A Novel Chitosan-based Dressing to Seal Renal Parenchymal Wound Following Laparoscopic Partial Nephrectomy: Preliminary Results in Swine

Hua Xie, M.D., Ph.D.[1]*, Jeffrey S. Teach, R.N.[1], Maria C. Anderson, R.N[1],
Barbara A. McGrath, B.S.[2], Simon J. McCarthy, Ph.D.[2]

[1]Oregon Medical Laser Center, Providence St. Vincent Medical Center, Portland, OR
[2]HemCon, Inc. Tigard, OR

ABSTRACT

Purpose: We evaluate the feasibility of using a chitosan-based hemostatic dressing to control hemorrhage and urinary leakage by sealing off the parenchymal wound following laparoscopic partial nephrectomy in an anticoagulated porcine model.

Materials and Methods: Nine heparinized domestic swine underwent bilateral laparoscopic partial nephrectomies involving either a polar (N=13) or wedge resection (N=5). Estimated blood loss (EBL), hemostatic score, operative time and adhesion score of the chitosan dressing were recorded. Retrograde pyelography was performed to assess the urine extravasation.

Results: Of 18 procedures, 17 successfully achieved complete hemostasis after deployment of the chitosan dressing. The hemostasis score was significantly improved after the deployment in both polar (p < 0.001) and wedge (p = 0.017) resections. The rate of successful pyelocaliceal seal was 85% (11/13) in polar and 60% (3/5) in wedge resections. There were no statistical differences in operative time, EBL, and change of hemostasis score between both procedures.

Table 2. Hemostasis score of pre- and post LPN with chitosan dressings

	Pre-LPN	Post LPN	*p* value*
Polar resection	1.0 ± 0.6	3.9 ± 0.3	< 0.001
Wedge resection	0.4 ± 0.6	3.4 ± 1.3	0.017

* Wilcoxon signed-rank test

Conclusions: The novel chitosan-based hemostatic dressing is effective as a primary or supplemental treatment for sealing the parenchymal wound in laparoscopic partial nephrectomy in the animal model. A long-term chronic study is warranted.

Table 1. Summarized information on LPN with chitosan dressings

	All LPN (N=18)	Pole (N=13)	Wedge (N=5)	p value*
Body weight, kg.	56±8			
Kidney weight, g.	117±17	111±15	113±22	0.79
Resection weight, g.	24±5	25±4	19±6	0.19
Resection area, cm sq.	12±6	11±3	15±11	0.55
Number of applications (range)	1.8±0.9	1.5±0.7 (1 to 3)	2.4±1.1 (1 to 4)	0.09
Operative time, min.	17±15	14±9	27±25	0.29
EBL, ml., (range)	71±104	51±74 (10 to 250)	121±160 (10 to 400)	0.40
ges of hemostasis score (range)	3.2±1.0	3.2±0.8 (2 to 4)	3±1.7 (0 to 4)	0.50
Adhesive score (range)	3.3±0.9	3.5±0.6 (2 to 4)	2.8±1.1 (1 to 4)	0.29

* Pole *vs.* Wedge