



MP9-11: ASSESSING THE SAFETY AND FEASIBILITY OF ELECTROMOTIVE DRUG ADMINISTRATION IN THE URETER IN AN IN-VIVO ANIMAL MODEL



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INTRODUCTION

Electromotive Drug Administration (EMDA) is a technique used to amplify drug delivery to targeted tissues. The application of a low-power, local electrical current induces the movement of charged molecules into the surrounding tissues. To the best of our knowledge, this has never been done in the ureter.

METHODS

- Two female juvenile Yorkshire pigs were placed under general anesthesia.
- Cystoscopy was used to introduce a 0.035" super-stiff guidewire into each ureter.
- A modified 10 Fr ureteral catheter with equidistant (5.0 mm apart) fenestrations in its distal 20 cm was advanced over the guidewires.
- The guidewires were removed.
- A silver conduction wire was passed into each ureteral catheter; the larger circumference of the conduction wire prevented fluid from exiting the catheter's tip during infusion.
- Methylene blue, a water-soluble dye with a positive charge, was infused through each catheter at 5 ml/min for 20 minutes.
- In the experimental ureter, a positive pulsed electrical current of 10 mA was applied using an EMDA generator for 20 minutes. No current was applied to the conduction wire in the control ureter.
- Ureters were harvested, vertically incised, and flash-frozen for histopathological analysis.

RESULTS

- Macroscopically, the surface of the urothelium of the EMDA ureter was stained densely (Figure. 1A).
- Both ureters showed mild urothelial cell denudation likely due to passage of the 10 Fr catheter; the deeper tissues revealed no injury (Figure. 1B & C).
- In the EMDA ureters, there was diffuse penetration of methylene blue into the urothelium, lamina propria, and muscularis propria (Figure. 1D). In the control ureter, patchy methylene blue staining was seen in the urothelium without penetration into the deeper layers of the ureter (arrow) (Figure. 1E).

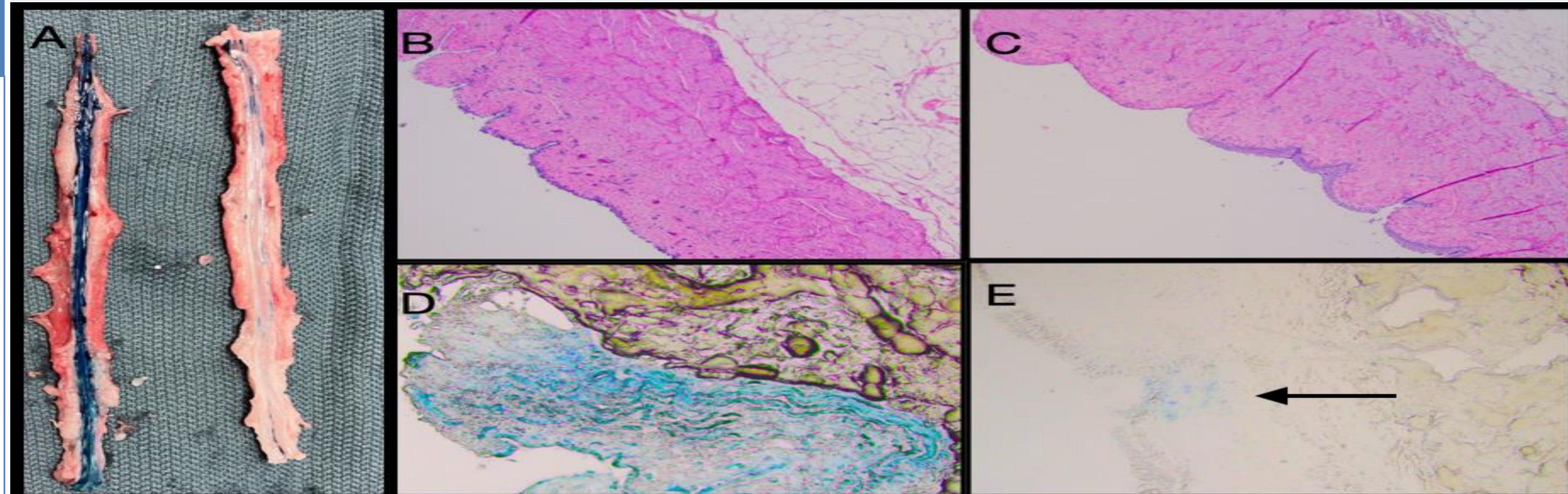


Figure 1: A. Macroscopic blue staining of the EMDA ureter (left side of the image), B & C. Normal architecture of EMDA ureter and control ureter respectively with mild denudation of superficial urothelium, D & E. Dense and minimal staining (arrow) of methylene blue in EMDA ureter and control ureters, respectively.

CONCLUSIONS

A novel Electromotive Drug Administration ureteral catheter resulted in the atraumatic penetration of charged molecules into the urothelium, lamina propria, and muscularis propria of the ureter.