



SURGICAL SITE WOUND COMPLICATION; A COMPARATIVE STUDY OF SURGICAL SITE WOUND COMPLICATION RATES OF METALLIC SKIN STAPLES VERSUS POLYPROPYLENE SUTURES IN ORTHOPAEDIC WOUND CLOSURE

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ABSTRACT... Objectives: To compare the frequency of surgical site wound complication rate between the skin closure with staples and polypropylene suture after elective hip surgery. **Study Design:** Prospective Randomized trial. **Place and Duration of the Study:** Orthopaedic & Traumatology Department Lady Reading Hospital from 13/03/2016 to 25/12/2017. **Material and Methods:** All patients of either gender or age with intertrochanteric fractures fulfilling the inclusion criteria and fixed with dynamic hip screw (DHS) were randomly divided into two groups. Group A surgical site skin wounds were closed with metallic skin staples while Group B wounds were closed with polypropylene sutures. Wounds were examined for inflammation, necrosis, dehiscence, discharge and abscess on 3rd day, 2nd week, 4th, and 8th weeks in both groups and compared. P value was considered significant if < 0.05. **Results:** Surgical site skin closure of 100 patients were done with staples (group A, 50 patients) and interrupted polypropylene suture (group B, 50 patients). Baseline parameters of both groups had no significant differences. Mean age of group A and B patients were 61.6±SD 17.1 and 61.02±SD 19.2 respectively. Surgical site wound complications were reported in 9(18%) patients with staples closure and 8(16%) patients with suture closure ($p > 0.05$). **Conclusion:** We found no significance difference in surgical site complication rates of staples and suture closure in elective hip surgery patients. The operating surgeon can use closure material of his own choice.

Key words: Surgical Wound Infection, Skin Staples, Polypropylene, Suture Technique.

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INTRODUCTION

The best material or method for Orthopaedic surgical site skin closure is still controversial but skin staples and sutures are the two most commonly used.^{1,2,3} Complications of wound after Orthopaedic surgery is a cause of major morbidity resulting in prolonged hospital stay, frequent hospital admissions and limiting post operative physical mobility and quality of life of these patients.^{2,4,5} The Centre for Disease Control(CDC) reported approximately 29900 Surgical Site Infections(SSI) per year after elective Orthopaedic operations causing an extra cost of 1to 10 billion US dollar.⁶ Controversial results have been shown by various studies comparing complication rates and efficacy of skin staples and sutures and no consensus has been obtained in the literature as to which method of skin closure is superior.⁷ Some authors suggest that although metal staples are costly

and associated with greater chances of wound complications but the closure is rapid.^{2,8,9} Others reported a lower rate of complication with staples when compared with suture closure.¹⁰ While some researchers documented no significant difference in wound complication rates between the staples and sutures.^{6,11} Whatever method or material is chosen the skin closure must be watertight, free of tension and without any inversion of skin edges.¹⁰ The wound healing should be rapid without any wound dehiscence or infection and cosmetically acceptable result.⁸

The aim of our study was to compare the frequency of surgical site wound complication rate between the skin closure with staples and polypropylene suture after elective hip surgery.

MATERIAL & METHODS

This prospective randomized trial was conducted

in Orthopaedic & Traumatology Department Lady Reading Hospital from 13/03/2016 to 25/12/2017. Patients of either gender and age with intertrochanteric fractures sustained within a week and fixed with dynamic hip screw (DHS) were included in the study. Patients with open fractures, pathological fractures, revision hip surgery and polytrauma patients with multiple fractures were excluded from the study. Approval of the Ethical Review Board (ERB) of the hospital was taken for conducting the study. Informed written consent was taken from all participants of the study. Complete history and physical examination was done in all patients. All patients were operated within 2 to 5 days of their admission. All surgeries were performed by the same experienced orthopaedic surgeon in a clean Orthopaedic operation theatre. A uniform standard surgical protocol was adopted for all the patients including application of Op-site® at the incision site and pre operative intravenous Cefuroxime 1.6 gm in each case. No thromboembolic prophylaxis was given. All the patients were randomized into two groups intraoperatively after closure of fascia and subcutaneous tissue with absorbable vicryl. The method of closure was either metallic skin staple (group A) or polypropylene suture (group B). The operating surgeon was not aware which method was to be used till the scrub nurse open one among the 10 sealed envelopes and announced the method of skin closure.

Skin closure of all the patients in the staple group were closed using a commercially available skin stapler (®Adan F-35,6mm wide by Ningbo Advan Electrical Co Ltd China) while the suture group skin was closed with interrupted polypropylene monofilament, non absorbable (®Premilene 2/0, straight cutting, 75 cm, B-Braun Spain) mattress sutures. The staples and sutures were placed 1cm apart with an assistant approximating the skin edges with a forceps ahead of staple application. The wound was covered with pyodene soaked gauze and crept bandage. Suction drainage was used in all cases and removed after 24 to 48 hours. Demographic data of patients such as age, comorbid status, type of anaesthesia, incision length, total operative time, skin closure time and hospital stay was

documented. First post op dressing and wound examination was done while the patient was discharge home from hospital usually on 3rd or 5th day. An intravenous antibiotic (Cefoperazone plus Salbactam 2gm) was prescribed for 2 to 3 days to all the patients. Further follow up visits were done at 2nd, 4th, and 8th weeks and patients with any surgical site complications were readmitted if required for debridement or wound care in hospital. Complications of surgical site wound like swelling, redness, necrosis, stitch abscess, dehiscence and discharge was recorded in both group. Swabs were taken and sent to laboratory for culture and sensitivity where necessary. In each visit wound examination and documentation was done by the same operating Orthopaedic surgeon. Staples or sutures were removed at two weeks with a sterilized clip remover, forceps and blade respectively. Statistical analysis was done by using SPSS version 20. Categorical variables like gender was represented as frequency and percentage while mean±SD was calculated for numerical variables like age. The significance of surgical site wound complications between the staples and suture was assessed with chi-square test. P value was considered significant if < 0.05.

RESULTS

One hundred patients of intertrochanteric fractures were fixed with dynamic hip screw (DHS) and their surgical site wounds were closed with staples (group A, 50 patients) and interrupted polypropylene suture (group B, 50 patients). Baseline parameters of both group had no significant differences. In group A male patients were 32(64%) and female patients were 18(36%) while in group B, 38(76%) were male and 12(24%) were female. Mean age of groups A and B patients were 61.6±SD17.1 and 61.02±SD19.2 respectively. The aetiology of fracture was fall in 41(82%), and traffic accidents in 9(18%) in group A patients. In group B patients 38(76%) cases were due to fall and 12(24%) cases were due to traffic accidents. Right side was involved in 31(62%) and left in 19(38%) in group A. In group B, 27(54%) had right sided fracture and 23(46%) had left sided fracture. Majority of surgeries in both groups [33(66%) in group A and 39(78%) in group B] were done under spinal anaesthesia.

General anaesthesia was used in 17(34%) and 11(22%) patients in group A and group B patients respectively. Total mean operating time was 39 minutes in group A patients and 48 minutes in group B. The mean length of skin incision was 14 cm in group A and 16 cm in group B. Mean skin closure time was 3 minutes in group A patients and 11 minutes in group B ($p < 0.05$). Overall 9(18%) patients in staples group and 8(16%) patients in suture group shown surgical site wound complications. ($p > 0.05$) The frequency of surgical site complications in both groups is shown in Table-I. Most of the patients with wound complications in both the groups (5 patients in staple group and 4 patients in suture group) were females and all were operated under spinal anaesthesia. 3(33.3%) patients in staple

group and 2(25%) patients in suture group were diabetics. Majority of the wound complications in both groups (55% in staples and 50% in suture group) were reported in second or fourth week post operatively. Wound discharge in 3 patients (2 in staple and 1 in suture group) reported staphylococcal aureus and sensitive to most of the commonly used antibiotics. 5 patients (3 in staple group and 2 in suture group) were readmitted and incision drainage of abscess, debridement and re-suturing was done. The average stay in hospital of these complicated cases in both groups were 9 days each. All the wounds were ultimately healed.

Implant was retained in all cases. No in hospital mortality was recorded.

Surgical site wound complications	Group A(staples) Number of patients	Group B(suture) Number of patients	P value
Inflammation	3	2	0.32
Discharge	3	4	0.32
Necrosis	0	1	0.15
Dehiscence	1	0	0.15
Abscess	2	1	0.27

Table-I. Comparison of surgical site wound complications.

DISCUSSION

The frequency of surgical site wound complications in our study was 18% in staple group and 16% in suture group ($p > 0.05$) The first meta-analysis of staples versus suture closure was done by Smith and his colleagues¹ in 2010. They collected data from six studies (three randomized) containing 683 orthopaedic surgeries. Staples were used in 351 patients and suture in 332 patients. They found an overall three times increased risk of infection in staple group and four times in hip surgery. However they admitted that only one out of six studies was a properly designed randomized study. Six years after Smith's meta-analysis, Krishnan and MacNeil¹² in 2016 analysed thirteen studies (ten randomized and three observational) published between 1990 and 2015 comparing 692 patients in staple group with 563 patients in suture group with majority focused on lower limb surgery. They found no significant difference in wound complication rate. (Staples 3.0% suture 3.0%, p value 0.89) except the operative time was significantly lower in staples group than the

suture group. (p value < 0.001) Similarly another study¹³ reported no statistically significant difference in wound complication rate between the staples and sutures. (29% vs 34.4%) except that patients were more satisfied with staples, removal of staple was less painful, quicker and decrease chances of needle stick injuries during closure. This study further assumed that poor staple application technique might be the cause of surgical site wound complications in staples and to minimize these the study suggested that an assistant must evert and approximate the wound edges with forceps ahead of stapling. Schantz and Vermon⁶ randomized 148 patients into staples (69 patients) and suture (79 patients) and found a complication rate of surgical site wounds 1.4% and 1.2% respectively. Staple closure however was quicker by seven minutes than suture but increased pain was observed on removal of staples than sutures. We have one similar findings in our study like Schantz as we also observed that mean skin closure time was 3 minutes with staple and 11 minutes with suture (p

< 0.05). Khan⁹ documented a complication rate of 22.2% (8 patients) in staple group and 15.1% (5 patients) in suture group.

These lower surgical site complication rates with staples in some studies was explained by Graham and Jeffery¹⁴ as they were of the opinion that wound healing is excellent when perfusion and oxygenation is optimal and staples provide maximum blood perfusion to the wound there by achieving excellent wound healing and less complications. However some studies¹⁵ reported a higher surgical site complications with staples than with sutures. Singh and Mowbray² compared 41 hip surgery patients whose skin was closed with staples and 30 patients with subcuticular vicryl suture and found surgical site wound complication rate of 7.31%(3 patients) in staple group while no infection in vicryl group. They concluded that suture closure was less costly and associated with significantly better wound healing than staples. Staples had no added advantage except less operative time. Shetty⁸ reported a significant wound complication rate of 11.1% (6/54) with staples while no complication (0/47) with suture in his hip surgery patients. ($p < 0.025$) In our study all the patients who had surgical site wound complications their surgeries were done under spinal anaesthesia. In literature we couldn't find any study analyzing complication rate of the two methods of skin closure in spinal versus general anaesthesia. Smith and Sexton¹ had the same observation.

Some important factors relating to orthopaedic surgical site skin closure are how easy and quickly the skin is closed, surgical site complication rate, cost of closure material, cosmetic acceptability and patient satisfaction.² But unfortunately we could not analyze all these aspects in our study as our objective was only to compare the possible surgical site wound complication rates. We therefore, recommend further well designed randomized controlled trials focusing on all of these aspects and including lower limb, upper limb and elective as well as emergency surgical wound closure with staples versus sutures. These studies must also take into consideration the possible confounding variables like smoking,

use of steroids and body mass index. Only then it will provide sufficient evidence to orthopaedic surgeons to justify closure material of their choice.

CONCLUSION

We found no significance difference in surgical site complication rates of staples and suture closure in hip surgery patients. The operating surgeon can use closure material of his own choice taking into consideration the availability and cost of closure material. We recommend that skin must be closed preferably by the operating surgeon himself and with optimum closure technique.

Wound closure by non-doctor assistant must be discouraged.

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Weakness of attitude becomes
weakness of character.

– Albert Einstein –

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AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Faaiz Ali Shah	Conception & Design, Data collection & interpretation.	
2	Mian Amjad Ali	Final approval of the study for publication.	
3	Umar Zia Khan	Revised the article critically for important intellectual content.	