Original Article

Comparison of Wound Infection in Skin Staples Versus Sutures for Skin Closure in Patients Undergoing Caesarean Section

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Abstract

Objective: To compare the frequency of wound infection in skin staples versus sutures for skin closure in patients undergoing caesarean section.

Methodology: The randomized control trial study was conducted in the Department of Obstetrics & Gynaecology, Benazir Bhutto Hospital, Rawalpindi from 4th February 2015 to 3rd September 2015. A total of 654 cases were included in the study. Patients were divided into two groups. Group A was allotted for Skin Staples and Group B for sutures. Caesarean section was performed following the departmental protocols and skin closure was done according to randomization. A wound infection was recorded.

Results: In this study, the mean age of patients was the same in both groups (29.64 ± 4.17 vs. 29.58 ± 4.54 years) respectively. Mean gestational age was also the same (38.48 ± 0.65 vs 38.57 ± 0.62). In skin staples group 53(16.2%) females underwent elective c-section and 274 (83.8%) emergency c-section. In sutures group 63(19.3%) cases underwent elective and 264(80.7%) cases had emergency c-section, p-value = 0.306. In skin staples group 40(12.2%) patients developed wound infection and in sutures group 19(5.8%) females got wound infection within 7th post-operative day. Wound infection was significantly lower in suture groups as compared to staples groups, p-value = 0.04.

Conclusion: It is concluded that closure of the skin incision at caesarean delivery with the suture is associated with decrease incidence of wound infection as compared to staples.

Keywords: Caesarean section, skin closure, skin staples, sutures, complication, wound infection.

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Introduction

Caesarean delivery is among the commonest major surgeries performed within the United States (U.S.) and globally. Roughly 33% of pregnant females in the U.S. and 15 % globally are actually delivered through caesarean, yet this rate is increasing.[1] The incidence varies in different part of world from 3% to 21%.[2, 3] Because of these factors, caesarean incision complications including damage or infections at surgical site are a major source of morbidity after caesarean at significant cost for patients and healthcare system.[4]

Surgical site infection occurs in subcutaneous tissue or skin within the initial 30 days following a surgery. In addition, with purulent incisional drainage, there must

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be species isolated from the culture obtained aseptically, or visible discomfort, localized swelling, heat or redness. Risk factors that contribute to SSI include the type of uterine incisions and skin, prolonged procedural duration, greater than expected blood loss, failure of rigorous hemostasis, surgeon's specific skills (such as tissue processing) and patient-related factors including maternal BMI, the existence of comorbidities like anemia, hypertension, diabetes, previous uterine surgery, and pre-operative diagnosed chorioamnionitis.[4]

Another factor contributing to SSI is a type of suture material used for skin incision. Following C-section (CS), several suturing materials as well as skin staples (SS) are utilized to close the skin. A few of such suturing products were correlated with cost-effectiveness, lower rates of wound infection, enhanced cosmetic benefits, and lower discomfort. SS is simpler to employ and is correlated with a 3- to 4-fold decline in skin closure time with minimal wound infections. Although these are much more costly than suturing products, besides, SS is claimed to be more painful, resulting in a lower cosmetic effect.[5]

Most research on suturing formulations and SS for post-caesarean skin closure are targeted to superficial aspects, post-operative pain control, and patient satisfaction with contradictory results. [6]

Mackeen AD and others[7] evaluated the impact of skin closure procedures and materials following C-section on operative and maternal results and reported that today no clear evidence is present as for the ideal skin closure procedure following C-section.[7]

The rationale of the study is that conflicting results are recorded regarding wound infection in patients undergoing caesarean section and skin closure done either with sutures or skin staples and no local study is done to address this issue.

The study was conducted to establish the frequency of wound infection in skin closure of patients, done either with staples or sutures.

Methodology

The randomized control trial study was conducted in the Department of Obstetrics & Gynaecology, Benazir Bhutto Hospital, Rawalpindi from 4th February 2015 to 3rd September 2015. Non-probability: Convenience Sampling Technique was used. 654 cases, the sample size is calculated by using WHO sample size calculator for two proportions

- P_1 = 4.9%
- P_2 = 10%
- Power of study=80%
- Level of significance=5%
- Sample size=654 (327 in each group)

Inclusion criteria:

- Age between 18-40 years.
- All women undergoing caesarean section
- Gestational age ≥36 weeks

Exclusion criteria:

- History of wound infection in any previous surgery
- Obese women (BMI > 30 Kg/ m^2)
- History of co-morbid condition (Diabetes mellitus, anemia)

Overall, 654 subjects fulfilling the criteria for inclusion/exclusion were enrolled from the Department of Obstetrics & Gynaecology, Benazir Bhutto Hospital, Rawalpindi. A well-versed pre-consent was taken from the participants to collect data for the study. Approval certificate has been obtained from hospital ethical committee. History, physical examination and demographic information of all the patients were recorded. Patients were divided into two groups by random-numbers table generated on computer. Group A was allotted for Skin Staples and Group-B for sutures (prolene≠ 2-0 straight needle/ Silk 1 round body needle). Caesarean section was performed following the departmental protocols and skin closure was done according to randomization. Wound infection was recorded based on the presence of any of the following, purulent drainage, cellulitis (a bacterial infection beneath the skin marked by pain, swelling, warmth, and redness), abscess (an inflamed site in the body tissue with accumulated pus) or wound demanding debridement, drainage, and antibiotics linked with the infection's clinical diagnosis on 7th postoperative day.

SPSS version 16 was utilized for data entry and analysis. Mean and standard deviations were considered for quantitative variables including age, gestational age of the patients. Frequency and percentage calculations were performed for any qualitative variable including wound infection in both groups. Chi square test was applied to compare frequency of infection between both groups.

Stratification for age was recorded to address the effect modifiers.

Results

In this study mean age of patients was 29.61 ± 4.36 years with minimum and maximum age 20 years and 38 years respectively. Mean age in skin staples and sutures group was statistically same. Mean gestational age these females was 38.51 ± 0.64 with minimum and maximum gestational age 37 and 40 weeks. In both groups mean gestational age was same statistically. (Table I)

Table I: Comparison of age (years) and gestational age (weeks) in both groups

	Study groups		*P-value*
	Skin staples	Sutures	
Age (years)	29.64±4.17	29.58±4.54	0.851
Gestational age (weeks)	38.48±0.65	38.57±0.62	0.067

In skin staples group 53(16.2%) females underwent elective c-section and 274(83.8%) females underwent emergency c-section. In sutures group 63(19.3%) cases underwent elective and 264(80.7%) cases had emergency c-section, p-value = 0.306. (Table II)

Table II: Comparison of types of C section in both study groups

		Study Group		*Total*
		Skin staples	***Sutures***	
Type of C section	**Elective**	53 (16.2%)	63 (19.3%)	116 17.7%
	Emergency	274 83.8%	264 80.7%	538 82.3%
Total		327	327	654
		100.0%	100.0%	100.0%
p-value = 0.306				

In skin staples group 40(12.2%) patients developed wound infection and in sutures group 19(5.8%) females got wound infection within 7th post operative day. Statically wound infection was significantly lower in suture groups as compared to staples groups, p-value = 0.04. **Table III.**

On stratifying data we found significant association between study groups and wound infection in patients aged ≥ 30 years, p-value = 0.005. (Table IV)

Table III: Comparison of wound infection in both study groups

		Study group		Total
		Skin staples	**Sutures**	
Wound infection at 7th day	***Yes***	40	19	59
		12.2%	5.8%	9.0%
	No	287	308	595
		87.8%	94.2%	91.0%
Total		327	327	654
		100.0%	100.0%	100.0%
p-value = 0.04				

Discussion

Caesarean section or C-section is an oldest and widely performed surgery on women in all over the world [8] with a low chance of mortality for mother and child. Recently, the Caesarean Section (CS) rates have been reported to increase globally, both in underdeveloped and developed nations.[9] All abdominal surgeries involve the risk of complications.[8] The frequency of c-section has increased significantly because of several feto-maternal factors.[10] Post-caesarean wound infections in surgical incisions are the bacterial infections. Following an abdominal (c-section) delivery, this infection may arise. The infection arises in around 3%-6% of females with c-section delivery. Wound

Table IV: Comparison of wound infection in both study groups with respect to age groups

Age groups			*Study Group*		*Total*	*p-value*
			Skin staples	***Sutures***		
< 30 years	***Wound infection At 7th day***	***Yes***	15	10	***25***	***0.161***
			10.3%	6.5%	***8.3%***	
		No	131	145	***276***	
			89.7%	93.5%	***91.7%***	
≥ 30 years	***Wound infection at 7th day***	***Yes***	25	9	***34***	***0.005***
			13.8%	5.2%	***9.6%***	
		No	156	163	***319***	
			86.2%	94.8%	***90.4%***	

infections elevate maternal morbidity, stay in the hospital, and medical expenses following a CS. The wound infection rates following CS published in the current literature varies between 3% and 16%, depending on surveillance approaches employed to distinguish infections, the population of patients, and the prophylactic antibiotics utilized.[11]

The technique of skin closure is becoming progressively significant in orthopedic surgical procedures with the advent of rapid healing as well as the demands placed upon surgeons to minimize periods of hospital stay.[12,13] Accelerated skin recovery and a suitable cosmetic outcome are the basic objectives of excellent wound closure, along with minimizing the risks for complications including wound infection or dehiscence.[13] For skin closure following CS, a range of suturing materials as well as SS are utilized. A few of these suturing products are linked with lesser rates of wound infection, cost-effectiveness, enhanced cosmetic benefits, and lower discomfort.[14] These complications impose a significant effect on the patient's rehabilitation, resulting in greater morbidity, additional costs, delayed discharge, and lower satisfaction.[13] There is likewise a relationship between deep (prosthetic) infections and skin surface wound infections.[15]

Nylon sutures or metal staples are the most widely used approaches for skin closure following the orthopedic surgical procedure.[12] All strategies help to keep the surfaces of the skin attached when healing is taking place. Metal staples are claimed to be superior because they are considered faster and simpler in comparison to sutures.[16] Some researchers indicated that the application of metal clips or staples presents a higher risk for infection with the wound as well as may be less cosmetically suitable in comparison to sutures. [3] Metal staples could as well be further expensive.[12]

A study reported among 1100 females was assigned randomly into 3 groups: polyglycolic acid (PGA) suture group (N=361), skin staple (SS) group (N=373) and nylon suture group (N=366).[14] One more study reported that SSI was developed among 80 (11.2%) cases, 57 (71%) of then were detected via surveillance after discharge. Risk factors correlated with infections were analyzed. The subcuticular suture selection instead of staples for surgical site closure was correlated with a significantly lesser occurrence of infections (*p-value* = 0.021).[17]

Basha SL et al reported average rates of aggregate wound complications and wound isolation were 15.10% & 10.30% respectively. Wound separation took place considerably more frequently among staple cases compare with suture groups (17% vs 5%; p-value < 0.001), similar to composite wound complications (22% vs. 9%; p-value <0.001).[18] Another study reported Mackeen AD and workers[19] recorded infection in 10.6% in staples and 4.9% in the suture group. In this study 746 women were included, 370 to suture and 376 to staple closure. The adjusted odds ratio [OR] was 0.43, 95% confidence interval [CL] 0.23-0.78 respectively. [19] We in this study found in skin staples group 40(12.2%) patients developed wound infection and in sutures group 19(5.8%) females got wound infection within 7th post operative day. Statically wound infection was significantly lower in suture groups as compared to staples groups, p-value = 0.04. Our findings are similar to Basha et al[18] and Mackeen AD and workers[7] but are comparable to Johnson A et al[17]

There are other several factors related to wound infection, so a study reported 83.4% of females faced emergency LSCS, however, others were operated electively. Emergency LSCS inclines further to SSI than the elective surgical procedure. [20] In the current study in skin staples group 53(16.2%) females underwent emergency c-section and 274(83.8%) females underwent elective c-section. In sutures group 63(19.3%) cases underwent emergency and 264(80.7%) cases had elective c-section, p-value = 0.306. Of the 121 infected cases, 80.16 % underwent an emergency procedure. The membranes might have ruptured during an emergency c-section, or home delivery might have been tried. Any earlier complication or condition or elevated exogenous bacterial infection or failures in sterile procedure or absence of prompt antibiotic prophylaxis may also occur. Martens et al. disclosed similar results as well.[21]

A meta analysis in 2015 also favored sutures closure method i.e. Females with suture-closed incisions were considerably less expected to undergo complications of the wound as compared to those with staples (risk ratio, 0.49; 95% confidence interval [CI], 0.28-0.87). Even though complications of the wound were stratified via obesity, this variance persisted significantly. The reduction in wound-associated complications were large because of lower occurrence of suture-closed wound separations (risk ratio, 0.29; 95 percent CI, 0.20-0.43), as no significant variance was found in readmission, seroma, hematoma, or infection.[22]

Moreover, BMI of >25 affects the surgical outcomes.[23,24] Local improvements including reduced adipose tissue, a necessity for greater incision, reduced fat tissue circulation, and elevated retraction-related local tissue injury lead to elevated SSI occurrence among these subjects. These patients are disturbed by independent factors associated with homeostatic body equilibrium that occurs in wound restoration and immunity response. In this study, an improved BMI regarding an elevated infection rate was found to affect the procedure's outcome. We did not compare infection rates in both groups concerning BMI but On stratifying data we found a significant association between study groups and wound infection in patients aged ≥ 30 years, p-value = 0.005. As in the current study mean age in skin staples and sutures group was statistically same, 29.64 ± 4.17 years and 29.58 ± 4.54 years, p-value = 0.851. The mean gestational age of these females was 38.51 ± 0.64 with minimum and maximum gestational age 37 and 40 weeks.

Conclusion

It is concluded that wound infection was significantly lower in suture groups as compared to staples groups.

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