Comparison of Incisional Bursting Strength Between Two Suture Patterns in the Linea Alba of Horses

Ashley A. Magee, DVM and Larry D. Galuppo, DVM

Because of its superior bursting strength, a continuous closure of the linea alba may offer greater wound security in horses undergoing abdominal surgery. Compared with the inverted cruciate pattern, this method of closure leaves less foreign material in the wound, potentially decreasing inflammation and lessening the potential for postoperative wound infection. Authors’ address: Dept. of Surgical and Radiological Sciences, Veterinary Medical Teaching Hospital, University of California at Davis, Davis, CA 95616. © 1998 AAEP.

1. Introduction

Although its reported incidence is low, incisional dehiscence in the equine abdomen is a catastrophic and usually fatal event.1-3 One of the most commonly reported conditions known to increase the risk of wound dehiscence is increased intra-abdominal pressure.1,4-6 Other incisional complications, such as infection and hernia formation, occur commonly and may be associated with closure style.1,2 Abdominal wound closure in horses has not been studied in great detail, and most conclusions about appropriate suture material, suture pattern, and tissue bite sizes have been adopted from in vitro biomechanical studies3 and clinical retrospectives.1,2 This study evaluates the bursting strength of two suture patterns used to close ventral midline incisions in horses. Inverted cruciate and continuous patterns were compared for strength, speed of closure, and amount of suture material used to close a standardized ventral midline incision in an intact cadaver model.

2. Materials and Methods

Twelve mature horses euthanatized at the teaching hospital for problems other than chronic debilitating disease were randomly assigned to the two experimental groups. The cadavers were positioned in dorsal recumbency and a 2 in. (~5 cm) nylon strap was tightened around the caudal abdomen just cranial to the pelvis. (This prevents herniation of the viscera through the inguinal fascia when high pressures are reached.) A 40-cm skin incision was made to expose the ventral midline, and subcutaneous tissues were dissected off the linea alba. With the use of a template and tissue stain, the abdominal fascia was marked for a 25-cm incision starting at the umbilicus and extending cranially. Marks for suture placement were placed 15 mm apart and 15 mm from the center of the linea alba. The abdomen
was opened along this length and a 200-L-capacity polyurethane bladder was positioned in the abdominal cavity. Ingress and egress tubes (for insufflation and pressure recording, respectively) exited through stab incisions between the ribs on each side of the abdomen. All incisions were closed with #3 polygalactin 910® suture, with either an inverted cruciate or continuous pattern. Two surgeons starting at opposite ends of the incision closed the wound simultaneously. Six throws were used to secure each knot and suture ends were left 10 mm long.

The time for closure of the incision was recorded. The total amount of suture in the closed incision was recorded by measuring the remnant suture and by subtracting this amount from the combined length of the number of suture packs used. The bladder was inflated within the abdomen at 40 L/min and the pressure was measured by means of a transducer connected to a digital meter. Bursting pressure (pressure in Torr at the abdominal wall failure) as well as modes of failure (suture vs. fascia) were recorded.

### 3. Results

Mean bursting pressure was significantly greater (p = 0.01) for the continuous pattern (433.5 Torr) than for the inverted cruciate pattern (358.8 Torr). The mean time for closure for each pattern was not significantly different (p = 0.14). The mean length of suture left in the wound was significantly less (p = 0.0002) for the continuous pattern (120.8 cm) than for the inverted cruciate pattern (159.9 cm). The main failure mode was suture breakage at the knot (98% of inverted cruciate knots and 75% of continuous knots). Fascial pull through occurred less frequently (15% of knots in continuous closure and 0% of inverted cruciate knots), and knot slippage occurred infrequently (5% of continuous knots and 2% of inverted cruciate knots).

### 4. Discussion

In this study, the continuous pattern was stronger than the inverted cruciate pattern. These results indicate that a continuous closure of the linea alba may offer greater wound security than the inverted cruciate pattern. Suture failed in all of the inverted cruciate closures, whereas 15% of the knots in the continuous patterns were able to withstand pressures until the fascia failed. This may indicate that the continuous pattern allows greater distribution of tension across the suture, concentrating less of the strain at the knots and allowing the closure to exceed the strength of the fascia during episodes of increased intra-abdominal pressure. This method of closure also leaves less foreign material in the wound, potentially decreasing inflammation and lessening the potential for post-operative wound complications.

### References and Footnotes


©Vicryl, Ethicon, Ltd., Sommerville, NJ 08876-0151.