

Reconstruction of bladder function and prevent renal deteriorate through end-to-side neurorrhaphy in rats with neurogenic bladder

Wen JG¹, Li YL¹, He XF¹, Gao WS², Yang J³, Li SL⁴, Wen Y¹

¹ Pediatric Urodynamic Center, ² Department of Urology and ³ Outpatient Clinic, The First Affiliated Hospital Of Zhengzhou University, Zhengzhou, China; ⁴ Department of Pediatric Surgery, The Children's Hospital of Shenzhen, Shenzhen, China

Introduction

Neurogenic bladder (NB) is common and incurable nowadays, which remains an important cause of renal injury and, eventually, end-stage renal disease. Neurorrhaphy provided a new way for reconstruction of bladder function in patients with NB, but is still controversial. Whether the neurorrhaphy is effective requires further study.

Objective

To investigate the feasibility of restoring bladder function and preventing renal deterioration by L6 ventral root (L6VR) and L4 ventral root (L4VR) end-to-side neurorrhaphy in rats with NB.

Methods

Forty-two rats were assigned to the end-to-side coaptation (ECG, n=16), no coaptation (NCG, n=16), or control groups (CG, n=10). The ventral and dorsal roots (VR, DR) of left L6 and S1 were transected in ECG, and the distal stump of L6VR was sutured to the lateral face of the L4VR. In NCG, the ventral and dorsal roots of left L6 and S1 were transected, but the distal stump of L6VR was not coapted; in CG, no operative procedure was performed. Nerve regeneration, bladder function, and renal function were evaluated with fluorogold (FG) retrograde tract-tracing, cystometry, electrical stimulation, histology and serum biochemistry measurements. The data were analyzed using one-way analysis of variance.

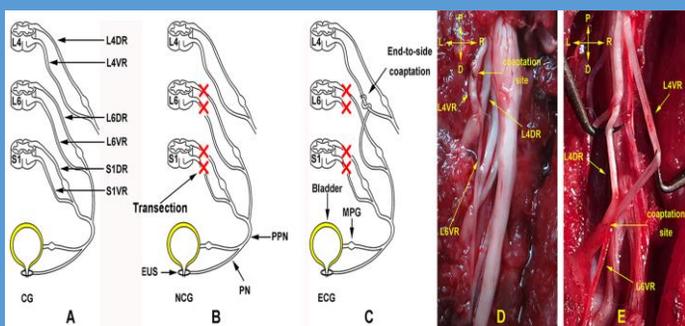


Figure 1 Schematic diagram of the surgical procedures in the three groups and surgical photograph of end-to-side coaptation.

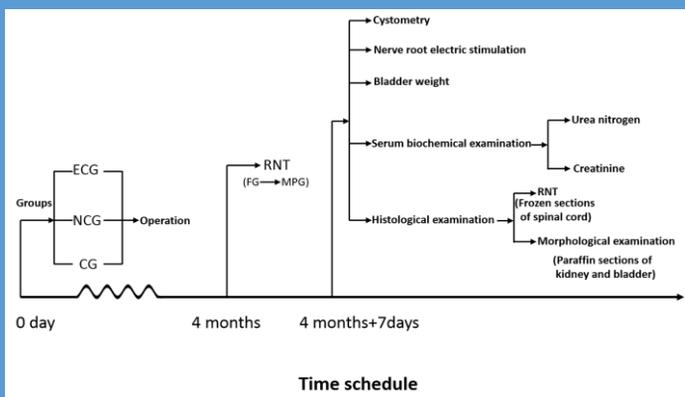


Figure 2 Schematic of the experimental procedures.

Results

In ECG, the FG-labeled neurons were observed in the left ventral horn of the L4 spinal cord. Maximum cystometric capacity, post-void residual urine, and bladder compliance in ECG were less than in NCG rats, but significantly greater than in CG. There was no significant difference in maximum detrusor voiding pressure between ECG and CG, but both were greater than NCG. ECG rats showed a significant increase in intravesical pressure when the left L4 VR proximal to the coaptation was stimulated. The bladder weight of ECG rats was significantly lighter than in NCG rats. Serum creatinine, blood urea nitrogen, and the fibrotic area of bladder and kidney were decreased in ECG compared with NCG.

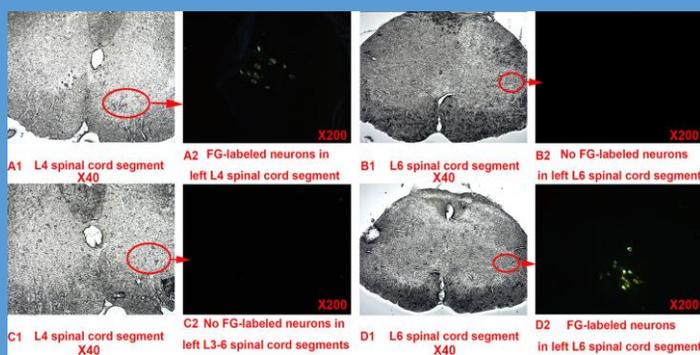


Figure 3 The distribution of FG-labeled neurons in the different spinal cord segment

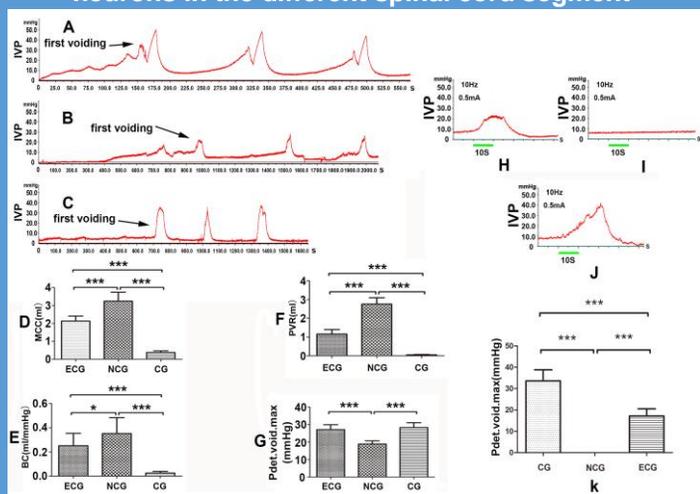


Figure 4 The bladder function recovery partially after end-to-side neurorrhaphy

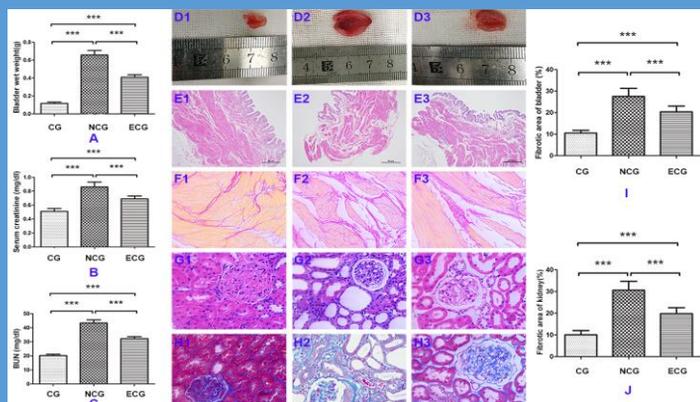


Figure 5 The histopathology of bladder and kidney and renal function improve after end-to-side neurorrhaphy

Conclusion

End-to-side neurorrhaphy is a useful method to restore bladder function and protect renal function in NB.