18-3208

Randomized Trial Comparing the Safety and Clarity of Water Versus Saline Irrigant in Ureteroscopy

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Hypothesis

- Sterile water irrigant will not increase postoperative hyponatremia compared to 0.9% saline and will provide superior visualization in ureteroscopy (URS)

Introduction

- AUA stone treatment guidelines recommend 0.9% saline in URS due to risks of using water irrigant in endoscopic procedures
- However, guideline evidence is weak
- A prospective study has indicated that fluid absorption in URS is minimal
- Water may provide better visualization

Methods

- In 2017, 121 adult patients undergoing URS at Emory University Hospital were prospectively randomized to receive sterile water or 0.9% saline irrigant
- Patients and surgeons blinded to fluid
- Pulsed irrigation used
- Pre-op and post-op serum sodium, osmolality, and temperature assessed
- Fluid clarity measured subjectively by surgeon visualization scores and objectively by turbidity analysis with a turbidimeter of renal fluid

Table 1. Demographic, Preoperative, and Intraoperative Variables of Water and Saline Groups

Variable	Total (n=121)	Water (n=61)	Saline (n=60)	*p*-value
Age, mean ± SD	57.02 ± 15.00	55.82 ± 15.37	58.25 ± 14.64	0.38
Body Mass Index (kg/m²), median (IQR)	28.80 (25.20-34.80)	27.50 (24.30-32.10)	30.45 (25.90-37.70)	**0.01**
Indication for surgery				0.97
Stone, n (%)	101 (83.47)	51 (83.61)	50 (83.33)	
Diagnostic, n (%)	20 (16.53)	10 (16.39)	10 (16.67)	
Location of stone in patients with nephrolithiasis				0.71
Kidney, n (%)	64 (71.91)	32 (72.73)	32 (71.11)	
Ureter, n (%)	19 (21.35)	8 (18.18)	11 (24.44)	
Kidney & ureter, n (%)	6 (6.74)	4 (9.09)	2 (4.44)	
Use of ureteral access sheath, n (%)	42 (34.71)	26 (42.62)	16 (26.67)	0.07
Stone burden (mm), mean ± SD	12.68 ± 7.27	12.56 ± 7.28	12.77 ± 7.34	0.89
Irrigation volume (mL), mean ± SD	792.72 ± 604.42	744.58 ± 554.52	840.85 ± 651.63	0.39
URS time (min), mean ± SD	35.03 ± 18.03	34.88 ± 18.72	35.18 ± 17.48	0.93

Table 2. Safety and Clarity Parameters of Water and Saline Groups

Variable	Water (n=61)	Saline (n=60)	*p*-value
Post-op Na ≤135 (mmol/L), n (%)	2 (3.28)	5 (8.33)	0.27
Post-op Na ≤130 (mmol/L), n (%)	0 (0)	0 (0)	--
Post-op Na (mmol/L), mean ± SD	139.51 ± 2.13	139.70 ± 3.15	0.70
Change in pre- and post-op Na (mmol/L), mean ± SD	-0.51 ± 2.06	0.27 ± 2.36	0.06
Change in pre- and post-op Osm (mOsm/kg)*, mean ± SD	0 ± 5.02	1.33 ± 4.64	0.14
Change in pre- and post-op temperature (°C)†, mean ± SD	-0.08 ± 0.44	-0.10 ± 0.49	0.79
Surgeon Visualization Score‡, median (IQR)	4 (3 - 5)	3 (2 - 4)	**<0.01**
Turbidity Clarity Score (NTU)§, mean ± SD	64.02 ± 84.63	144.04 ± 226.32	**0.02**

* 2 patients did not have valid osmolality values for analysis.
† 9 patients did not have both temperatures taken before and after URS.
‡ 5-level score determined immediately following URS: 1=Poor; 2=Below Average; 3=Average; 4=Above Average; 5=Excellent.
§ 18 patients did not have valid turbidity scores due to overrange scores or an inability to obtain renal fluid. Turbidity Clarity Scores were missing for 12 patients in the saline group and 6 patients in the water group.

Results

- Fewer post-op hyponatremia (Na ≤135 mEq/L) events in water group and no significant difference between groups
- No significant difference in change in serum sodium (pre-op → post-op) between groups
- No significant difference in post-op hypothermia incidence
- Surgeon visualization score significantly higher for water
- Measured turbidity significantly lower for water
- Multivariate analysis indicated that use of ureteral access sheath was not a confounding variable

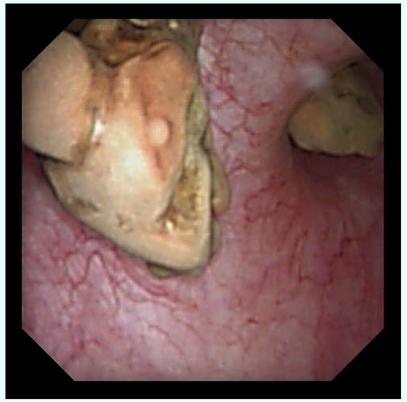

Figure 1. Example of Endoscopic Visualization with Water Irrigant

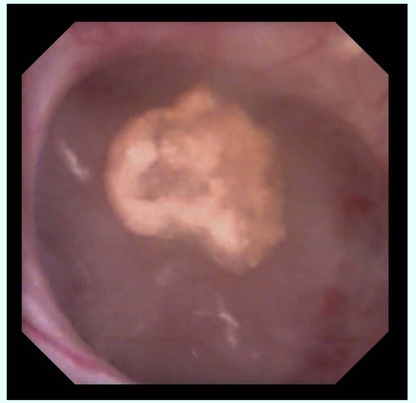

Figure 2. Example of Endoscopic Visualization with Saline Irrigant

Conclusions

- Water irrigant does not cause an increased incidence of hyponatremia or hypothermia in uncomplicated URS
- Water irrigant appears to provide clearer endoscopic visualization than saline and can be recommended for URS cases with suboptimal visualization