Pre-Procedure Tranexamic Acid for Novel Insights: Influence on Perinephric Hematoma Incidence and Hospitalization Duration in Renal Cryoablation

Marc McCoy[1], Shaine Jivan[1], Steven Lu[2], Evan Allarie[1], Zachary Valley[1], Summit Kawakami[1], Richard Cormack[3], Henry Walton[3], Michael Welsh[3], Bryan J. Donnelly[1], Kamaljot S. Kaler[1]

1. Department of Surgery, Section of Urology, University of Calgary, Calgary, AB, Canada
2. Department of Urology, University of Winnipeg, Manitoba, ON, Canada
3. Department of Radiology, University of Calgary, Calgary, AB, Canada

INTRODUCTION:
Percutaneous renal cryoablation (PCA) is a minimally invasive alternative treatment for small renal masses. Prior research has investigated the use of tranexamic acid (TXA) in diverse urologic procedures, yet there is a no evidence regarding its application in PCA. This study assesses the efficacy of pre-operative TXA in reducing post-operative perinephric hematoma formation.

METHODS:
Patients who underwent PCA of renal masses from June 2020 to June 2023 were analyzed. Cryoprobe placement and ice-ball formation were monitored via computed tomography (CT) imaging intraoperatively. Perinephric hematoma status was determined upon review of CT imaging performed at the end of the treatment. Pre-operative IV TXA was regularly administered commencing August 2021. AIC minimized generalized linear models with a logit link function were developed for the primary outcome of post-procedural perinephric hematoma and secondary outcome of same-day discharge. A Fisher's Exact Test was used to compare TXA and non-TXA groups.

RESULTS:
This study included 223 patients (TXA; n=118, non-TXA; n=105) with a median age of 65.8 years and median follow-up of 15 months. There were relatively fewer post-operative perinephric hematomas in the TXA group (27.1%) when compared to the non-TXA group (39.1%) (Table 1). TXA administration was associated with an OR of 0.54 [95% CI, 0.29 - 1.01; p-value = 0.055] when analyzing post-operative perinephric hematoma. Same day discharge incidence was higher in the TXA group (88.1%) relative to the non-TXA group (76.2%). TXA was associated with an OR of 2.80 [95% CI, 1.25 – 6.26; p-value = 0.013] when analyzing same day discharge, (Figure 1). The Clavien-Dindo 3+ complication rate was 1.8%, overall local recurrence rate was 0.0%, and residual disease rate was 3.1% for the aggregate cohort.

CONCLUSIONS:
This study provides novel evidence for the administration of pre-operative TXA in reducing perinephric hematoma post PCA, as well as increasing the likelihood of same day discharge.

Table 1: Comparison of Perioperative Characteristics by TXA Status during PCA

Demographics	Total Cohort	TXA	No TXA	2-Tail Fisher's Test
Total Number of Patients (n)	223	118	105	*p-value > 0.5*
Male	147 (65.9%)	78 (66.1%)	69 (65.7%)	
Female	76 (34.1%)	40 (33.9%)	36 (34.3%)	
Age at treatment (yrs)	65.8	65.4	66.2	
Outcomes				
Same Day Discharge	184 (82.5%)	104 (88.1%)	80 (76.2%)	
Same Day Biopsy	156 (70.0%)	85 (72.03%)	71 (67.6%)	
Hematoma	73 (32.7%)	32 (27.1%)	41 (39.1%)	
Average Length of Stay (hours)	13.7	13	14.4	
Metastatic RCC after Cryoablation	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Median Follow Up (months)	15	4	19	
Average Change in Hemoglobin (Pre - Post)	9.5	9.2	8.7	
Average Change in eGFR (Pre - Post)	-1.8	-1.6	-1.8	
Average Change in Creatinine (Post - Pre)	2.2	1.4	2.8	
Recurrence				
No Recurrence	210 (94.2%)	111 (94.1%)	99 (94.3%)	*p-value > 0.5*
Local Recurrence	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Residual Disease	7 (3.1%)	3 (2.5%)	4 (3.8%)	
Repeat Cryoablation	5	2	3	
Radical Nephrectomy	2	1	1	
De Novo Recurrence	2 (0.9%)	1 (0.8%)	1 (1.0%)	
Repeat Cryoablation	2	1	1	
Radical Nephrectomy	0	0	0	
No Follow Up Imaging	4 (1.8%)	3 (2.5%)	1 (1.0%)	
Tumor Characteristics				
Average tumor dimension in cm	2.8	2.76	2.85	
Average number of probes	3	3	2.9	
Number of T1a tumors	153 (80.7%)	86 (81.4%)	84 (80.0%)	
Number of T1b tumors	23 (10.3%)	9 (7.6%)	14 (13.3%)	
Mass Without Diagnostic Biopsy	44 (19.7%)	22 (18.6%)	22 (21.0%)	
Nephrometry Score				
Nephrometry Score Average	6.38	6.43	6.32	*p-value > 0.5*
Low	122 (54.7%)	65 (55.1%)	57 (54.3%)	
Medium	91 (40.8%)	48 (40.7%)	43 (41.0%)	
High	10 (4.5%)	5 (4.2%)	5 (4.8%)	
Pathology				
Clear Cell	118 (52.9%)	63 (53.4%)	55 (52.4%)	*p-value = 0.202*
Papillary	28 (12.6%)	11 (9.3%)	17 (16.2%)	
Chromophobe	4 (1.8%)	4 (3.4%)	0 (0.0%)	
Mucinous Tubular/Spindle Cell	1 (1.8%)	1 (0.4%)	0 (0.0%)	
Sarcomatoid	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Benign	17 (7.6%)	11 (9.3%)	6 (5.7%)	
Non-diagnostic/Normal	24 (10.8%)	14 (11.9%)	10 (9.5%)	
Other/No Biopsy	31 (13.9%)	14 (11.9%)	17 (16.2%)	
Fuhrman Grade				
I-II	117 (52.5%)	61 (51.7%)	56 (53.3%)	*p-value > 0.5*
III-IV	28 (12.6%)	15 (12.7%)	13 (12.4%)	
Not reported	78 (35.0%)	42 (35.6%)	36 (34.3%)	
Complications (Clavien-Dindo)				
Total	20 (9.0%)	15 (12.7%)	5 (4.8%)	
I-II	16 (7.2%)	13 (11.0%)	3 (2.9%)	
III-IV	4 (1.8%)	2 (1.7%)	2 (1.9%)	

Figure 1: Odds Ratio Outputs for AIC Minimized Logistic Regression Model for Factors in Determining Perinephric Hematoma and Same Day Discharge in PCA