The Effect of Action Research on Neobladder Function Training in Patients with Orthotopic Ileal Neobladders: A Prospective Cohort Study

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Purpose: This study aims to evaluate the effects of action research on neobladder function training in patients with orthotopic ileal neobladders.

Methods: A total of 68 patients with orthotopic ileal neobladders were randomly divided into two groups: a control group (31 patients) and an experimental group (37 patients). Patients in the control group received neobladder function training, while patients in the experimental group received neobladder function training based on the action research method. The effects of neobladder function training in all patients were evaluated after three months.

Results: (1) The differences between the two groups in the micturition time interval, urine volume per time, number of incidences of nocturia, and urinary continence rate (day time and night time) were statistically significant ($P < 0.05$). (2) Compared to the control group (241.6 ± 42.3 mL, 15.1 ± 4.9 mL/s, 23.1 ± 9.9 cmH_2O, 63.6 ± 22.3 mL), the bladder capacity (292.6 ± 66.9 mL), maximum urinary flow rate (19.2 ± 6.5 mL/s), and bladder detrusor pressure (31.2 ± 11.4 cmH_2O) of the experimental group increased, while the residual urine volume (47.2 ± 21.1 mL) decreased ($P < 0.05$).

Conclusion: Neobladder function training based on the action research method can improve the neobladder function of patients with orthotopic ileal neobladders.

Keywords: action research; orthotopic ileal neobladder; neobladder function

INTRODUCTION

Bladder cancer is the ninth most common cancer and the second most common urologic malignancy worldwide [(1)]. Currently, the most effective method for the treatment of invasive bladder cancer is radical cystectomy with an orthotopic ileal neobladder[(2)]. This method of bladder replacement is closest to the normal physiological state of the human body and has gradually become the recommended approach for urine diversion[(2)]. However, as the intestine—which is a replacement for the new bladder—does not have sensory function and active contraction ability, it is prone to complications, such as urinary incontinence, urinary retention, hydronephrosis, and renal damage[(3)]. To enable patients to adapt to the new urination mode and improve their urination function, urine storage, and urine control, postoperative training of the function of the new bladder is particularly important. However, after the training, patients often continue to have problems, such as night dysuria and urinary incontinence[(1)]. Therefore, it is particularly important to improve the effectiveness of new bladder function training.

Action research is also known as a problem-solving approach. It is a research method that closely combines work with problem solving and carries out a spiral cycle of planning, action, observation, and reflection[(4)]. It has been increasingly applied in nursing research: Tong et al.[(5)] for example, applied the method to hemophiliac patients with total knee arthroplasty, finding that it led to a significant reduction in the incidence of bleeding and a significant increase in the range of movements (ROM). Li et al.[(6)] used the method in the feeding of patients with senile dementia, bringing the diet nursing of the patients closer to clinical practice. Tian et al.[(7)] provided nursing interventions based on action research to patients with cerebral infarction, finding that it could significantly improve a patient's neurological function and ability to carry out everyday tasks.

As the effectiveness of action research in the training of orthotopic ileum neobladders has not yet been reported, the present study aims to explore the application value of action research in neobladder function training in these patients.

PATIENTS AND METHODS

Patients

A total of 68 male patients who underwent radical cystectomy between January 2014 and June 2018 in the urology departments of the top three hospitals were enrolled in this study.

Inclusion criteria: (1) invasive bladder urothelial carcinoma confirmed by pathological examination; (2) pa-

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Received April 2020 & Accepted April 2021

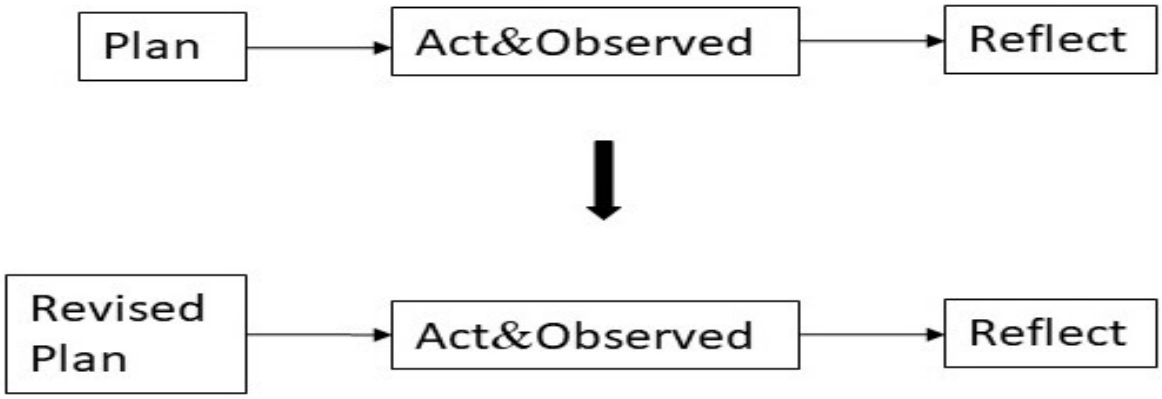

Figure 1. Action research spiral

tients were able to communicate; (3) informed consent was obtained from the patient and their family.
Exclusion criteria: (1) distant metastases of cancer; (2) other serious diseases.
The patients were split into two groups—a control group (31 patients) and an experimental group (37 patients)—using assignments by a random number table and grouping of the assigned numbers by a special person. The study used a single blind design: the follow-up specialist and the statistics specialist were blinded, but the nurse in charge of the health research was not.

Ethics approval
The institutional review board of the hospital approved the study protocol. All enrolled patients or their family members provided signed informed consent prior to participation.

Study design
The study aimed to investigate the effect of action research on new bladder function training. First, the problems that exist in new bladder function training in patients with orthotopic ileal neobladders were identified. Three spiral circulation processes (cycles) of action research were then used to solve each problem.
All the nurses who participated in the study had worked as nurses for more than five years and attended a training course on the action research method.

Problem identification
Patients with orthotopic ileal neobladders are prone to urinary incontinence and other complications after surgery[8]. Therefore, it is necessary to identify an effective bladder training mode to improve bladder urination function after surgery. However, there is currently no uniform method for urination function exercise in patients with orthotopic ileal neobladders after radical resection of bladder cancer. In the present study, a self-developed questionnaire was used to investigate the problems of neobladder function training in 68 patients with orthotopic ileal neobladders. The results revealed that 70.7% of patients considered the teaching of new bladder training methods by nurses difficult to understand and easy to forget. It was also found that 77.6% of the patients continued to lack knowledge of the importance of new bladder function training, and 91.4% believed it necessary to improve the training methods. These results provide a reference for improving neobladder training.

Planning
Both groups received routine new bladder function training, including pelvic floor muscle training and levator ani muscle training, according to clinical urological disease treatment guidelines[9]. The day before surgery, each patient was evaluated by a urological specialist nurse and guided through routine bladder function training[10], which consisted of (1) pelvic floor muscle exercises and(2) levator ani muscle training exercises. After surgery, the patients were given (3) urine storage function training and (4) urine control mode training.
(1) Pelvic floor muscle exercises: the patient should be in a supine position, a sitting position, or a walking position, breathe deeply, and contract the pelvic floor muscles for 10–15 seconds, then relax for 10 seconds, and repeat 30 times, 3 times a day.
(2) Levator ani muscle training exercises: the patient should breathe in quietly and contract his abdominal muscle, gluteus muscle, anal sphincter muscle, and pudendal muscle simultaneously for 15–18 seconds, then breathe out and relax, and repeat 30 times, 3 times a day.
(3) Urine storage function training: a regular clamping catheter and an appropriate clamping catheter were used. Initially, urine was released once every 30 minutes, which was gradually increased to once every hour. The urine storage capacity of the new bladder was observed.
(4) Urine control mode training: in the process of urination the patient should consciously contract the perineum, stop urination, and then relax the muscles of the perineum to continue urination, repeating until his bladder is empty. This should be repeated two or three times a day.
In addition to this training, the experimental group was given intervention using the action research method.

Action
The members of the research team undertook a three-day training course, which included (1) the concepts of a new bladder, pelvic floor muscles, the levator ani muscle, and other anatomical positions; (2) the surgical methods, indications, and possible postoperative complications of radical cystectomy for orthotopic ileal neobladders; (3) the purpose and significance of new bladder function training; (4) the methods of new bladder function training.

Table 1. Comparison of general data between the two groups

Group	n	Age /Year	Education		Tumor Staging		Pathologic Type		
			Middle School Education	School Education	T2	T3	Epithelioma	Squamous Cell Carcinoma	Gland Cell Carcinoma
Control Group	31	50.1 ± 12.8	21	10	14	17	29	1	1
Experimental Group	37	51.5 ± 13.9	23	14	16	21	34	2	1
$t/\chi 2$		1.85	0.23		0.025			1.3	
P		0.17	0.632		0.874			0.522	

The day before surgery, members of the research team gave one-on-one lectures to each patient and their family, instructing patients on how to perform the functional exercises and giving them demonstrations. Patients were followed up after discharge to survey the status of the training.

Observation, reflection, revision, and implementation Cycle 1

(1) Observation and reflection: Regarding the timing of the training and education materials, it was found that, prior to surgery, patients were worried about the effects, complications, and prognosis of the surgery; as such, they were absent-minded or inattentive during the training. After the operation, they were weak and uncomfortable due to multiple drainage tubes, so they could not attentively listen and understand the training. Regarding the content of the training and education materials, it was found that most patients felt it was difficult to master the pelvic floor muscle training.

(2) Revision of intervention plans and measures: The timing of the training and distribution of education materials was adjusted. In this revised approach, the training and education materials were given to each patient three days before surgery to ensure they fully understood the importance of the training. The day before the operation, patients in the same department shared their experience of bladder function training to help eliminate their concerns. Three to five days after surgery, the researchers gave instructions to each participant one-on-one and emphasized the importance of the training. Patients were able to ask questions at any time during the process to ensure that they understood the training. The education materials were also altered using cartoons to make them easier to understand. These materials focused on the new bladder, the pelvic floor muscle, the characteristics of the post-operative urination method, and possible complications.

Cycle 2

(1) Observation and reflection: During the follow-up after discharge, it was found that the new bladder function training of patients was relatively casual and that the patients could not recall the recent conditions of their urination. This made it difficult to make a clinical diagnosis with the bladder training method.

(2) Revision of intervention plans and measures: Patients were taught to set alarm clocks to remind them to do their training exercises and were instructed to maintain a urination diary. The main contents of the diary included the number of urinations within 24 hours and any nocturnal urination, the interval between urinations, the volume of each urination, the number of urinary incontinences, and whether there were any accompanying symptoms (such as intermittent urination, sense of urine insufficiency, and dysuria). After discharge, a clinical nurse was responsible for a weekly telephone follow-up, which focused on three things: investigating compliance with the new bladder function training, asking for information from the urination diary, and timely correction of bad behaviors and habits.

Cycle 3

(1) Observation and reflection: The patients indicated that maintaining a urination diary was too complicated and that they often forgot to use it.

(2) Revision of intervention plans and measures: A tabular urination diary was established, in which patients only needed to mark √ or × under the corresponding content. As the urination diary initially contained too many pages, which was not conducive to use, the updated diary had one table for each month. For easy storage, patients could also maintain a one-page urine diary a day.

Evaluating indicators

Three months after surgery, the urinary control indexes, including the interval time between two urinations, the volume of each urination, number of incidences of nocturia, rate of urine control during the day (the number of daytime controllability/the total number of daytime urinations), and rate of urine control at night (the number of night-time controllability/the total number of night-time urinations) were measured for both groups. This was the primary clinical outcome.

The secondary clinical outcome was measuring the urinary flow mechanics indexes, including bladder volume (the volume of urine stored when the bladder is full), residual urine volume (the amount of urine left in the bladder after urination), maximum urine flow rate (the maximum volume of urine discharged from the urethra per unit time), and pressure of the bladder detrusor muscle (pressure caused by contraction and relaxation of the bladder detrusor). The urinary flow mechanics were operated by a qualified medical technician using a urodynamic analyzer from Beijing Leiborui Medical Technology Co., Ltd.

Statistical analysis

The measurement data were expressed as $\bar{x} \pm$ standard deviation (SD), and a t test was used for comparison between the two groups. Count data were expressed in ratio or rate, and a chi-squared test was used for comparison between the two groups. All statistical analyses were carried out using IBM SPSS 17.0 for Windows (IBM Corp., New York, NY, USA). $P < 0.05$ was considered statistically significant.

RESULTS

Table 1 shows the results of the comparisons between

Table2. Results of urination and urinary control indexes (`x±s).

Group	n	Micturition time interval (h)	Urine volume (mL)	Number of nocturia	Urinary continence rate in day-time (%)	Urinary continence rate in night-time (%)
Control group	31	2.3 ± 0.8	218 ± 58.1	3.4 ± 1.5	77.4	71.0
Experimental group	37	3.5 ± 1.1	265 ± 69.1	2.5 ± 1.0	94.6	91.9
t/χ2		4.37	8.92	1.93	4.33	5.08
P		0.02	< 0.01	0.03	0.04	0.03

the two groups in terms of micturition time interval, volume of urine per time, number of incidences of nocturia, and urinary continence rate in the daytime and night-time.

Compared with the control group, the micturition time interval and volume of urine per time increased ($P < 0.05$), the number of nocturia decreased ($P < 0.05$), and the rate of urine control in the daytime and night-time increased ($P < 0.05$) in the experimental group.

Table 2 shows the results of the comparisons between the two groups in terms of bladder capacity, maximum urinary flow rate, bladder detrusor pressure, and residual urine volume. The bladder capacity, maximum urinary flow rate, and bladder detrusor pressure were higher in the experimental group than in the control group ($P < 0.05$), while the residual urine volume was lower in the experimental group than in the control group ($P < 0.05$).

DISCUSSION

Action research[11] aims to develop a research process that allows researchers to discovers problems, formulate plans to solve the problems, implement the plans, observe the implementation process, analyze the results of the implementation, and re-plan where necessary, thereby solving problems in clinical practice (see Figure 1). Experience suggests that an action research approach is particularly relevant when treating patients with chronic diseases and complex care needs[4].

In the present study, the action research method was applied in the training of neobladder function in patients with orthotopic ileal neobladders. No significant differences were found in the ages, education levels, tumor staging, and pathologic types of the patients in the two groups, which provided a justification for the study. The results of the urination and the urinary control indexes revealed that the micturition time interval and urine volume per time increased, the number of incidences of nocturia decreased, and the urinary continence rate in the daytime and night-time increased in the experimental group compared with the control group. The results of the urinary flow mechanics indexes revealed that bladder volume, maximum urine flow rate, and pressure of the bladder detrusor muscle were higher in the experimental group than in the control group, while the residual urine volume was lower in the experimental group than in the control group.

Conventional new bladder function training mainly consists of health education given during hospitalization combined with follow-up after discharge, and the impact of the training is not effectively monitored. Furthermore, the timing of the pre-operative health education is not appropriate and the educational materials are not focused, so patients cannot fully grasp the content. In the present study, patients in the experimental group received training with the action research method applied, allowing appropriate measures to be implemented to improve the effectiveness of the training.

Throughout the research process, the four steps of planning, action, observation, and reflection were carried out in three spiral cycles to develop a more effective new bladder function training program[12-13]. The process emphasized each patient's feelings and sought solutions when problems were encountered. As a result, the education materials and standardized teaching process were formulated in a more targeted manner, and the patients were given the details of the practical problems encountered in new bladder function training to help them understand why the training was required. Through the step-by-step training of bladder filling and regular emptying, the pelvic floor muscles were repeatedly contracted and relaxed to improve the storage, urination, and urine control of the new bladder.

A voiding diary is a commonly used diagnostic tool to aid clinicians in treatment planning for patients with urinary incontinence[14]. In the present study, a tabular urination diary was developed and made into a book, in which patients only needed to mark √ or × under the corresponding content. This was a simpler and easier approach to the diary, allowing the patients to become active managers instead of passive participants, thereby increasing their enthusiasm for the new bladder function training.

The present study found that it is also important to explain the purpose and method of the new bladder function training and of maintaining a urination diary to the patient's family members, as it enables the patient to obtain their support and encouragement. Telephone follow-up acts as another form of social support[15-16], making patients feel valued and encouraging them to continue with the training. During a telephone follow-up, patients can actively consult relevant knowledge, there-

Table 3. Results of urinary flow mechanics indexes (`x±s).

Group	n	Bladder capacity (mL)	Residual urine volume (mL)	Maximum urinary flow rate (mL/s)	Bladder detrusor pressure (cmH_2O)
Control group	31	241.6 ± 42.3	63.6 ± 22.3	15.1 ± 4.9	23.1 ± 9.9
Experimental group	37	292.6 ± 66.9	47.2 ± 21.1	19.2 ± 6.5	31.2 ± 11.4
t/χ2		9.83	8.61	9.52	11.86
P		< 0.01	< 0.01	0.02	< 0.01

by further strengthening the importance of the training. The results of the present study are limited by the small sample size and short evaluation period. Therefore, these results may not apply to all patients with orthotopic ileum neobladders in different areas of China or in other populations. The patients were also from a single institution, which may cause site bias. Although the present results suggest that the application of the action research method to neobladder function training in patients with orthotopic ileum neobladders would improve the effect of the training, larger prospective multicenter studies with longer application periods are needed to confirm the results.

CONCLUSIONS

The results of the present study suggest that the application of the action research method to the neobladder function training of patients with orthotopic ileum neobladders could improve the urination status of these patients, thereby enhancing their quality of life.

ACKNOWLEDGEMENT

The study was sponsored by the National Key Clinical Specialty Discipline Construction Program of China (No. [2014]182).

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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