BACKGROUND

Our previous studies have shown in a canine model that after bladder, urethra and anal sphincter denervation, that bladder and external urethral sphincter reinnervation could be achieved by immediate and delayed repair of sacral roots to the bladder, after transfer of coccygeal roots to the sacral roots to the bladder, and after transfer of somatic nerves to the vesicle branches of pelvic and pudendal nerves. In one study, the intercostal nerve proved too short for transfer to the pelvic nerves. However, the genitofemoral nerve originates from upper- to mid-lumbar spinal cord segments and contains both motor and sensory components.

HYPOTHESIS

We hypothesized that the transfer of a somatic nerve (genitofemoral, GF, a nerve of L3,4 origin in dogs) to the anterior vesical branch of the pelvic nerve (PN, nerves of upper sacral origin) of a neurogenic bladder (due to spinal root injury), would restore bladder function by the ingrowth of new axons from the transferred GF nerve through the anterior vesical branch of the PN to the detrusor muscle.

AIM

To determine if bladder emptying function could be regained by this reinnervation procedure using a nerve cross-over method in which nerves from supraspinal segments are transferred to vesical branches of the pelvic nerve.

STUDY DESIGN AND METHODS

Bladder denervation, genitofemoral nerve transfer (GFNT) and radiofrequency microstimulator placement.

RESULTS

1. Functional electrical stimulation and urodynamics

Activation of the implanted RF micro stimulators induced increase bladder pressures in 1 of the 5 GF nerve transfer dogs.

![Pressure vs. Stimulation Intensity](image)

Recruitment curve and mean awake bladder contraction with FES of the radiofrequency microstimulator

2. Neuronal retrograde tracing methods and anatomical dissection

Dissection of the transferred GF nerve at 226 d after surgical nerve transfer and Anastomosis to PN.

Retrograde labeled neurons in lumbar and sacral spinal cord segments, after injection of retrograde dyes into the detrusor muscle at two weeks before tissue collection.

![Retrograde Dye](image)

![GFNT](image)

INTERPRETATION OF RESULTS AND CONCLUSIONS

Detrusor muscle can be reinnervated by transfer of genitofemoral nerves (L3, 4 origin) to anterior vesical branches of the PN. Evidence presented for this model of includes:

a) Return of detrusor contractions at 184 days after bilateral GFNT following activation of nerve cuff electrodes placed in the transferred GF nerve.

b) Similar number of retrogradely labeled cell bodies in lumbar spinal cord segments, after dye injection into the detrusor muscle, compared to number in sacral segments in control dogs

Using this surgical approach, we may be able to provide a means by which patients with sacral spinal cord injuries can have improved control of their micturition, urinary and fecal continence, and thus improved quality of life.

REFERENCES AND ACKNOWLEDGEMENTS


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