

## PREVENTION OF VESICOVAGINAL FISTULAS IN LAPAROSCOPIC HYSTERECTOMY WITH ELECTROSURGICALLY INDUCED CYSTOTOMY

### Aims of Study

Vesicovaginal fistula formation is a rare but potentially devastating complication of gynecologic surgery. The most common laparoscopic procedure causing bladder injury with subsequent vesicovaginal fistula formation is laparoscopically-assisted vaginal hysterectomy (LAVH). During LAVH, sharp electrosurgical dissection of the bladder is the most often implicated antecedent event. While the exact mechanism of fistula formation remains unclear, evidence suggests that the use of electrosurgical current during laparoscopy may play an important role in fistula formation. The role of electrosurgical bladder injury on fistula formation was tested in our recently published pilot study using a dog model (1). In that study, two of eight dogs who sustained a monopolar cystotomy repaired by a single-layer closure developed vesicovaginal fistulas. In contrast, no fistulas were noted when the bladder was superficially desiccated with bipolar current or when 2-0 polyglactin sutures were placed to incorporate the full-thickness bladder wall in the vaginal cuff closure. The primary objective of this study is to compare the effectiveness of three methods of double-layer cystotomy repair after electrosurgical bladder injury in the prevention of vesicovaginal fistulas. A second objective is to compare the rate of fistula formation after cystotomy repair using a double-layer closure to a historical control group that underwent cystotomy repair with single-layer closure.

### Methods

Twenty-four female mongrels were divided into three groups and underwent laparoscopic hysterectomy followed by a 2cm monopolar electrosurgical cystotomy. Group 1 had simple two-layer cystotomy repair with interrupted 2-0 polyglactin suture, group 2 had resection of tissue 5mm beyond the visible electrosurgical burn margin followed by two-layer closure, and group 3 had interposition of an omental flap after two-layer closure. Animals were sacrificed at least 27 days postoperatively. The presence and severity of adhesions were noted and graded on an ordinal scale (1-mild to 3-severe). The bladder and vagina of each dog was harvested en bloc and a careful evaluation for vesicovaginal fistulas was undertaken by retrograde bladder filling. Groups were compared to each other and to a historical control group of eight dogs who underwent cystotomy repair with single-layer closure. Dichotomous variables were compared by the Fisher's exact test and postoperative adhesions were compared using a Wilcoxon rank-sum test. 95% confidence intervals for the proportion of dogs developing fistulas in the single and double-layer closure groups were calculated.

### Results

All groups were similar in preoperative and necropsy weight ( $P=0.69$ ). In the study cohort, one dog in group 1 (simple double-layer repair) exhibited evidence of malaise, anorexia, and severe abdominal distension on the third postoperative day. Laparotomy was immediately performed revealing bladder rupture lateral to the sutures at a site of electrosurgical thermal spread. Sutures at the surgical site appeared intact without evidence of urethral or ureteral obstruction. No evidence of infection or abscess was present. The dog was sacrificed immediately after laparotomy and was thus excluded from the analysis of fistula rate. All other dogs survived the postoperative period with minimal complications. Two dogs exhibited signs of both malaise and anorexia on postoperative day #1. The anorexia and malaise were attributed to postoperative pain and no significant findings were noted in either dog during autopsy.

Table 1 - Postoperative complications in study-group dogs

	Group 1 (N=8)	Group (N=8)	2 Group (N=8)	3 Total (N=24)	P
Anorexia	1 (12.5)	0	1 (12.5)	2 (8.3)	0.57
Oliguria	1 (12.5)	0	0	1 (4.1)	0.31
Malaise	1 (12.5)	1 (12.5)	1 (12.5)	3 (12.5)	1.0
Perforation	1 (12.5)	0	0	1 (4.1)	0.31

Data are represented as number (%)

At necropsy, postoperative adhesions were present in nine of twenty-four dogs (37.5%) in the study group. Using the ordinal adhesion scale, adhesion scores were not significantly different among the groups ( $P=0.4$ ). Data regarding the severity of adhesions at necropsy was not collected in the control dogs during the pilot study. None of the dogs in either the control or study groups exhibited purulence or abscesses at necropsy. No vesicovaginal fistulas were noted in any of the study dogs (0/23, 95%CI [0-12.7%]), compared to 2/8 (25%) who underwent single-layer closure (95%CI [0-55%],  $P = 0.06$ ).

### **Conclusions**

Two-layer bladder closure appears to be superior to single-layer closure for the prevention of vesicovaginal fistulas after monopolar cystotomy. The benefit of electrosurgical burn margin excision or omental flap interposition remains unclear, but both are easily accomplished with little risk and may play a role in fistula prevention.