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OUTCOMES AMONG TRAUMA PATIENTS WITH DUODENAL LEAK FOLLOWING PRIMARY VS COMPLEX REPAIR OF DUODENAL INJURIES: AN EAST MULTICENTER TRIAL

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Objectives: Duodenal leak is a feared complication of repair and innovative, complex repairs with adjunctive measures(CRAM) were developed to decrease both leak occurrence and severity when leaks occur. Data on the association of CRAM and duodenal leak is sparse and its impact on duodenal leak outcomes nonexistent. We hypothesized CRAM would 1) be associated with decreased duodenal leak rates and 2) improve recovery and outcomes when leaks do occur.

Methods: A retrospective, multicenter analysis from 35 L1 centers included patients(>14yr) with operative, traumatic duodenal injuries (1/2010-12/2020). The study sample compared duodenal operative repair strategy: primary repair alone(PRA) vs CRAM(any repair plus pyloric exclusion, gastrojejunostomy, triple tube drainage, duodenectomy). Measured study endpoints included duodenal leaks and markers of leak sequelae and recovery.

Results: The sample(n=861) was primarily young(33 years) male(84%) with penetrating injuries(77%); 523 underwent PRA, 338 CRAM. Although CRAM were more critically injured(Table 1) than PRA, CRAM did not correlate with improved leak rates (PRA 8% v CRAM 21%, $p<0.001$). In turn, adverse outcomes were more common after CRAM with more IR drains, prolonged NPO and LOS, greater mortality, and more 30-day readmissions than PRA(all $p<0.05$). Importantly, CRAM also had no positive impact on leak recovery(Table 2). There were no differences in number of operations, drain duration, NPO duration, need for IR drainage, HLOS, readmissions or mortality between PRA leak vs CRAM leak patients(all $p>0.05$). CRAM leaks had longer antibiotic duration, more GI complications and *longer* duration until duodenal leak resolution(all $p<0.05$).

Conclusions: CRAM did not prevent duodenal leaks and moreover, did not reduce adverse sequelae when leaks did occur. Our results suggest that CRAM is not a protective operative duodenal repair strategy.

Table 1. Clinical variables, entire study sample and duodenal leak subset compared by repair type (PRA vs CRAM)								
	All Patients (n=861)	All Primary Repair Patients (PRA) (n=523)	All Complex Repair Patients (CRAM) (n=338)	p value	**All Patients with Duodenal Leaks (n=113)**	Duodenal Leaks s/p PRA (n=43)	Duodenal Leaks s/p CRAM (n=70)	p value
Age (mean ± SD)	33 ± 29	32 ± 14	35 ± 43	0.499	39 ± 72	30 ± 12	44 ± 90	0.418
Male	84%	83%	85%	0.405	83%	86%	81%	0.524
Penetrating injury	77%	80%	72%	**0.006**	81%	88%	77%	0.136
Systolic Blood Pressure (mmHg)	119 [98–137]	121 [99–138]	114 [96–133]	**0.024**	113 [94–134]	113 [100–131]	112 [93–135]	0.916
Injury Severity Score	22 [14-29]	19 [11-29]	25 [16-30]	**0.001**	24 [16–29]	22 [16–29]	25 [16–29]	0.941
AIS abdomen	4 [3–4]	4 [3–4]	4 [3–5]	**<0.001**	4 [3-4]	4 [3–4]	4 [3–4]	0.128
Massive Transfusion Protocol	39%	35%	46%	**0.002**	44%	37%	49%	0.193
Pancreatic injury	32%	25%	43%	**<0.001**	39%	23%	49%	**0.007**
Multiple duodenal Injuries	23%	20%	27%	**0.008**	34%	35%	33%	0.825
Duodenal injury AAST grade *I*	18%	21%	15%	**0.022**	6%	12%	3%	0.103
II	40%	50%	24%	**<0.001**	38%	49%	31%	0.064
III	34%	28%	44%	**<0.001**	43%	40%	46%	0.520
IV	4%	1%	10%	**<0.001**	10%	0%	16%	**0.006**
V	3%	1%	7%	**<0.001**	3%	0%	4%	0.287

Table 1. Clinical variables, entire study sample and duodenal leak subset compared by repair type (PRA vs CRAM)

PRA = Primary Repair Alone

CRAM = Complex Repair with Adjunctive Measures

Table 2. Duodenal injury operative management and outcomes, entire study sample and duodenal leak subset compared by repair type (PRA vs CRAM)								
	All Patients with Operative Duodenal Injuries (n=861)	All Primary Repair Patients (PRA) (n=523)	All Complex Repair Patients (CRAM) (n=338)	p value	**All Patients with Duodenal Leaks (n=113)**	Duodenal Leaks s/p PRA (n=43)	Duodenal Leaks s/p CRAM (n=70)	p value
Primary Repair Alone (PRA)	61%				38%			**<0.001**
Complex Repairs with Adjunctive Measures (CRAM)	39%				62%			
Pyloric Exclusion with Gastrojejunostomy			23%				36%	
Duodenectomy with Enteric Anastomosis			22%				16%	
Duodenal Diverticulization			1%				0%	
Retrograde Duodenostomy Tube and Feeding Jejunostomy Tube			4%				7%	
Whipple			11%				11%	
Combination of complex repairs/Other			39%				30%	
Total Number of Abdominal Operations	2 [1–3]	2 [1–3]	2 [1–4]	**<0.001**	3 [2–7]	3 [2–5]	4 [2–7]	0.084
IR Drain Placement for Duodenal Leak					42%	35%	46%	0.257
Duration of drains (days)	12 [6–29]	11 [5–23]	17 [7–67]	**<0.001**	38 [15–58]	34 [15–43]	43 [16–66]	0.098
Duration of Antibiotic Therapy (days)					10 [8–21]	9 [7-14]	12 [10–25]	**<0.001**
Days until fistula/duodenal leak resolution					14 [4–42]	11 [2–19]	21 [6–58]	**0.020**
Days NPO	8 [5–16]	7 [5–13]	11 [6–21]	**<0.001**	23 [9–48]	23 [8–38]	22 [10–54]	0.575
GI Related Complication (abscess, GI bleed, ulcer, ileus, abdominal compartment syndrome, EC fistula, anastomotic leak)	43%	39%	50%	**0.001**	81%	65%	91%	**0.001**
Hospital Length of Stay (days)	16 [9–30]	14 [8–26]	20 [10–34]	**<0.001**	38 [22–54]	36 [21–50]	38 [23–48]	0.544
Mortality	11%	9%	15%	**0.002**	10%	5%	13%	0.201
30-day Readmission	20%	17%	23%	**0.003**	33%	35%	31%	0.879

Table 2. Duodenal injury operative management and outcomes, entire study sample and duodenal leak subset compared by repair type (PRA vs CRAM)

PRA = Primary Repair Alone

CRAM = Complex Repair with Adjunctive Measures