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Original article

Comparison of three suture techniques in closure of caprine skin incision: cosmetic and cost considerations

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ABSTRACT

The cosmetic and economic evaluations of three suture techniques were evaluated in closure of caprine skin incision. Fifteen apparently healthy male and female intact goats, free of any dermatological lesions were used for the investigation. They were randomly grouped into three; A (Subcuticular); B (Ford interlocking) and C (Simple interrupted). Cosmetic appearance of the surgical site was assessed on day 7, 14 and 21 post surgery using standard procedure as described by Sakka *et al*, 1995. There was statistical significant difference ($P<0.05$) in cosmetic appearance among the three groups at day 7 and 14, but there was no significant difference ($P>0.05$) at day 21 post surgery; in the entire scoring interval, subcuticular group had the best score. There was also statistical significant difference ($P<0.05$) in the three cost of suture materials used with the subcuticular suture pattern being the most economic. It was concluded that subcuticular suture patter gave the best cosmetic outlook and most economic in closure of caprine skin incision.

1. Introduction

The objectives of surgical wound closure include safety, effective healing with good cosmetic results. Effective cost utilization in the surgical suite and post-operative management are determining factors in the selection of incisional closure modality. A number of incisional closure techniques are available, including a variety of suture materials, metal skin staplers, tissue glues and adhesive dressings (Ademuyiwa *et al*., 2009).

The cosmetic outcome of surgical scars is of paramount importance to surgeon and clients in veterinary practice. Predicting the wound-healing properties of individual patients is difficult. The postsurgical wound-healing process is closely associated with various cellular activities that occur over several months (Rhett *et al*., 2008). Normal wound healing of the skin results in a flat and flexible scar. However, scar tissue remains weaker than normal skin and has an altered extracellular matrix composition (Colwell *et al*., 2003). The ideal end point would be total regeneration, with the new tissue having the same structural, aesthetic, and functional attributes as the original uninjured skin. Every effort must be made to improve scar appearance and, more importantly, to avoid the development of postsurgical hypertrophic scars or keloids. Excellent surgical technique and efforts to prevent postsurgical infection are of prime importance. Prevention of hypertrophic scars is obviously preferable to treatment and implies using a therapy aimed at reducing their incidence (Mustoe *et al*., 2002).

In this study the cosmetic outcome and cost value of suture materials used in closure of caprine skin incision were evaluated in the three suture techniques.

2. Materials and methods

Fifteen apparently healthy goats free of any dermatological lesion, with average age of 15.85±6.71 months (Mean±SD) were used for the investigations. They were kept in the Usmanu Danfodiyo University, Veterinary Teaching Hospital facilities and conditioned for 3 months during when they were evaluated and stabilized for the surgery. The animals were randomly divided into three groups (A, B and C). The left flank region of each goat was prepared for routine aseptic surgery by shaving the proposed surgical site; the site was scrubbed with Purit® (Chlorhexidine Gluconate B. P 0.3%W/V, Cetrimide B. P 3%W/V, Saro LifeCare Limited, Lagos, Nigeria) and rinsed with Methylated spirit (Binji Global Pharmaceutical Company, Sokoto, Nigeria).

Local anaesthesia was achieved with plain (lignocaine hydrochloride, Lignocaine injection B. P. 2%, Sahib Singh Agencies, Mumbai, India), mild sedation was achieved using Xylazine 20®. (Xylazine HCl 20mg/ml, Kepro Holland at 0.025mgkg^{-1}) and Atropine sulphate 0.6mg/ml(Laborate Pharmaceuticals India) was given at 0.05mgkg^{-1}.

The animals were placed on right lateral recumbency and draped for routine paralumber skin incision. About 12 cm vertical skin incision was made on the left flank from the epidermis to subcutaneous layer using standard procedure described by Gyang (1990) and Freeman (2003). The incision was routinely closed; the subcutaneous layer in all groups was closed with Becton® chromic catgut size 2/0, attached to atraumatic, ½ circle, taper point needle (Anhui Kangning Industrial Groups, China) using simple continuous suture pattern. Subcuticular closure pattern was used in group A. Skin was closed in group B and C using ford interlocking and simple interrupted suture patterns respectively with Agary® Nylon size 0, attached to atraumatic, $^{3}/_{8}$ curved, cutting needle (Agary Pharmaceutical Ltd, Xinghuai, China). Post surgery, the surgical site was dressed with sterile gauze bandage, adhesive plaster and a paediatric vest. Skin sutures were removed ten days post surgery in groups B and C.

Cosmetic appearance of the three suture pattern was evaluated at 7, 14 and 21 days post surgery according to method described by Sakka *et al*., (1995), using the following scoring parameters shown in table 1.

Cost implication of using each suture pattern was evaluated by considering the number of suture materials used per suture pattern and their corresponding cost value in Naira.

Data obtained were recorded and tabulated; the results were presented as Means±SD. One way analysis of variance (ANOVA) was used to compare statistical difference among the three suture patterns using GraphPad statistical software package.

3. Results

There was significant difference in cosmetic appearance of surgical site ($P<0.05$) at day 7 between subcuticular having the best score (4.25±0.5) and simple interrupted (5.25±0.5) group, but there was no significant

difference between subcuticular and ford-interlocking (5.00±0.0); and between ford-interlocking and simple interrupted groups (Table 2).

At day 14 post surgery, the overall cosmetic score was higher than that of 7 and 21 day post surgery with ford interlocking having the worst score (6.25±0.9). There was significant difference (P<0.05) between the subcuticular (4.50±0.5) and ford-interlocking groups, but there was no significant different between subcuticular and simple interrupted groups; and between ford interlocking and simple interrupted groups (Table 2).

At day 21 post surgery, there was no significant difference (*P>0.05*) among the groups (Table 2; Plate 1), but subcuticular group had the best score (4.25±0.5).

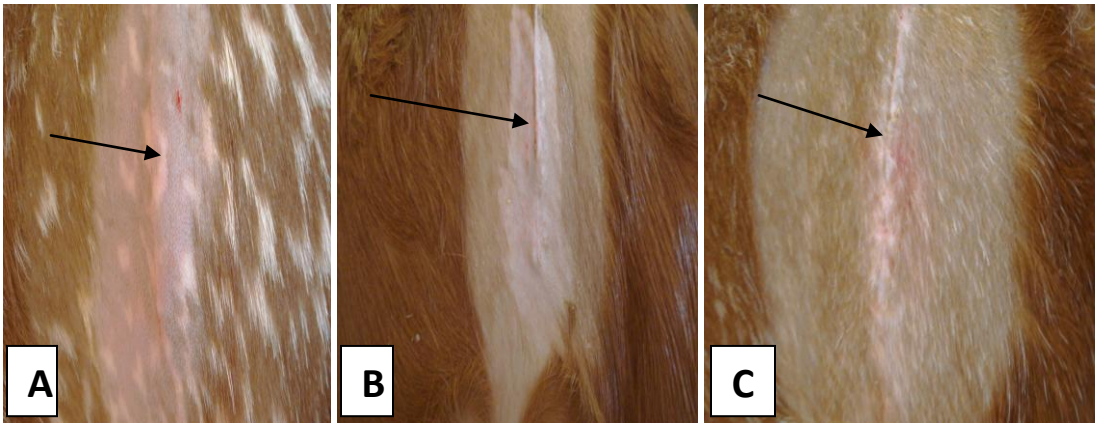
Table 1
Criteria and Scoring System used for Cosmetic Assessment (Sakka *et al*., 1995).

Parameters	Score
With of the Scare	
Not spread	1
Mildly spread	2
Moderately spread	3
Widely spread	4
Redness	
None	1
Present mild	2
Moderate	3
Severe	4
Thickness	
None	1
Present mild	2
Moderate	3
Severe	4
Pigmentation	
None	0
Present mild	1
Moderate	2
Severe	3
Puckerting (contour irregularity)	
None	1
Present mild	2
Moderate	3
Severe	4
Maximum score is 16 (worst), minimum score is 4(best)	

Table 2
Mean Cosmetic Scores of Different Suture Patterns at Day 7, 14 and 21 Post Surgery (Mean±SD)

Scoring interval (days)	Group A	Group B	Group C
7	4.25 ±0.5[a]	5.00 ±0.0[a]	5.25 ±0.5[b]
14	4.50 ±0.5[a]	6.25 ±0.9[b]	5.75 ±0.5[b]
21	4.25±0.5	5.25±0.5	5.00±0.8

[ab]Mean on the same row with different superscript are significantly different (*P<0.05*).



Plates 1. Cosmetic Appearance of the Three Surgical Groups (A B C) at Day 21 post surgery with arrow indicating the incision site.

There was significant difference (*p<0.05*) in the cost of materials used in the three suture patterns with the subcuticular pattern having the lowest mean cost price of the suture materials (Table 3). Ford interlocking and simple interrupted had the moderate and highest cost values of suture materials respectively (Table 3).

Table 3
Mean Cost Value of Suture Materials Used for Different Suture Patterns (Mean±SD) in Naira and US dollar equivalent.

Groups	n	Cost of suture materials (₦)(US$)
A	5	100 ±00 (US$ 0.61 ±00)[a]
B	5	200 ±00 (US$ 1.21 ±00)[b]
C	5	275 ±50 (US$ 1.67 ±.30)[c]

[abc]Mean on the same row with different superscript are significantly different (*P<0.05*).

4. Discussion

Effective skin closure is a necessary factor in prevention of infection. Halsted was the first surgeon to introduce subcuticular suture in 1887 in order to reduce infection in his procedure for repair of inguinal hernia, but it was J. S. Davis who was explored its full potential for wound aesthetic (Alexander *et al*., 2009). Subcticular suturing provide a better cosmetic as no much skin interruption was caused by suturing tools (clips or needle), a better blood flow maintained to the skin than when either the staple or the transcutaneous suturing method is used (Zografos *et al*., 1992). Our finding is in agreement with that of Giddins, (1994); Sakka, *et al*., (1995) and St. John, (1997) who also reported better cosmetic out come at day 7 and beyond post surgery. Our findings in this study suggest that there is difference in cosmetic outcome and cost of suture material among the skin closure techniques evaluated in caprine with the subcuticular closure pattern having the best cosmetic outcome and the lowest cost value of suture materials.

5. Conclusion

In conclusion, subcuticular closure pattern offered the best cosmetic outcome in closure of caprine skin incision and the pattern was economic in terms of suture materials used. Subcuticular suture pattern is therefore recommended as pattern of choice in closure of caprine skin incision.

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