

# Development of a Novel Canine Prostatectomy Model

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## ABSTRACT

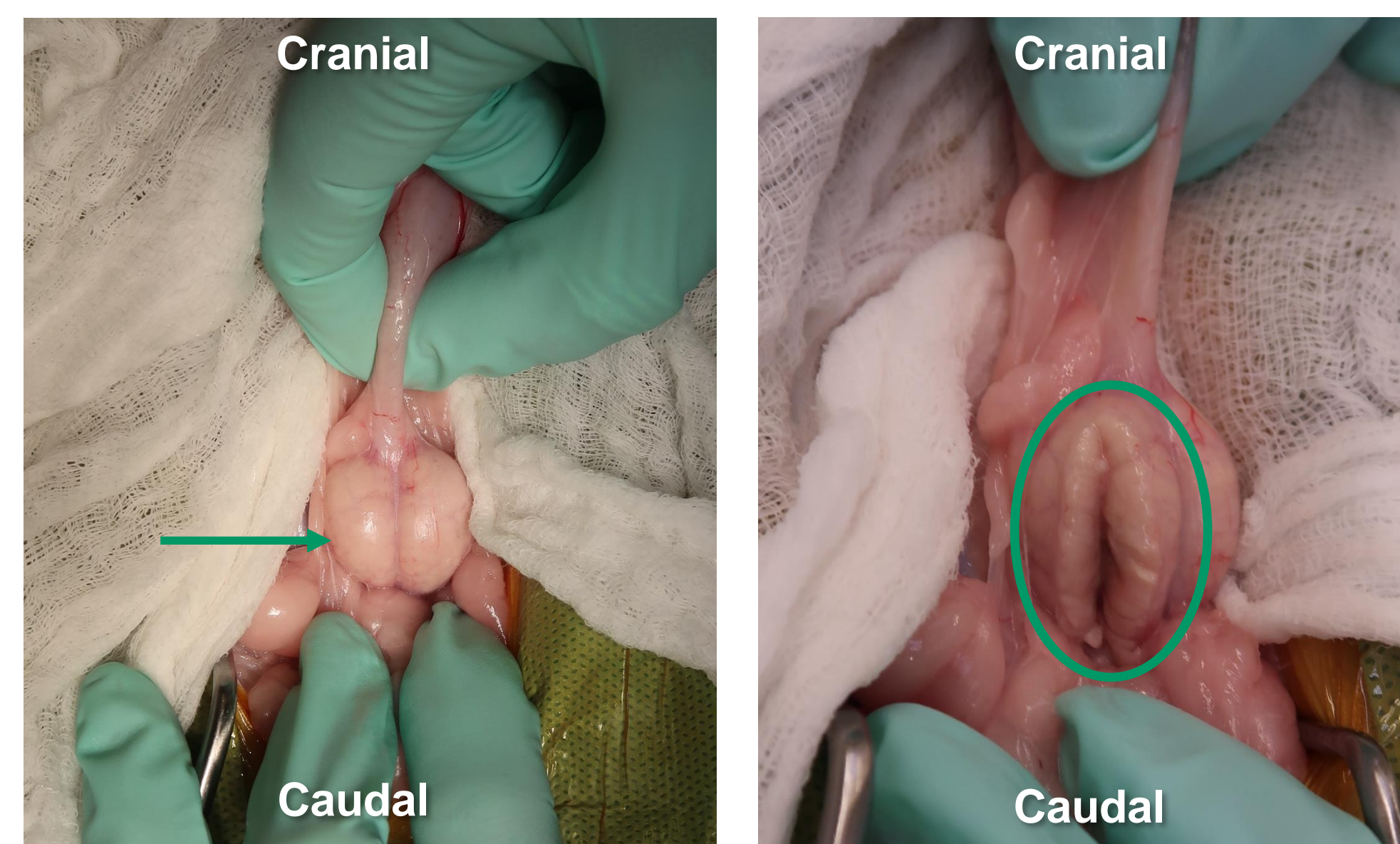
Due to many shared anatomical similarities, the canine is an ideal animal model for human prostate disorders, such as prostate cancer. In men, a total prostatectomy is commonly performed to remove cancerous tissue. However, this procedure is difficult to model in dogs due to a high rate of serious complications. The purpose of this study was to develop a canine prostatectomy model that would allow future investigation of locally applied test material. The goal of the model was to induce manipulation and removal of prostate tissue to mimic human prostatectomy procedures while minimizing post-operative complications associated with canine prostatectomy. Male, beagles (n=3) underwent a partial prostatectomy. Dogs were sedated with dexmedetomidine, acepromazine, and buprenorphine, induced with alfaxalone, intubated, and maintained on isoflurane. Carprofen, buprenorphine ER, and cefazolin were given pre-operatively. Through an abdominal incision, a pocket was created within the periprostatic fat. Approximately 25% of each prostatic lobe was removed via wedge resection. Care was taken to avoid the urethra. The resection sites allowed direct application of test material, after which the pocket and abdominal incision (3 layers) was closed with absorbable suture. Carprofen was given for 2 days post-op. Euthanasia was performed 5 days post-op to assess gross abnormalities. A partial prostatectomy was successfully performed in all animals. No major surgical related complications, such as urinary incontinence or retention were noted following surgery. Free-catch urinalysis performed prior to termination revealed hematuria and proteinuria. At necropsy, gross observations included focal discoloration in renal tissue and at the resection site. Histological findings included minimal to mild vacuolation and intracellular brown pigment in the renal tubular epithelium that was considered non-adverse. One dog had a focal adhesion between the urinary bladder and the omentum. Canine partial prostatectomy can be accomplished with minimal complications and may serve as a reliable model for human prostatectomy procedures. Total canine prostatectomy often results in urinary incontinence or retention. Thus, this model offers a refinement to the more invasive procedure, while mimicking manipulation and removal of prostate tissue. Future work will include studies of longer duration to demonstrate improvement of post-op hematuria and proteinuria. Additionally, follow-up studies will utilize this model to investigate locally applied test material in efficacy and safety studies. In conclusion, this model may open up the door for new therapeutics for those suffering from prostate cancer or other prostate disorders.

## INTRODUCTION

Due to many shared anatomical similarities, the canine is an ideal animal model for human prostate disorders, such as prostate cancer. In men, a total prostatectomy is commonly performed to remove cancerous tissue. However, this procedure is difficult to model in dogs due to a high rate of serious complications. The purpose of this study was to develop a canine prostatectomy model that would allow future investigation of locally applied test material. The goal of the model was to induce manipulation and removal of prostate tissue to represent human prostatectomy procedures while minimizing post-operative complications associated with canine prostatectomy.

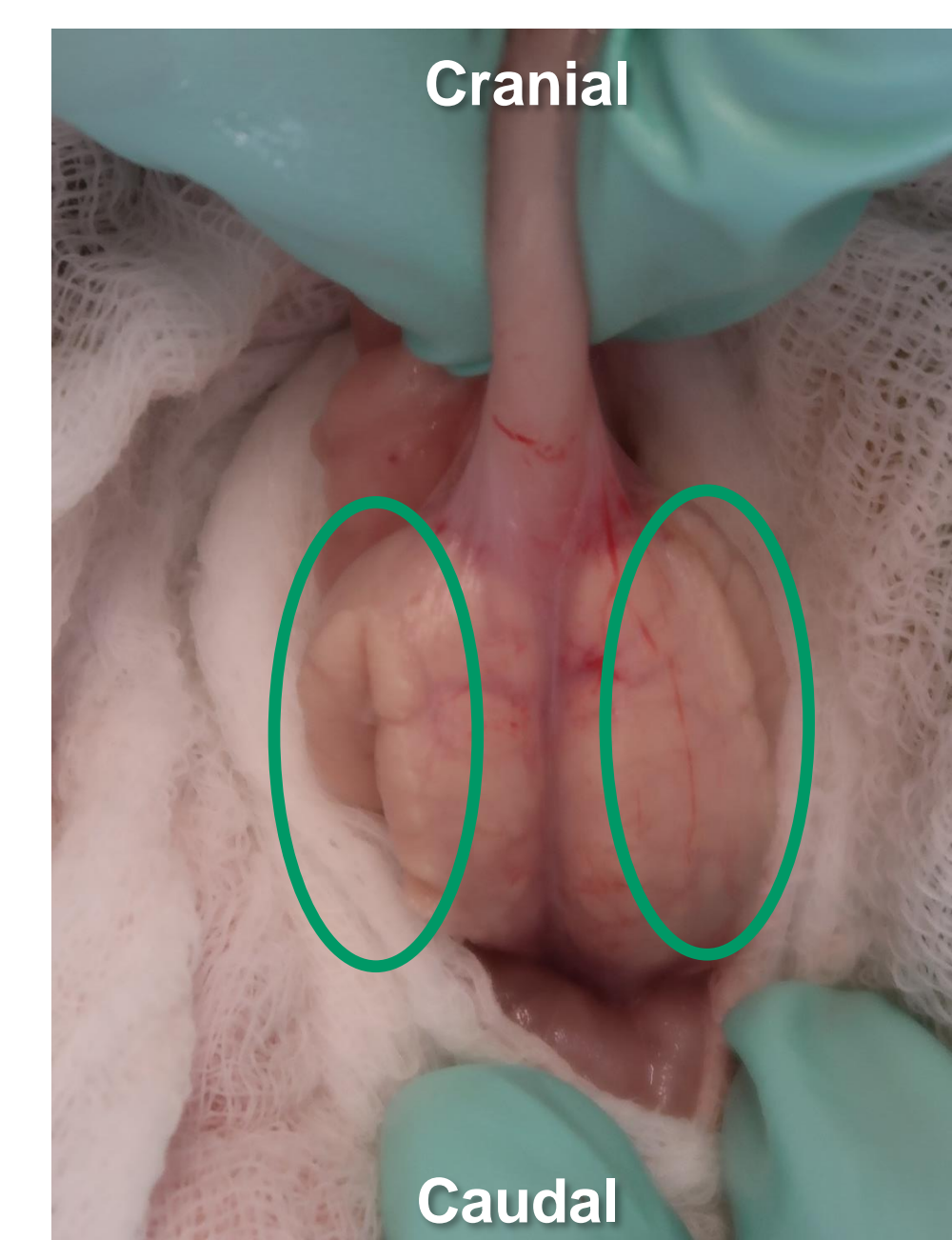
## METHODS

- Male, beagles (n=3) underwent a partial prostatectomy
- Sedated with dexmedetomidine (0.005 mg/kg, IM), acepromazine (0.025 mg/kg, IM), and buprenorphine (0.01 mg/kg, IM), induced with alfaxalone (2 mg/kg, IV), intubated, and maintained on isoflurane
- Carprofen (4.4 mg/kg, SC), buprenorphine ER (0.2 mg/kg SC), and cefazolin (20 mg/kg IV) were given pre-operatively
- See Figures 1-6 for procedures
- Carprofen (4.4 mg/kg, PO) was given for 2 days post-op. Euthanasia was performed 5 days post-op to assess gross abnormalities



**Figure 1.** Through a caudal ventral abdominal incision, a pocket was created within the periprostatic fat, and the prostate gland (arrow) was exposed.

**Figure 2.** Approximately 25% of the prostatic lobe was removed via wedge resection with a #11 scalpel blade. Care was taken to avoid the urethra. (Circle = resection site).



**Figure 3.** Hemostasis was achieved with manual pressure and hemostatic gelatin sponges. Following bilateral resection, the prostate capsule was not closed to allow for direct application of test material. (Circle = resection site)



**Figure 4.** Approximately 25% of each prostatic lobe was removed via wedge resection. Ruler on scalpel blade handle used for size reference.



**Figure 5.** The periprostatic pocket was partially closed, the test material applied directly onto resection sites within the pocket via a syringe, and then the remaining pocket was closed. (\* = urinary bladder)



**Figure 6.** The periprostatic fat pocket was closed with absorbable suture in a simple continuous pattern. The abdominal incision (3 layers) was then closed with absorbable suture in a simple continuous pattern. (\* = urinary bladder)

Note: All pictures are from a cadaver

## RESULTS

- A partial prostatectomy was successfully performed in all animals
- No major surgical-related complications, such as urinary incontinence or retention were noted following surgery
- Free-catch urinalysis prior to termination revealed hematuria and proteinuria
- Gross observations:
  - focal discoloration in renal tissue and resection site
  - focal adhesion (n=1) between the urinary bladder and omentum
- Histological findings: minimal to mild vacuolation and intracellular brown pigment in the renal tubular epithelium that was considered non-adverse

## CONCLUSION

Canine partial prostatectomy can be accomplished with minimal complications and may serve as a reliable model for human prostatectomy procedures. Total canine prostatectomy often results in urinary incontinence or retention. Thus, this model offers a refinement to the more invasive procedure, while mimicking the manipulation and removal of prostate tissue. Future work will include studies of longer duration to demonstrate improvement of post-op hematuria and proteinuria. Additionally, follow-up studies will utilize this model to investigate locally applied test material in efficacy and safety studies. In conclusion, this model may open up the door for new therapeutics for those suffering from prostate cancer or other prostate disorders.

## REFERENCES

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