Negative Pressure Diuresis, Preliminary Results of a First In Human Treatment of Cardiorenal Syndrome

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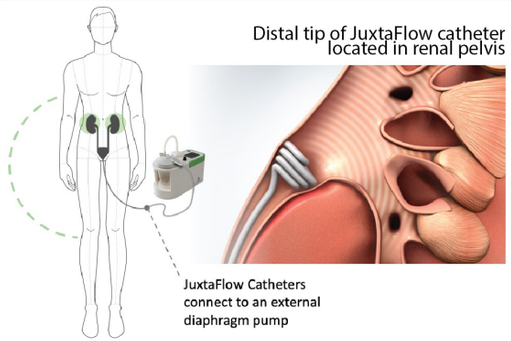
INTRODUCTION

- Cardiorenal syndrome in the setting of acute decompensated heart failure is a significant and common complication of chronic heart failure.
- The mainstay of treatment is intravascular volume removal by diuresis and in recalcitrant cases ultrafiltration.
- We present the initial experience with a novel device (the JuxtaFlow® System) that utilizes negative pressure in the renal pelvis to promote diuresis.
- We refer to this therapy as renal Negative Pressure Diuresis (rNPD).

JUXTAFLOW® SYSTEM



HYPOTHESIS

- Placement of a novel renal negative pressure device leads to increased diuresis to treat acute decompensated heart failure with cardiorenal syndrome.

RESULTS

- The current study cohort consists of 3 patients meeting inclusion and exclusion criteria who underwent rNPD.
- Average urine output at baseline was 2.4 L per day which increased during the treatment period to 4.4 L per day. Increased urine output continued to be observed in the observational period with average urine output of 3.1 L per day (Figures 1 and 3).
- Urine sodium excretion increased for all 3 patients from an average of 147.7 mmol/L to an average of 377.6 mmol/L during the treatment period with a persistent increase in two of three patients in the 24-hour observation period after treatment with an average of 190.72 mmol/L (Figure2).
- Average creatinine at time of entry into the trial was 1.86 mg/dL and 1.82 mg/dL at the end of the treatment period and on average GFR increased during and after treatment (Figure 4).

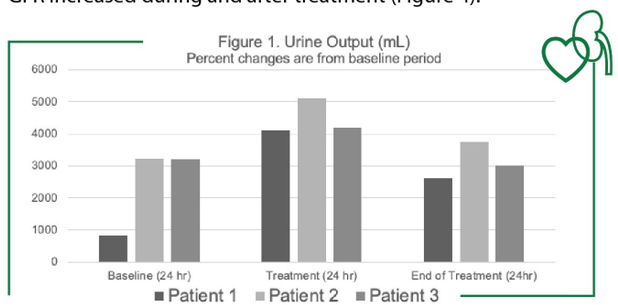


Figure 2.
Sodium Excretion (mmol)

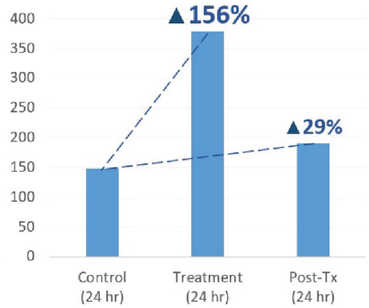


Figure 3.
Urine Output (mL)

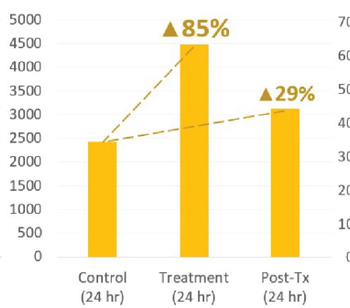
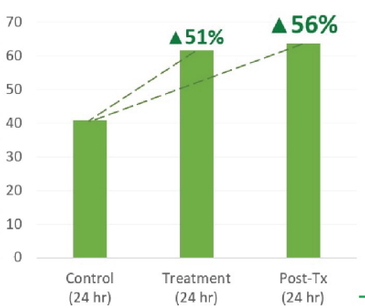


Figure 4.
Measured GFR (mL/min)



METHODS

- After successful animal studies, IRB approval was obtained at two institutions.
- Patients who presented with acute decompensated heart failure and diuretic resistance underwent placement of the rNPD device.
- Diuretic dose was maintained the same throughout the 72-hour urine measurement period to most accurately measure effect of rNPD. Prior to placement, urine output and response to diuretics was recorded during a 24-hour period of observation. The rNPD device was placed and negative pressure applied to the renal pelvis for 24 hours.
- Urine output, urine electrolytes, and cell counts were obtained from the rNPD device and urinary catheter.
- Continued measurements were made for an additional 24 hours following cessation of rNPD.

CONCLUSION

- Treatment of acute heart failure with rNPD represents a novel treatment for patients with acute decompensated heart failure and cardiorenal syndrome which may improve diuretic response by improving total urine output and natriuresis.

Narration by Alex Parker