



**Original article**

## Evaluation of three suture techniques based on surgical wound assessment in Caprine

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### ABSTRACT

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Subcuticular, simple interrupted and ford interlocking suture patterns were used in closing skin incision at paralumbar fossa in fifteen apparently healthy male and female adult goats. The goats were randomly divided into three groups: A (Subcuticular); B(Ford interlocking) and C(Simple interrupted). Clinical appearance of the surgical wound was scored twice post surgery at 18-24 hours and 10-14 days using swelling, erythema, dehiscence and discharge as the parameters. There were no statistical difference ( $P < 0.05$ ) among the three suture patterns at 18-24 hours and 10-14 days post surgery. It was concluded that any of the three suture techniques could be used to close skin incision in goats and result in good healing.

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## 1. Introduction

Surgical incision may be closed in a number of different patterns and the choice of the pattern may greatly influence the successes of wound healing. Post-operative inflammation and pain is a result of surgical trauma in surgery. The more trauma to tissues the greater is the incidence of inflammation and the greater the likelihood of post-operative pain. Handling tissue gently and infrequently is one of the key elements in reducing tissue trauma (Philip, 2005). Subcuticular suture technique or the buried continuous subcuticular suture pattern has been used in veterinary practice as an alternative to other skin closure techniques; it was developed as a way of reducing wound infection by avoiding percutaneous suture tracts and dead spaces (Smeak, 1992). The subcuticular closure has many advantages in elective surgeries, such as eliminating the need for suture removal, causing less pain, and reducing any visible scarring (Smeak, 1992; Cassie *et al.*, 1988). The risk of trauma from self mutilation trauma is also reduced, since there is no protruding suture material for the patient to lick or scratch; the technique also apposes skin edges evenly, thus promoting rapid epithelialization thereby enhancing healing process (Kirpensteijn *et al.*, 1997). Subcuticular suture pattern however requires substantial implanted suture, as well as increased tissue handling (Smeak, 1992).

The choice of suture material also impacts on wound healing, therefore, the smallest suture material size that will perform the job should be selected. Larger size suture only increase the amount of foreign materials for which the body might react. Size of suture to be used should be based upon the size of the animal, organ or tissue and the location and the function of the suture (Boothe, 1998). Wound dehiscence occurs in about 1-3% of abdominal surgical procedures. Systemic and local factors contribute to the development of this complication. Improper closure techniques and deficient wound healing are the two most important local factors predisposing to wound dehiscence (Sahin *et al.*, 2001).

The objective of the study was to compare the frequency of wound complications in caprine undergoing vertical paralumber skin incision closure using subcuticular, simple interrupted and ford interlocking suture patterns.

## 2. Materials and methods

Fifteen apparently healthy goats free of any dermatological lesion, with average age of  $15.85 \pm 6.71$  months (Mean $\pm$ 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<sup>®</sup> (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<sup>®</sup>. (Xylazine HCl 20mg/ml, Kepro Holland at  $0.025 \text{mgkg}^{-1}$ ) and Atropine sulphate 0.6mg/ml (Laborate Pharmaceuticals India) at  $0.05 \text{mgkg}^{-1}$ .

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 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<sup>®</sup> chromic catgut size 2/0, atraumatic;  $\frac{1}{2}$  circle taper point needle (Anhui Kangning Industrial Groups, China) using simple continues 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<sup>®</sup> Nylon size 0, atraumatic;  $\frac{3}{8}$  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. Sutures were removed ten days post surgery in groups B and C.

The clinical appearance of the skin was scored twice: 18 to 24 hours and 10 to 14 days post surgery as described by Hare *et al.*, (2002). The skin incision was scored based on the following criteria: swelling, erythema, dehiscence, and discharge (Table 1).

Data collected were tabulated and presented in form of graphs, means and standard deviation of means of the surgical scores were computed and one way ANOVA was used to analyse the data using graphPad statistical soft ware package.

**Table 1**

Criteria used to score appearance of surgical wounds.

Outcome	Score			
	0	1	2	3
Swelling (mm) (Wound edges thicker than surrounding skin)	None	0–2 mm	2–5 mm	>5 mm
Erythema (mm) Distance from wound margin	None	0–2 mm	2–5 mm	>5 mm
Dehiscence (% of suture line)	None	0–20%	20%–50%	>50%
Discharge	None	Serosanguinous Prulent		

Table adapted from Hare et al., (2002)

### 3. Results

At 18-24 hours post surgery, there was marked swelling in all the groups, subcuticular and ford interlocking groups had the same mean swelling scores (1.25±0.5) but simple interrupted group had lowest mean swelling score (Table 2). Ford interlocking and simple interrupted groups had similar mean erythema scores, but subcuticular group had lower mean erythema value. In all the groups at 18-24 hours post surgery, there was no dehiscence recorded. There was no discharge recorded also at 18-24 hours post surgery in ford interlocking and simple interrupted groups, but subcuticular group had a mean discharge score of 0.25±0.5 (Table 2). There was no significant difference ( $P>0.05$ ) in all groups at 18-24 hours post surgery (Table 2).

**Table 2**

Mean Surgical Wound Scores of Three Suture Patterns at 18-24 Hours Post Surgery (Mean±SD).

	Total scores		
	Group A	Group B	Group C
Swelling	1.25 ±0.5	1.25 ±0.5	0.50 ±0.5
Erythema	0.25 ±0.5	0.50 ±1.0	0.50 ±1.0
Dehiscence	0.00 ±0.0	0.00 ±0.0	0.00 ±0.0
Discharge	0.25 ±0.5	0.00 ±0.0	0.00 ±0.0

( $P>0.05$ ): No significant difference

At day 10-14 post surgery, there were varying degrees of mild swelling in all the groups with the simple interrupted having the highest mean score of 1.25±0.5. Erythema was only recorded in subcuticular group; mild dehiscence and discharge were also observed in simple interrupted group only (Table 3). There was no significant difference ( $P>0.05$ ) in all groups at 10-14 days post surgery (Table 3).

**Table 3**

Mean Surgical Wound Scores of Three Suture Patterns at 10-14 Days Post Surgery (Mean±SD).

	Total scores		
	Group A	Group B	Group C
Swelling	1.00 ±0.0	0.05 ±0.5	1.25 ±0.5
Erythema	0.25 ±0.5	0.00 ±0.0	0.00 ±0.0
Dehiscence	0.00 ±0.0	0.00 ±0.0	0.50 ±5.0

( $P>0.05$ ): No significant difference

### 4. Discussion

The overall surgical wound score at 10-14 days was lower than at 18-24 hours post surgery. This was due to the inflammatory responses to the surgical trauma which occur early post surgery. Hare *et al.*, (2002) recorded significant difference of swelling and erythema in canine ovariohysterectomy skin closure using two different suture patterns with synthetic absorbable suture materials. The increased swelling and erythema noted in the first

18-24 hours may have been due to greater tissue handling required for suture placement as well as the amount of implanted suture. Runk *et al.*, (1999) reported that implanted suture was identified by immune system as foreign material, and the inflammatory response was attributed to body reactivity to suture material. This response is crucial for normal wound healing to occur. Muir *et al.*, (1993) also reported that there was increased incisional swelling 24 hours postoperatively when a subcutaneous suture layer was added in a closure of linea alba celiotomy incision in cat.

Consistent with other investigations, the subcuticular closure pattern was somewhat more technically demanding and time-consuming than was the simple interrupted and ford interlocking patterns. Carefully placed final bites are required for correct apposition and complete knot burial. In this study, subcuticular closure provided a superior end result, with less degree of complications. The initial inflammatory result did not impede the overall healing at 10 to 14 days. It was concluded that the three suture patterns gave similar post operative tissue response when appropriate size of sutures were made. The three suture patterns were therefore recommended for use in closing skin incision made at paralumbar fossa in goats.

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