



## STUDY OF USE OF SURGICAL STAPLER VERSUS SUBCUTICULAR SUTURE FOR WOUND CLOSURE IN CAESAREAN SECTION

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### ABSTRACT

**OBJECTIVES:** Study of surgical staplers compared with sub cuticular sutures for wound closure in caesarean section. **METHODS:** Women from wards undergoing Caesarean section both elective and emergency were included in this comparative observational study. Patients were randomly allocated to sub cuticular sutures and staplers for skin closure and 100 cases were studied in each group. A total time of closure was recorded in seconds, Skin wound was evaluated with follow up direct 1 week, 6 weeks and 3 months for infection, discharge, swelling, cross hatching, wound dehiscence and photograph of scar taken each time for evaluation of cosmetic appearance. Verbal analogue scale for examining post-operative pain. Wound was assessed for cosmesis on 7<sup>th</sup> POD using modified Hollander cosmesis scale of 1-6. Wound infection resulting in discharge in any group; the exudate was sent for culture and sensitivity and wound was assessed on ASEPSIS score. Patients were reevaluated at 6 weeks of 3 months to study the scar and keloid formation using Stony brook scar evaluation score. P value less than 0.05 was considered as statistically significant. **RESULTS:** a total of 200 patients were recruited in the study. With mean age of 25.17 years and for sutures was 24.12 years. 79 % of the surgeries were emergency in nature. The time taken for stapler suture group was 106.17 seconds as compared to subcuticular suture (435.49 seconds) was statistically less ( $p < 0.0001$ ). Pain score, wound cosmesis score, scar score in stapler group was also statistically less. ( $p < 0.0001$ ,  $p < 0.0001$ ,  $p < 0.01$ ). Also, a large proportion of stapler cases giving hypopigmented scar than suture group ( $p < 0.001$ ). Width of the scar was less in stapler method as compared to subcuticular method ( $p = 0.1875$ ). The mean scar score in stapler group was  $4.12 \pm 1.08$  and in subcuticular group it was  $3.76 \pm 1.17$ . ( $p = 0.027$ ). 5 patients (2.65%) of stapler group had keloid but lesser compared to suture group (3.72%), p value  $< 0.001$ . Mean asepsis score was also less in stapler group ( $8.66 \pm 7.10$ ) as compared to subcuticular group ( $12.62 \pm 9.93$ ),  $p = 0.003$ . **CONCLUSION:** Time taken for closure with staplers is 4 times lesser than with subcuticular sutures. Post operative pain lesser with staplers, Aesthetic outcomes better with staplers, Good scars result in staplers, Wound infection lesser in staplers, incidence of keloid more in sutures. Hence, this study recommends use of skin staplers for skin closure in emergency and elective Caesarean section.

**KEYWORDS :** caesarean section, subcuticular suture, surgical stapler, wound closure

### INTRODUCTION

Skin is a protective and self-repairing barrier between the body and external environment. When the surgeon sutures a clean skin incision, methods during closure should provide appropriate approximation of tissue ends for wound healing with minimal risk of infection and produce an acceptable cosmetic outcome so a modern surgeon should have the ability to know what to use, when to use and for how long. The method used should be simple, quick painless and cost effective.<sup>[1]</sup>

Wound closure techniques and the materials used have evolved over the years. Closure materials vary in their chemical composition, caliber, knot security, elasticity absorbability, tensile strength and tissue reactivity.<sup>[2]</sup> Outcome of wound closure is influenced by factors such as wound site location, indication for the procedure and associated intra operative or post-operative complication.<sup>[3]</sup> After caesarean delivery, surgical incision site is closed with placement of either a continuous subcuticular suture that dissolves over time or interrupted vertical mattress suture or multiple metal staples that are removed at later date.<sup>[4,5]</sup>

So, we conducted this study to evaluate comparative efficacy of stapler versus subcuticular suture methods in caesarean section.

### OBJECTIVES

Study of surgical staplers compared with sub cuticular sutures for wound closure in caesarean section.

### METHODS-12202684361

A comparative observational study in Obstetrics & Gynaecology wards and OPD patients in Dr. D. Y. Patil Medical College, Hospital & Research Centre, Pune was carried from September 2018 to August 2020. Women from wards undergoing Caesarean section both elective and emergency were included in this comparative observational study. Patient with diabetes mellitus in pregnancy, patients with immune compromised status like AIDS/ HIV categories and patients with skin allergy, previous keloid formation or hypertrophic scar, tattoo in skin area of study were excluded from the trial. Patients were randomly allocated to sub cuticular sutures and staplers for skin closure and 100 cases were studied in each group after obtaining Institutional ethics committee. A total time of closure was recorded in seconds, Skin wound was evaluated with follow up direct 1 week, 6 weeks and 3 months for infection, discharge, swelling, cross hatching, wound dehiscence and photograph of scar taken each time for evaluation of cosmetic appearance. Verbal analogue scale for examining post-operative pain.<sup>[6]</sup> Wound was assessed for cosmesis on 7<sup>th</sup> POD using modified Hollander cosmesis scale of 1-6.<sup>[7]</sup> Wound infection resulting in discharge in any group; the exudate was sent for culture and sensitivity and wound was assessed on ASEPSIS score.<sup>[8]</sup> Patients were reevaluated at 6 weeks of 3 months to study the scar and keloid formation using Stony brook scar evaluation score.<sup>[9]</sup>

### STATISTICAL ANALYSIS

Data was entered in Microsoft excel 2016 version and analysed using SPSS 25.0 version. The difference between

surgical stapler and subcuticular suture for wound closure in caesarean section was calculated using unpaired t test and chi-square test. P value less than 0.05 was considered as statistically significant.

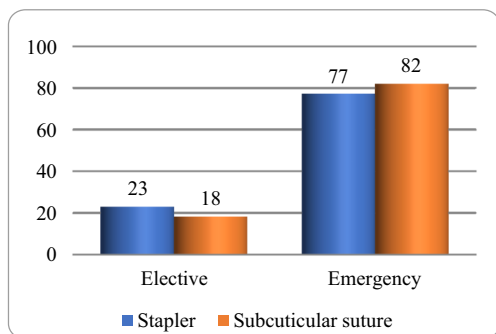
**RESULT**

A total of 200 patients were recruited in the study. With mean age of 25.17 years as shown in table 1.

**Table 1 : Comparison of age in Stapler and Subcuticular suture group**

Group	n	Age (Yrs)		t' value
		Mean	SD	
Stapler	100	25.17	3.939	2.01
Subcuticular suture	100	24.12	3.418	

79 % of the surgeries were emergency in nature as shown in figure 1.



**Figure 1. Distribution of cases in the study group into elective and emergency procedures.**

The time taken for stapler suture group was 106.17 seconds as compared to subcuticular suture (435.49 seconds) was statistically less (p<0.0001). As shown in table 2.

**Table 2: Comparison of time taken for skin closure in Stapler and Subcuticular suture group**

Group	n	Time taken for skin closure (sec)		Z Value	P Value
		Mean	SD		
Stapler	100	106.17	3.328	244.40	<0.0001
Subcuticular suture	100	435.49	13.057		

Pain score(table 3), wound cosmesis score(table 4), scar score(table 5) in stapler group was also statistically less. (p<0.0001, p<0.0001, p<0.01).

**Table 3: Comparison of pain score in Stapler and Subcuticular suture group**

Pain score	Skin closure method		Total
	Stapler(n)	Subcuticular suture(n)	
1	40(21.12%)	28(14.8%)	68(36.17%)
2	22(11.7%)	14(7.4%)	36(19.14%)
3	12(6.38%)	22(11.7%)	34(18.08%)
4	18(9.57%)	8(4.25%)	26(13.82%)
5 & above	4(2.12%)	20(10.6%)	24(12.76%)
<b>Total</b>	<b>96</b>	<b>92</b>	<b>188</b>

Chi-square = 21.27, P< 0.0001

**Table 4: Comparison of wound cosmesis score in Stapler and Subcuticular suture group**

Wound cosmesis score	Skin closure method		Total
	Stapler(n)	Subcuticular suture(n)	
0 – 3	94(50%)	76(40.42%)	170(90.43%)
4 – 6	2(1.06%)	16(8.51%)	18(9.57%)
<b>Total</b>	<b>96</b>	<b>92</b>	<b>188</b>

Chi-square = 12.72, P< 0.0001

**Table 5: Comparison of Scar score with skin closure methods**

Scar score	Skin closure method		Total
	Stapler(n)	Subcuticular suture(n)	
<3	20(10.6%)	38(20.21%)	58(30.85%)
4	30(15.95%)	20(10.63%)	50(26.59%)
5	46(24.46%)	34(18.08%)	80(42.55%)
<b>Total</b>	<b>96</b>	<b>92</b>	<b>188</b>

Chi-square = 9.31, P= 0.01

Also, a large proportion of stapler cases giving hypopigmented scar than suture group (p<0.001) as shown in table 6.

**Table 6: Scar characteristics in relation to skin closure methods**

Color of scars	Skin closure method		P value
	Stapler	Subcuticular suture	
Hyper	34(18.08%)	13(6.9%)	P= 0.001
Hypo	62(32.97%)	79(42.02%)	
<b>Width of scars (mm)</b>			
<2	57(30.31%)	45(23.93%)	P=0.1875
<3	39(20.74%)	47(25%)	
<b>Mean scar score</b>	4.12±1.08	3.76±1.17	p=0.027
<b>Keloid formations</b>			
Present	5	7	P< 0.0001
Absent	91	85	
<b>Asepsis Score</b>	8.66±7.10	12.62±9.93	p=0.003

Width of the scar was less in stapler method as compared to subcuticular method(p=0.1875). The mean scar score in stapler group was 4.12±1.08 and in subcuticular group it was 3.76±1.17.(p=0.027). 5 patients ( 2.65%) of stapler group had keloid but lesser compared to suture group (3.72%) , p value <0.001. Mean asepsis score was also less in stapler group (8.66±7.10) as compared to subcuticular group (12.62±9.93), p=0.003.

**DISCUSSION**

Our study was destined to evaluate the difference between the two surgical methods. In this comparative observational study, 200 patients underwent Caesarean section (41 elective, 159 emergency). Out of these 200, 100 underwent skin closure by stapler and other 100 by subcuticular sutures.

**Time consumption**

The average time taken for skin closure with stapler was 106.17 seconds and with sutures was 435.49 seconds. Stapler closure consumes 4 times lesser time than suturing with p value <0.001 (<0.05) ; statistically significant. Study of Ranaboldo et al states the rate of wound closure with stapler was 8 sec and with sutures 12.7 sec . (4 times faster)<sup>(10)</sup>.

Eldrup et al in 137 patients also concluded that it took one third time for mechanical sutures to close wound than conventional sutures.<sup>(11)</sup> Medina dos Santos et al found in their trial , staplers consuming lesser time in skin closures.<sup>(12)</sup>It was reported in a study conducted by Harvey and Logan, that there is 66.6% of time saving with staplers<sup>(13)</sup>. Mr. A Subramanian in his study also concluded stapler took 54 sec and sub cuticular sutures took 210 seconds for skin closure<sup>(14)</sup>

**Post operative pain**

Post operative pain was evaluated on linear verbal analog pain score , showing majority of suture patients have greater pain with higher scores hence in our study , it concluded patients in stapler group have lesser pain than those in suture group. Similar observation was seen in study of Ritchie AJ that skin stapling was faster and less painful than suturing.<sup>(15)</sup>

### Wound cosmesis

As stated by Fritz Gibbon in 1968 – “ By your scars you will be judged ” Patients in our study group were followed up on 1 week, 6 weeks and 3 months for evaluation of wound. P value in our study was <0.0001, statistically significant correlating with the study of George TK that states healing of wound and overall cosmesis is better with stapler.<sup>[16]</sup> Medina dos Santos et al compared the cosmetic results of two methods stating staplers 80% cosmetically superior than sutures.<sup>[16]</sup> Hence, in our study cosmetically staplers produce good wound ever skin and more appreciated by patient.

### Scar score assessment

Linear scar was evaluated on on Stony brook scale ranging from 0 (worst) to 5 (best). p value in this study was <0.05 , statistically significant stating scars in stapler group were more or less scarless , similar to skin colour and with width <2 mm. Rail road scar seen in all cases of stapler group although staples avoid problem of introducing infection deep into the wound but they produce local tension and ischaemia resulting in cross hatching along the scar.<sup>[17]</sup>

### Wound Complication

In our study by relating the two mean asepsis score of these methods, p value came <0.05 thus stapler cases had lesser wound complications. Conventional skin suturing methods have disadvantages in form of needle passing through the intact skin on either side of wound carrying both epidermis and organisms along its tract deep into the wound resulting in greater incidence of wound infection than observed in suture less technique.

Kanagaye et al in his study observed no complication in staple group.<sup>[18,19]</sup> Rate of infection is greater in braided filament suture than monofilament material.<sup>[20,21]</sup> Even the conduction of surface bacteria by per cutaneous multifilament suture by wicking effect leads to infection.<sup>[22]</sup>

According to Johnson et al , resistance to infection offered by stapler wounds is greater than sutural wounds as shown in similar studies of Stillmann , Bookare and colleague, Ivazzo , Gkegkes ID<sup>[23]</sup>

According to Graham et al, deposition of wound collagen is directly related to oxygen supply to that area and perfusion that is seen greater in staplers than sutures. In addition proper healing is seen in stapler wound as wound is in contact with blood for longer time than sutures.<sup>[24]</sup>

Wound was calculated using ASEPSIS score<sup>[25]</sup>

In present study, the presence of serous exudates, purulent exudates, erythema and wound gapes were less in staplers cases than suture cases on day 7 with better outcomes on later follow up. Study of Khan et al and Chibbaro et al however stated no significant difference regarding serous collection among suture and stapler group.<sup>[26,27]</sup>

The most common Surgical site infection in both groups was Staphylococcus, Klebsiella, Pseudomonas and E. Coli.

### Keloid

Keloids in our study was more seen in cases of suture group as per the study by Layton et al keloids with higher blood flow (seen in stapler) when exposed to cryotherapy treatment respond better.<sup>[28]</sup>

### CONCLUSION

The primary focuses after a surgical skin incision are rapid acquisition of tissue strength, lesser tissue damage, minimal inflammation and a neat scar. Skin staplers have more advantages than conventional subcuticular sutures as

staplers being relatively inert if left in situ for longer duration are without any complication; additionally patient can even take bath in early post-operative period. Staplers eliminates the risk of needle stick injury from unknown patient histories to health care providers.

Time taken for closure with staplers is 4 times lesser than with subcuticular sutures. Post operative pain lesser with staplers, Aesthetic outcomes better with staplers, Good scars result in staplers, Wound infection lesser in staplers, incidence of keloid more in sutures. Caesarean section. However, the only drawback of stapler use was the cost. To conclude, alterations over the years have taken place from conventional skin suturing to newer methods of cosmesis like skin stapling for achieving near virgin scar less skin.

Hence, this study recommends use of skin staplers for skin closure in emergency and elective Caesarean section.

**PRIOR PUBLICATION: NIL**

**SOURCE OF FUNDING: NIL**

**ETHICAL APPROVAL: TAKEN**

**CONFLICT OF INTEREST: NIL**

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