

Obturator to pelvic nerve transfer one year after bladder decentralization restores bladder sensation and emptying function in canines



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INTRODUCTION

BACKGROUND: Previously we demonstrated motor reinnervation of the decentralized canine bladder after nerve transfer¹. Also observed full bladder and bowel sensation in the reinnervated animals².

OBJECTIVES:

The goal of this study was to determine whether these micturition and defecation postures are eliminated in decentralized animals up to one year after nerve transection and determine whether these same animals are capable of sensing bladder fullness after reinnervation.

ACKNOWLEDGEMENT

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METHODS

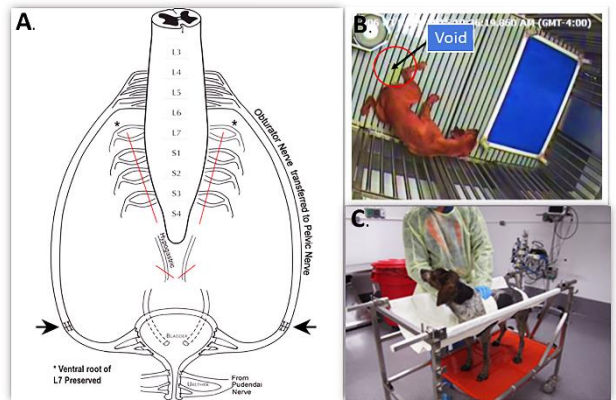


Figure 1: A) Surgical approach used for decentralization (n=7) and reinnervation (n=3). In another group decentralization was performed after transection all roots caudal to L7 (n=6) B) Observation of micturition postures in canines pre-operatively (t=0 in figure 2) and at monthly intervals post-operatively (PO) via video surveillance of housing cages. C) Awake urodynamic were performed at monthly intervals PO, to studied the ability to empty a filled bladder in recovery cage with in 10 minutes.

RESULTS

A. L7 Dorsal Root Intact, Transection of All Dorsal & Ventral Sacral Roots & Hypogastric Nerves

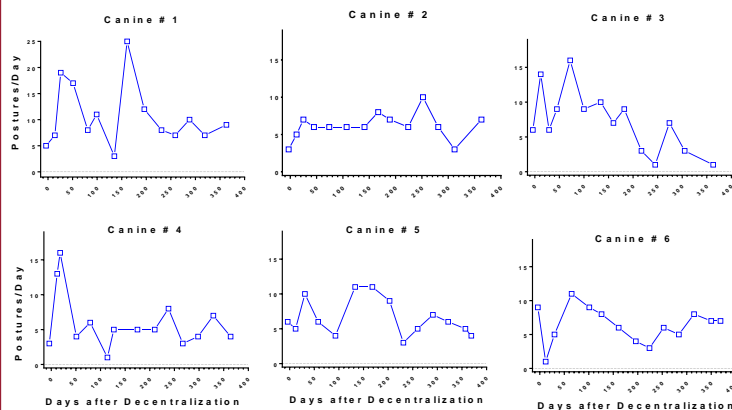


Figure 2 A: We observed that all animals with intact L7 dorsal roots showed micturition postures, from the 1st through the 12th postoperative month.

- Urinalysis and cultures were performed in the 4 of 8 animals (#14,#15, #18,#20) with transected L7 dorsal root.
- Urinary tract infections resolved in all 4 animals following Enrofloxacin treatment.
- In 2 of these 4 (#18 & #20), intermediate postures were coincident with culture confirmed bacteriuria and disappeared with antimicrobial treatment.

B. Transection of L7 Dorsal Roots, All Dorsal & Ventral Sacral Roots & Hypogastric Nerves

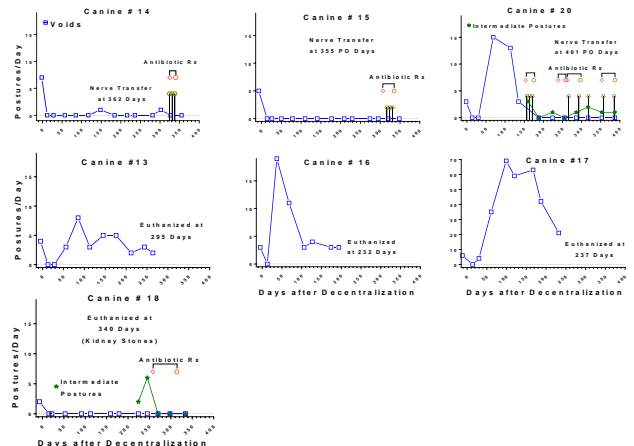


Figure 2 B: One of these 8 animals (#15) showed no micturition postures up to 12-month PO and one (#14) has shown 2 single incidences of micturition postures at 5th and 10th months PO

- Two of the other 6 dogs (#18 and #20) started showing unusual postures (intermediate between micturition and defecation)
- One of these 2 was euthanized at 9 months due to kidney stone problem
- 3 of 4 animals that consistently showed micturition postures at monthly observation periods were euthanized at 8-9 months PO (#13, #16 and #17).

Reinnervation after 12 Month Decentralization by Transection of L7 Dorsal Roots, All Dorsal & Ventral Sacral Roots & Hypogastric Nerves

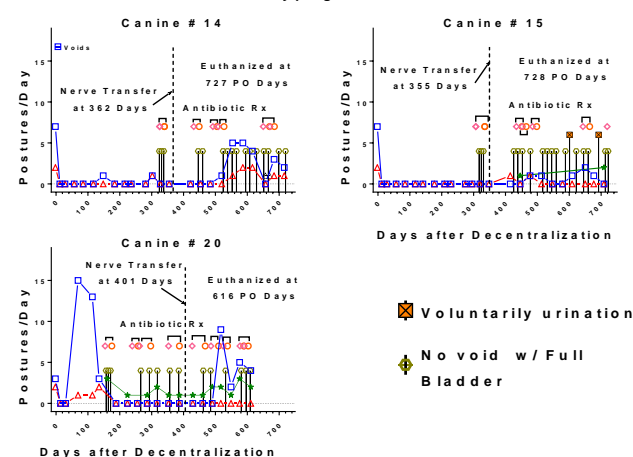


Figure 3. Obturator to pelvic nerve transfer was performed in 3 animals.
➤ Urination postures were observed in all 3 of these reinnervated animals 4-6 months PO in housing cages.
➤ With full bladder, #15 assumed the urination posture and voluntarily emptied the bladder on 2 occasions in transport cage during awake urodynamic
➤ Micturition postures in housing cage and voluntarily urination in transport cage were not coincident with infection.

CONCLUSIONS

- More complete sensory decentralization that include L7 dorsal root transection reduces the number of animals able to sense bladder fullness (Figure 2B).
- Resolution of urinary tract infections (UTI) eliminated unusual postures in decentralized animals.
- Urination postures in animals not tested for UTIs may be the result of undetected UTIs, sensory nerve sprouting or variations in sacral sensory innervation³.
- In at least one animal that showed no urination postures for 12 months after decentralization, nerve transfer induced both the ability to sense bladder fullness and bladder emptying behavior confirming both motor and sensory bladder reinnervation (Figure 3).

REFERENCES

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3. Gomez-Amaya, S.M., et al. Anat Histol Embryol. 2015 Apr;44(2):118-27