)**

Parameter	Group A Suture group (n=250)	Group B Staples group (n=250)	P value
Age (years)	56.91 $\pm$ 15.60	58.36 $\pm$ 16.02	0.592 <sup>1</sup>
Gender (M/F)	115 (46.9%)/135 (52.9%)	130 (53.1%)/120 (47.1%)	0.180 <sup>2</sup>
Haemoglobin (g/dl)	12.37 $\pm$ 1.726	12.46 $\pm$ 1.677	0.805 <sup>3</sup>
Skin closure time (seconds)	251.07 $\pm$ 28.61	87.28 $\pm$ 17.20	0.000 <sup>4</sup>
SSIs (Y/N)	52 (61.2%)/198 (47.7%)	33 (38.8%)/217 (52.3%)	<0.024 <sup>5</sup>

computer generated random numbers. Surgical procedures were carried out by senior specialist and skin closure was done according to groups assigned. In group A, skin was closed with subcuticular polypropylene suture (, Prolene 2/0), while in group B, skin staples were used (Proximate skin stapler). Skin closure time was noted with stop watch android application (Simple stopwatch v 1.07, by ViK). First dressing was removed after 48 hours. Wounds were inspected for the disruption and infection on weekly basis up to 4 weeks. The wound infection was assessed by Southampton wound grading system. Only wounds with grade IV (Pus from wound) and V (Deep or severe infection with or without tissue breakdown, Hematoma requiring aspiration) were considered infected.

**Data analysis:** Data was analyzed using using SPSS version 24 for windows. The quantitative variables were age of patient, skin closure time and hemoglobin. These variables were expressed by mean and standard deviation. The qualitative variables were gender, type of surgery and wound grade. These variables were expressed as proportions. Both groups had compared each other in terms of quantitative and qualitative variables by independent sample t test and Chi square tests. P value of  $\leq 0.05$  was considered significant.

### DISCUSSION

Surgical wounds are prone to get infected due to exposure to environment during procedures. Despite all infection control measures, wounds get infected up to 2% in clean elective surgeries. Most of these infections can be cured with minimal discomfort to patient but more severe infections can lead to more catastrophic results. Skin closure is the final step in restoring mechanical defense against microorganism invasion after surgical procedure. Skin closure material and methods show some differences in wound infection, wound pain and healing rates.<sup>10</sup> Obesity, diabetes and previous radiation exposure increase the chance of wound infections.<sup>11</sup> Skin staples can be used in surgery other than skin like drape fixation, hernia mesh fixation and intestinal anastomosis.<sup>12-14</sup> Now a days most of the skin staples are made from stainless steel but absorbable staples also were used occasionally. In animal models, inflammatory response was minimum with absorbable staples.<sup>10</sup> In 1981, Eldrup et al. showed that skin staplers are superior only in terms of speed in elective breast and abdominal surgeries<sup>15</sup>. The mean closure time was 80 versus 242 seconds in staples and suture groups respectively.

The wound infection rates are similar in suturing and stapling. Staples are more painful in the early period and during removal of stitches.<sup>6,16</sup> Some studies showed that staples are less painful at six weeks' time as compared to sutures or equivalent to sutures.<sup>9,17</sup> In our study the closure time was almost three times long in suture group ( $87.28 \pm 17.20$  versus  $251.07 \pm 28.61$  seconds for staples and suture group respectively,  $p$  value  $<0.0001$ ). Stapling may be up to seven times quicker than suturing.<sup>17,18</sup> In cosmetic surgery the staples don't give good scar on face as compared to Prolene or nylon sutures.<sup>19</sup> Similarly for abdominal surgeries the cosmetic satisfaction was in the favor of sutures.<sup>20</sup> Cosmetic appearance and patient's satisfaction of both suture and staples may be the same at the end of six weeks in elective cesarean sections.<sup>17</sup> For emergency cesarean section deliveries, sutures proved to be more cosmetic than the staples. Anyhow, staples are associated with prolonged hospital stay.<sup>7</sup> A recent metaanalysis by Mackeen et al. favored skin staples due to decreased wound morbidity and separation in cesarean sections. There was no difference in cosmetic results.<sup>1</sup> In my study the cosmetic appearance and postoperative wound pain were not considered. A metaanalysis by Smith et al. concluded that in orthopedic surgery, skin staples are associated with higher rate of infections. Staples are not recommended especially in hip and knee surgery.<sup>8</sup> Regarding wound infection in orthopedic surgery, similar results were obtained in another study.<sup>21</sup> In my study, for orthopedic patients, 12 (17.4%) and 5 (8.5%) patients from suture and staples groups developed wound infection ( $p$  value 0.138). The suture group showed more infection, but it did not reach up to statistical significance. Another metaanalysis showed that wound infections in general surgeries can be decreased by stapled skin closure.<sup>6</sup> A recent RCT favored sutured closure for elective cesarean sections to decrease wound morbidity.<sup>9</sup>

## CONCLUSION

Skin staples cause less wound infection than sutures in clean elective surgeries. Moreover, skin staples are quicker for skin approximation than sutures.

## CONTRIBUTION OF AUTHORS

Basit A: Conceived Idea, Designed Research Methodology, Manuscript final reading and approval

Abbasi SH: Data Collection

Haider S: Data Interpretation, Statistical Analysis

Kiani YM: Manuscript Writing

Shah FH: Manuscript Writing, Statistical Analysis

Disclaimer: None.

Conflict of Interest: None.

Source of Funding: None.

## REFERENCES

- Mackeen AD, Schuster M, Berghella V. Suture versus staples for skin closure after cesarean: a metaanalysis. *Am J Obstet Gynecol*. 2015;212(5):621 e1-10.
- Berrios-Torres SI, Umscheid CA, Bratzler DW, Leas B, Stone EC, Kelz RR, et al. Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017. *JAMA Surg*. 2017;152(8):784-91.
- Merritt K, Hitchins VM, Neale AR. Tissue colonization from implantable biomaterials with low numbers of bacteria. *J Biomed Mater Res*. 1999;44(3):261-65.
- Oswal S, Borle R, Bhola N, Jadhav A, Surana S, Oswal R. Surgical Staples: A Superior Alternative to Sutures for Skin Closure After Neck Dissection-A Single-Blinded Prospective Randomized Clinical Study. *J Oral Maxillofac Surg*. 2017;75(12):2707 e1- e6.
- Slade Shantz JA, Vernon J, Morshed S, Leiter J, Stranges G. Sutures versus staples for wound closure in orthopaedic surgery: a pilot randomized controlled trial. *Patient Saf Surg*. 2013;7(1):6.
- Iavazzo C, Gkegkes ID, Vouloumanou EK, Mamais I, Peppas G, Falagas ME. Sutures versus staples for the management of surgical wounds: a meta-analysis of randomized controlled trials. *Am Surg*. 2011;77(9):1206-21.
- Sharma C, Verma A, Soni A, Thusoo M, Mahajan VK, Verma S. A randomized controlled trial comparing cosmetic outcome after skin closure with 'staples' or 'subcuticular sutures' in emergency cesarean section. *Arch Gynecol Obstet*. 2014;290(4):655-59.
- Smith TO, Sexton D, Mann C, Donell S. Sutures versus staples for skin closure in orthopaedic surgery: meta-analysis. *BMJ*. 2010;340:c1199.
- Figuerola D, Jauk VC, Szychowski JM, Garner R, Biggio JR, Andrews WW, et al. Surgical staples compared with subcuticular suture for skin closure after cesarean delivery: a randomized controlled trial. *Obstet Gynecol*. 2013;121(1):33-38.
- Fick JL, Novo RE, Kirchhof N. Comparison of gross and histologic tissue responses of skin incisions closed by use of absorbable subcuticular staples, cutaneous metal staples, and polyglactin 910 suture in pigs. *Am J Vet Res*. 2005;66(11):1975-84.
- Moore DC, Sellers MH, Archer KR, Schwartz HS, Holt GE. Staples equal sutures for skin closure after soft tissue tumor resection. *Clin Orthop Relat Res*. 2013;471(3):899-904.
- Fraser I. Intestinal anastomosis with a skin stapler: a safe and efficient method in humans. *Br J Surg*. 1994;81(5):665-67.
- Amin N, Fu B, Rutka J, Das P. Stapled double head and neck drape for otological procedures. *The Journal of laryngology and otology*. 2013;127(11):1139-40.
- Khan AA, Majeed S, Shahzadi M, Hussain SM, Ali MZ, Siddique K. Polypropylene suture versus skin staples for securing mesh in lichtenstein inguinal hernioplasty. *J Coll Physic & Surg Pak*. 2014;24(2):88-90.
- Eldrup J, Wied U, Andersen B. Randomised trial comparing Proximate stapler with conventional skin closure. *Acta Chir Scand*. 1981;147(7):501-2.
- Tseng TH, Jiang CC, Fu SH, Lee TL, Chuang YH, Chiang H. Topical anesthesia for staple removal from surgical wounds on the knee: a prospective, double-blind, randomized trial. *J Surg Res*. 2017;215:167-72.

- 17 Rousseau JA, Girard K, Turcot-Lemay L, Thomas N. A randomized study comparing skin closure in cesarean sections: staples vs subcuticular sutures. *Am J Obstet Gynecol.* 2009;200(3):265 e1-4.
- 18 O'Neill JK, Robinson P, Giddins GE. Staples for intra-operative skin retraction in hand surgery. *Journal of hand and microsurgery.* 2014;6(2):100-101.
- 19 Stegmaier OC. Use of skin stapler in dermatologic surgery. *J Am Acad Dermatol.* 1982;6(3):305-309.
- 20 Simcock JW, Armitage J, Dixon L, MacFarlane K, Robertson GM, Frizelle FA. Skin closure after laparotomy with staples or sutures: a study of the mature scar. *ANZ J Surg.* 2014;84(9):656-59.
- 21 Syed KA, Gandhi R, Davey JR, Mahomed NN. Risk of wound infection is greater after skin closure with staples than with sutures in orthopaedic surgery. *J Bone Joint Surg Am.* 2010;92(16):2732.