Characterization of the pancreatico-enteric anastomosis in a porcine survival model

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OBJECTIVE: Leakage from the pancreatico-enteric anastomosis after pancreatico-duodenectomy is an important cause of postoperative morbidity and mortality. Histological studies of ileal and colonic anastomoses have provided valuable insights into anastomotic failure. However, this crucial information is lacking for pancreatico-enteric anastomoses. The aim of this study was to characterize the histology, collagen deposition and bursting strength of the anastomoses in a porcine survival model during the early post-operative period.

METHODS: Pancreatico-duodenectomy was performed followed by two layered end-to-side pancreatico-enteric and an end-to-end enteral-enteral anastomosis. Animals were survived for at least five days. Drain amylase was measured on postoperative day 3 and 5. Animals were euthanized between postoperative day 5 and 9 and the pancreatico-enteric anastomosis was resected en-block with the enteral-enteral anstomosis. Burst pressure testing was performed using Gastrograffin solution under direct fluoroscopic guidance. Histological sections of the anastomoses were prepared. A digital quantitative collagen assessment was performed on tissue from both anastomoses.

RESULTS: Data on drain amylase levels and collagen content at the anastomoses is summarized in the table below. Animal 2 was found to have a sub-clinical leak at the enteral-enteral anastomosis at the time of sacrifice. Animal 8 was planned to survive for 8 days but was sacrificed on postoperative day 5 secondary to clinical deterioration. The animal was found to have a leak at the pancreatico-enteric anastomosis. The quantitative collagen assessment was less than 40% in both anastomoses that leaked, compared to 43.6% to 74.7% in anastomoses with no evidence of leak. High drain amylase did not seem to correlate with poor healing. Unfortunately drain amylase levels were not available in the animal with a pancreatico-enteric anastomotic leak.

CONCLUSION: Our initial results indicate that quantitative collagen assessment is a reasonable surrogate for anastomotic failure. Future studies will examine methods to increase the collagen content of the anastomoses.

	Drain Amylase (POD#3)	Drain Amylase (POD#5)	Drain Output (ml,POD#5)	Sacrifice on POD#	P-E Collagen area/ Whole Tissue Area (%)	E-E Collagen area/ Whole Tissue Area (%)	Anastomotic Integrity
1	6350	>10000	50	5	43.6	64.9	no leak
2	>10000	4433	5	5	73.9	37.6	E-E leak
3	>10000	3862	10	9	74.7	71.8	no leak
4	5907	4416	10	9	54.6	46.6	no leak
5	1868	10000	25	9	43.6	46.1	no leak
6	6625	4467	5	9	45.5	50.4	no leak

7	3388	1978	5	8	52.5	53.6	no leak
8	Sample clotted	Sample clotted	30	5	32.4	59.6	P-E leak

POD = postoperative day; P-E = pancreatico-enteric anastomosis; E-E = enteral-enteral anastomosis