

# Role of Urodynamic study in guiding the treatment of lower urinary tract dysfunction in elderly patients with ischemic stroke

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## Introduction

Ischemic stroke (IS) is a common neurological disease in the elderly, accounting for 60%-80% of the total cerebrovascular diseases. Lower urinary tract dysfunction (LUTD) is a common complication in the recovery period of IS. IS can cause LUTD in up to 60% of patients, and 25% of patients still have LUTD in the recovery period. Urodynamic study (UDS) is the most reliable method to diagnose bladder dysfunction, which can provide relevant information about the changes of detrusor muscle and urethral sphincter function. However, there are limited studies to assess changes in UDS before and after treatment in patients with LUTD after IS. The purpose of this study is to investigate the urodynamic characteristics of LUTD during the rehabilitation period in elderly patients with IS. Based on the UDS results, corresponding treatment plans are formulated to assess the value of UDS in guiding clinical treatment, and to provide a reference for the clinical management of LUTD following IS.

## Methods and Materials

Approved by the Ethics Committee of our hospital. A total of 117 patients with LUTD after IS (61-86 years old) admitted to the Hospital from November 2021 to November 2023 were included in this study. 84 patients who underwent urodynamic studies (UDS) were designated as the observation group, while 33 patients who did not receive UDS were placed in the control group. The control group received only basic urological treatment, which included voiding training and pelvic floor exercises. The treatment plan for the observation group was adjusted based on the UDS results: patients with detrusor overactivity (DO) were treated with oral tolterodine; those with non-reflexive detrusor leading to increased post-void residual (PVR) were given clean intermittent catheterization (CIC); patients with functional bladder outlet obstruction were treated with oral tamsulosin, and those with multiple conditions were managed with a combination of corresponding treatments. The treatment duration was three months. Both groups were assessed for quality of life (QOL) before treatment and three months after treatment to observe the therapeutic effects and patient satisfaction. The observation group underwent urodynamic testing before and after three months of treatment, and the changes in maximum urinary flow rate (Qmax), urine output, post-void residual (PVR), detrusor pressure at maximum flow rate (PdetQmax), and maximum bladder capacity (MCC) were compared. The bladder function status of the patients was evaluated based on UDS results, and the characteristics of their UDS changes were analyzed.

**Table 1.** Comparison of urodynamic results before and after treatment in observation group

	before treatment (n=84)	after treatment (n=84)	t	p
Qmax(ml/s)	9.80 ± 2.94	12.41 ± 2.48	-31.574	<0.001
VV(ml)	122.80 ± 11.04	144.86 ± 11.02	-46.346	<0.001
PVR(ml)	109.32 ± 11.22	86.25 ± 11.41	141.416	<0.001
PdetQmax(cmH2O)	73.43 ± 31.70	50.23 ± 17.22	14.140	<0.001
MCC(mL)	273.96 ± 97.07	319.51 ± 92.70	-22.231	<0.001

**Table 3.** Comparison of results before and after drug use in observation group

	before treatment (n=84)	after treatment (n=84)	t	p
Qmax(ml/s)	9.92 ± 2.82	12.39 ± 2.38	-25.834	<0.001
VV(ml)	122.55 ± 11.26	145.35 ± 11.75	-34.010	<0.001
PVR(ml)	108.87 ± 11.37	85.80 ± 11.49	113.977	<0.001
PdetQmax(cmH2O)	72.35 ± 32.23	50.00 ± 17.82	11.029	<0.001
MCC(mL)	274.16 ± 96.50	320.58 ± 90.88	-16.732	<0.001

**Table 4.** Comparison of results before and after CIC combined with drugs in observation group

	before treatment (n=84)	after treatment (n=84)	t	p
Qmax(ml/s)	9.87 ± 2.47	12.67 ± 2.02	-12.582	<0.001
VV(ml)	124.73 ± 9.90	144.53 ± 8.95	121.447	<0.001
PVR(ml)	109.53 ± 10.73	86.60 ± 10.99	51.944	<0.001
PdetQmax(cmH2O)	79.00 ± 31.34	52.27 ± 16.03	6.549	<0.001
MCC(mL)	287.80 ± 111.24	327.13 ± 105.04	-9.392	<0.001

## Result

1. UDS Results and Changes in UDS Before and After Treatment: In the observation group of 84 patients, there were 58 cases of DO (69%), 16 cases of weakened detrusor contraction (19%), 10 cases of detrusor areflexia (12%), and no detrusor-external sphincter dyscoordination was observed. After treatment, Qmax, urine output, and MCC significantly increased; PVR and PdetQmax significantly decreased (all  $P < 0.001$ ).

2. QOL Score: At the time of enrollment, there was no significant difference in QOL scores between the two groups ( $P > 0.05$ ). After treatment, QOL scores in both groups significantly decreased compared to before treatment ( $P < 0.001$ ); further comparison between groups showed that the improvement in QOL scores in the observation group was significantly better than that in the control group ( $P < 0.001$ ). The QOL scores significantly decreased after the observation group received either drug treatment alone or CIC combined with drug treatment compared to before ( $P < 0.001$ ).

3. After 3 months of treatment according to the UDS results, the lower urinary tract symptoms of the observation group were significantly improved compared with those before treatment. After 3 months of basic urination treatment, the symptoms of lower urinary tract in control group were improved compared with before treatment. The comparison between the two groups showed that the treatment effect of lower urinary tract symptoms before and after treatment was significantly different ( $P < 0.05$ ).

## Discussion

1. The results of this study showed that the most common change of UDS in elderly LUTD patients in the rehabilitation period after IS is DO, which may be due to the damage of the detrusor center of the brain or its conducting fibers.

2. Under the guidance of UDS, the lower urinary tract symptoms of the patients were significantly improved after treatment, and the improvement of the observation group was significantly better than that of the control group. Qmax, urine output, PVR, PdetQmax, MCC and QOL scores were significantly improved, patient satisfaction was improved, and quality of life was significantly improved. This indicates that UDS is an effective tool to evaluate LUTD in the rehabilitation period after IS in the elderly, which can be used to guide rational drug use, and has important guiding value to improve the therapeutic effect and the quality of life of patients.

**Table 2.** Comparison of QOL scores before and after treatment between the two groups

group	before treatment (n=84)	after treatment (n=84)	difference value
observation group	4.64 ± 0.51	2.87 ± 0.60a	1.77 ± 0.55c
control group	4.75 ± 0.56	4.06 ± 0.50b	0.70 ± 0.47

Note: a: In observation group, compared with before and after treatment,  $P < 0.01$ ; b: Compared with control group before and after treatment,  $P < 0.01$ ; c: The improvement rate of observation group after treatment was compared with that of control group,  $P < 0.01$ .

**Table 5.** Comparison of treatment effect of lower urinary tract symptoms before and after treatment between the two groups

	quantity	improve	ineffective	$\chi^2$	P
frequent				5.530	0.019
observation group	50	29 (58.0%)	21 (42.0%)		
control group	19	5 (26.3%)	14 (73.7%)		
urgency to urinate				4.516	0.034
observation group	49	29 (59.2%)	20 (40.8%)		
control group	12	3 (25.0%)	9 (75.0%)		
urinary incontinence				4.022	0.045
observation group	28	15 (53.6%)	13 (46.4%)		
control group	11	2 (18.2%)	9 (81.8%)		
dysuria				6.170	0.013
observation group	27	15 (55.6%)	12 (44.4%)		
control group	10	1 (10.0%)	9 (90.0%)		
urinary retention				5.215	0.022
observation group	24	16 (66.7%)	8 (33.3%)		
control group	9	2 (22.2%)	7 (77.8%)		

## Conclusions

In the rehabilitation period after stroke in the elderly, lower urinary tract dysfunction (LUTD) is primarily manifested as detrusor overactivity (DO) in UDS, with a minority of cases exhibiting detrusor contractility weakness or even absence of reflex. After treatment based on the UDS results, there is a significant improvement in clinical symptoms, UDS findings, and quality of life for these patients. UDS is an effective tool for assessing the treatment of LUTD in the rehabilitation period after stroke in the elderly.

## References