PD60-07

Acute Kidney Injury with Enhanced Recovery After Surgery Protocol in Radical Cystectomy Surgery: A Propensity Score-Matched Study

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INTRODUCTION:

④ Fluid management within enhanced recovery after surgery is a crucial element aiming to maintain optimum fluid balance through the perioperative period.

④We assessed the effect of ERAS protocol-related fluid restriction on kidney function and the incidence of postoperative acute kidney injury and 3-month kidney function.

PATIENTS AND METHODS:

1- STUDY POPULATION

- From 2010 through 2018, 115 radical cystectomy patients managed by ERAS protocol were compared to a propensity-matched group of patients prior to ERAS protocol implementation (control group).

- The data have been prospectively collected since introduction of the ERAS protocol and data for the traditional non-ERAS group was obtained by retrospective chart review.

2- OUTCOME MEASURE

④***The primary outcome*** was the incidence of postoperative acute kidney injury as classified by the Kidney Disease Improving Global Outcomes (KDIGO) staging system

④***Secondary outcomes*** were

1. Length of hospital stay
2. GIT recovery time
3. Postoperative complications
4. 30-day readmission rate.

3- STATISTICAL ANALYSIS

④A propensity-matched analysis was performed considering age, sex, smoking status, Charleson comorbidities index and type of operative approach (robotic vs open).

④All comparisons performed between categorical variables using Chi-square test, Fisher Exact test and between continuous variables using student t-test if parametric, and Mann-Whitney test or Wilcoxon signed rank test if non-parametric.

RESULTS:

(1) Demographics:

There were no significant differences between both groups

	Non-ERAS (n=115)	ERAS (n=115)	P value
Age, median (IQR)	69 (16)	67 (12)	0.475
Sex			1.0
Male	95 (82.6 %)	95 (82.6 %)	
Female	20 (17.4 %)	20 (17.4 %)	
Height (m), median (IQR)	1.75 (0.1)	1.75 (0.1)	0.906
Weight (pounds) , median (IQR)	175.5 (41.25)	181 (58)	0.540
BMI ((kg/m^2)			0.424
Median (IQR)	26.47 (5.66)	27.55 (7.59)	
Smoking			0.06
No	34 (29.6 %)	38 (33 %)	
Yes	34 (29.6 %)	19 (16.5 %)	
X-smoker	47 (40.9 %)	58 (50.4 %)	
Severity of comorbidity			0.546
None	30 (26.1 %)	29 (25.2 %)	
Mild	65 (56.5 %)	66 (57.4 %)	
Moderate	18 (15.7 %)	20 (17.4 %)	
Severe	2 (1.7 %)	0 (0.0 %)	
Surgical approach			0.78
Open	78 (67.8 %)	80 (69.6 %)	
Robotic	37 (32.2 %)	35 (30.4 %)	
Neoadjuvant chemotherapy			0.293
No	68 (59.1 %)	59 (52.2 %)	
Yes	47 (40.9 %)	54 (47.8 %)	

(2) Intraoperative characteristics:

The rate of intraoperative blood transfusion was significantly lower in ERAS group n=27 (23. 5 %) compared to pre- ERAS cohorts n= 47 (40.9 %) (p= 0.005) (Table 3). In terms of optimization perioperative fluid administered as recommended by ERAS society guidelines; intraoperative IV fluids were significantly lower in ERAS group compared to matched pre-ERAS cohorts (p=0.002).

	Non-ERAS	ERAS	P value
Operative time Median (IQR), min	389.4 (150.6)	370.2 (128.4)	0.042
Estimated blood loss, median (IQR), mL	600 (600)	500 (500)	0.085
IOP blood transfusion, n (%)	47 (40.9 %)	27 (23.5 %)	0.005
IOP fluid management			
(1) IOP crystalloid Median (IQR), ml	3900 (2200)	2600 (1625)	<0.0001
(2) IOP Colloid: Median (IQR), ml	500 (750)	750 (500)	0.0001
(3) Total IOP fluids Median (IQR), ml	4400 (2400)	3400 (1650)	<0.0001
Lymphadenectomy Total L.N. (Median) (IQR)	19 (14)	16 (12)	0.064
Type of Lymphadenectomy Standard Extended	110 (97.3 %) 3 (2.7 %)	104 (91.2 %) 10 (8.8 %)	0.047
Diversion type: Ileal conduit Ileal neobladder	82 (71.8 %) 33 (28.7 %)	81 (70.4 %) 34 (29.6 %)	1.0

3- postoperative outcomes

	NON-ERAS (N=115)	ERAS (N=115)	P VALUE
Acute kidney injury	18 (15.7 %)	32 (27.8 %)	0.025
LOS			0.310
Median (IQR)	8 (4)	7.5 (4)	
Time to bowel movements			0.002
Median (IQR)	5 (2)	4 (2)	
Time tolerance to regular diet			0.015
Median (IQR)	6 (3)	5 (3)	
Time to first ambulation			0.001
Median (IQR)	2 (1)	1 (1)	
Postoperative Clavien grade			0.867
Clavien=0	48 (41.7 %)	45 (39.1 %)	
Clavien G1, 2	45 (39.1 %)	50 (43.5 %)	
Clavien G3, 4	20 (17.4 %)	19 (16.5 %)	
Clavien 5 (death)	2 (1.7 %)	1 (0.9 %)	
Postoperative ileus	24 (20.9 %)	34 (29.6 %)	0.12
30 days readmission	49 (42.6 %)	41 (35.7 %)	0.28
Postoperative blood transfusion	20 (17.4 %)	21 (18.3 %)	0.86
eGFR on 3-month follow up			0.17
Median (IQR)	65 (49-81)	69.5 (57-84)	

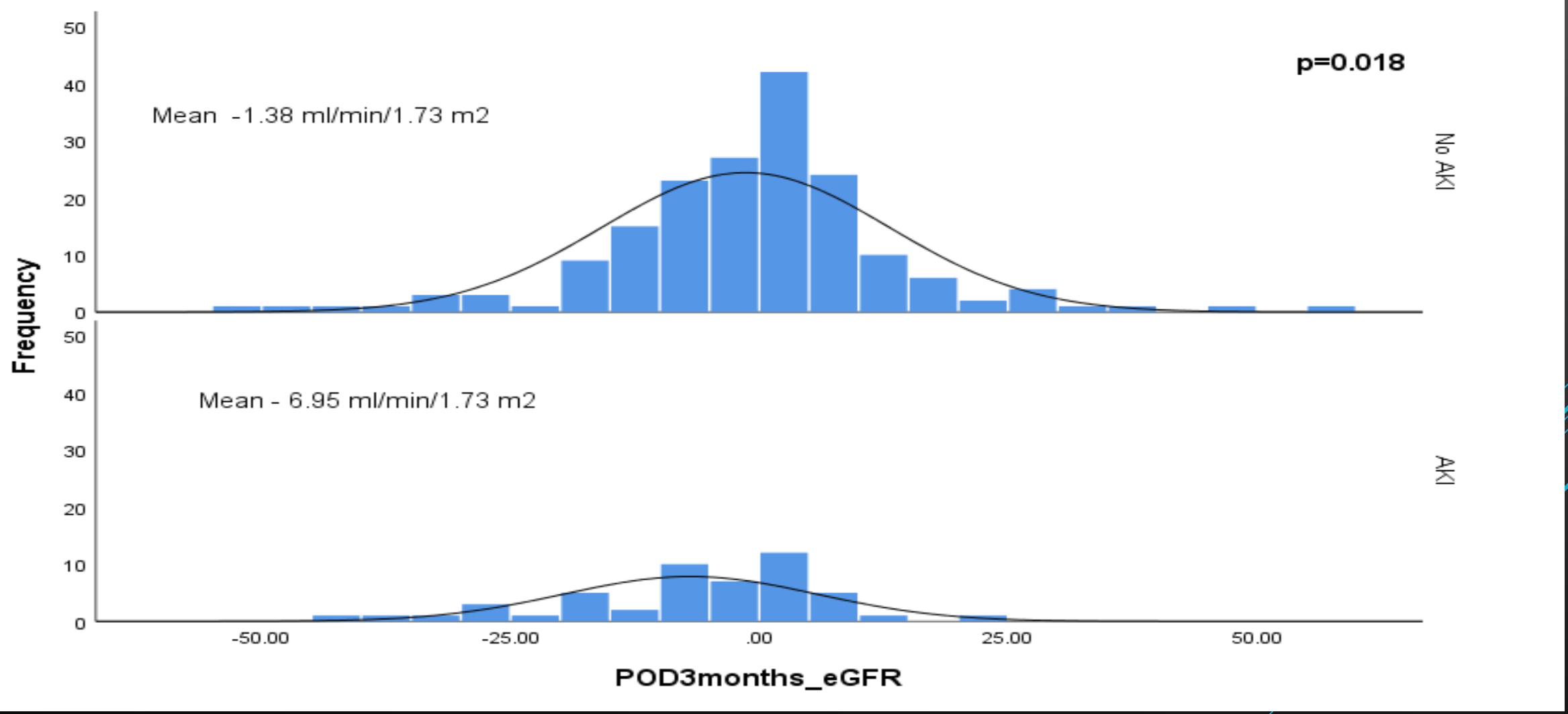
ACUTE KIDNEY INJURY RATE (AKI)

- Increased rate of postoperative AKI was observed in patients undergoing cystectomy using the ERAS protocol mandated fluid restrictions (27.8 % vs. 15.7 %).
- We applied KDIGO criteria to whole data set of patients instead of subset of patients with normal baseline renal function (as described in the submitted abstract).

Changes of kidney function:
(1) Pre-ERAS vs. ERAS

Pre-ERAS Median (IQR)	Preoperative	Postoperative	P value	ERAS	Preoperative	Postoperative	P value
Preoperative baseline	69 (48-86)	-	-		72 (55-87)		
POD1		56 (42-73)	< 0.0001			61 (42-79)	< 0.0001
POD2		64 (46-83)	0.20			68 (49-87)	0.110
On discharge		70 (52-90)	0.120			74 (53-90)	0.88
3-month follow up		65 (48-80)	0.030			69 (57-84)	0.040

2- No AKI vs. AKI patients

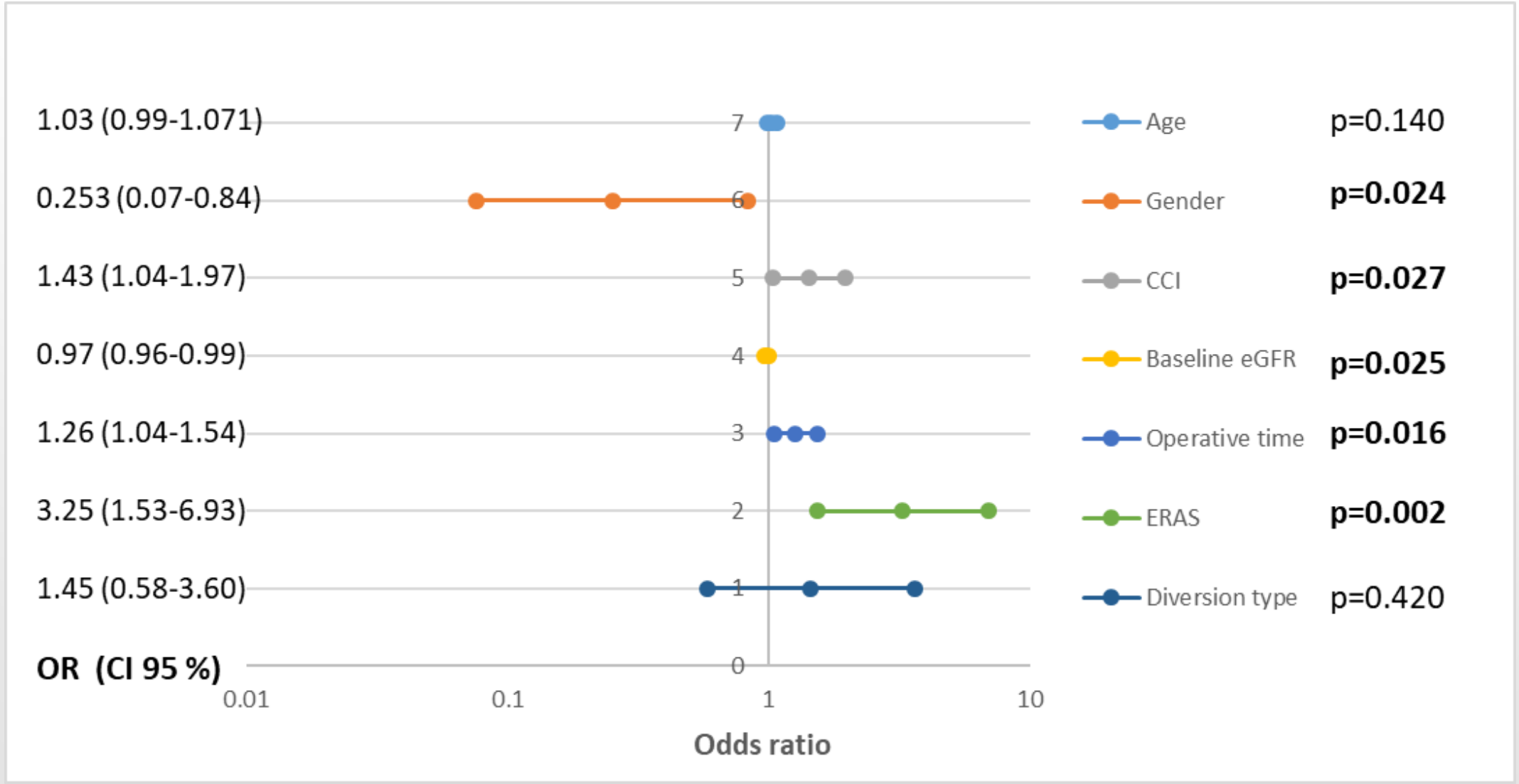


Histogram showing mean differences of eGFR on 3-month follow-up compared to baseline in non-AKI and AKI groups

(1) Univariate predictors of AKI

	No AKI (180)	AKI (50)	P value
ERAS Non-ERAS ERAS	 97 (53.9 %) 98 83 (46.1 %)	 18 (36 %) 32 (64 %)	0.025
Age, median (IQR)	67 (60-74)	70 (63-76)	0.120
Gender Male Female	 144 (80 %) 36 (20 %)	 46 (92 %) 4 (8 %)	0.048
Preoperative eGFR	74 (56-90)	60 (43-72)	0.003
Baseline chronic renal disease G1, 2 (eGFR ≥ 60 ml/min/1.73 m2) G3, 4 and 5 (eGFR < 60 ml/min/1.73 m2)	 154 (86.5 %) 24 (13.5 %)	 35 (70 %) 15 (30 %)	0.006
DM	30 (16.7 %)	15 (30 %)	0.036
IOP fluids/weight/operative time Median (IQR), mL/kg/hour	7.9 (6.19-11.15)	6.84 (5.23-9.14)	0.003
Operative time, median (IQR)	374.4 (312-450)	378 (322-488)	0.360

(2) Multivariate predictors of AKI



SECONDARY OUTCOMES:

(1) Length of hospital stay:

On multivariate analysis, ERAS protocol wasn't significantly associated with decrease of LOS (p= 0.310).

(2) GIT recovery time:

ERAs protocol was significantly associated with shorter time to resume bowel movements (p=0.002).

(3) Postoperative Complications and Readmission rate:

ERAS protocol wasn't significantly associated with either complications or readmission rate (p=0.73), (p=0.28) respectively.

CONCLUSION

Use of an ERAS protocol after radical cystectomy for bladder cancer was associated with a higher risk of postoperative AKI in our cohort, however, at 3-month follow up, there were no significant differences in eGFR between the two cohorts. The well-established benefits of the ERAS may need to be balanced against the risk of AKI. Individuals with baseline chronic kidney disease were more prone to AKI incited by the restrictive perioperative fluid management mandated by ERAS in our cohort. Our results should not discourage ERAS usage unless they are replicated in other cohorts.

THANK YOU