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Application of Improved Urostomy Pouch in Collection of Seepage from Nephrostomy Tube Entry After Percutaneous Nephrolithotomy

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Abstract: Objective: We attempt to explore the effect of improved urostomy pouch on collecting the seepage from the entry of the nephrostomy tube after percutaneous nephrolithotomy. Methods: We selected 106 patients who underwent percutaneous nephrolithotomy and had indwelling nephrostomy tube with abnormal increase in seepage from the nephrostomy tube entry. Random number table was used to averagely divide them into observation group (53) and control group (53). For the observation group, we used improved urostomy pouches to collect seepage from the nephrostomy tube entry while for the control group, we dealt with the seepage through changing dressings following surgical routine. After that, we compared occurrence of dermatitis around the stoma, discomfort of stoma, stoma care cost, medical staff's satisfaction with collection of seepage, frequency of changing dressings for stoma and material expenditure, etc. between the two groups. Results: occurrence of dermatitis around the stoma, discomfort of stoma and stoma care cost in observation group were lower than those in control group with a significant difference (P=0.000). Besides, medical staff's satisfaction with collection of seepage in observation group was higher than that in control group with a significant difference (P=0.000). Frequency of caring for the stoma expenditure of dressings in the observation group were lower than those in the control group also with a significant difference (P=0.000). Conclusions: Improved urostomy pouches in collection of seepage from the stoma after PCNL can not only ensure the leakproofness of the urinary system and the function of nephrostomy tube but also reduce the occurrence of stoma infection to improve comfort of patients and accuracy of measurement of seepage, and reduce workload of medical staff. What's more, the improved urostomy pouches help reduce the cost of changing dressings for patients and cost of materials of the department, and thus is worth application in collection of seepage from other drainage tubes.

Keywords: Improved Urostomy Pouch, Percutaneous Nephrolithotomy, Collection of Seepage, Application

1. Introduction

Percutaneous nephrolithotomy (PCNL), with the advantages of less trauma, lower risk, less complication and quicker recovery, has become one of the operative treatment for renal and upper ureteral calculi [1-5]. PCNL requires construction of a channel guided by ultrasound B before crushing and removing the calculi. Usually a 0.5-1 cm incision is made at the lower part between the eleventh costal interval and twelfth costa near posterior axillary line for puncture to establish the channel for removal of the calculi. During the operation, to flush out broken stone and maintain clear vision, continuous perfusion of normal saline under a certain pressure is required. However, high pressure and a large amount of irrigation for a short time cause the irrigation fluid to seep to the periphery of the kidneys. We can stop bleeding by compressing the nephrostomy tube. The nephrostomy tube is beneficial for drainage of urine in the kidney after surgery, and can also be used for second-time surgical entry. After operation, the irrigation fluid that seeps to the periphery of the kidneys during the operation may seep out of the channel through the nephrostomy tube entry,

which not only soaks dressings on the stoma but also the patient's clothing. If the dressings are not changed in time, the skin around the stoma will be red and swollen, which will bring to the patient physical and mental discomfort. Nevertheless, frequent changes of dressings and clothing increase not only the workload of medical staff, but also the financial burden on patients as well as expenditure of the department.

In order to improve postoperative comfort of patients who underwent percutaneous nephrolithotomy, reduce occurrence of wound infection, medical cost and nurses' working burden, we adopted improved urostomy pouches for collection of seepage from nephrostomy tube entry in patients who received PCNL and had indwelling nephrostomy tube with abnormal increase in the seepage from January 2019 to December 2019 in out department. The experiment achieved good results.

2. Clinical Data and Methods

2.1. General Data

We included 106 patients who received PCNL with abnormal increase in the seepage from nephrostomy tube entry and the dressings were totally soaked which affected the clothing. We averagely randomized them into observation group and control group. In the observation group, there were 32 males and 21 females who aged from 20 to 80 with an average age of (54.1±11.8), and there were 21 cases of multiple calculi in two kidneys, 18 cases of calculi in left kidney, 9 cases of calculi in right kidney, 4 stag horn calculi in left kidney, and 1 left ureteropelvic junction calculi. Among the 53 cases in the observation group, 48 cases were given unilateral percutaneous nephrolithotomy and the other 5 cases were given bilateral percutaneous nephrolithotomy. The operation averagely took (62.7±15.9) minutes, and the nephrostomy tubes were kept inside the patients for 4.37±0.85 days on average. In the control group, there were 30 males and 23 females who aged from 26 to 83 with an average age of (55.7±13.7), and there were 25 cases of multiple calculi in two kidneys, 15 cases of calculi in left kidney, 12 calculi in right kidney, and 1 stag horn calculi in right kidney. Among them, 46 cases received unilateral percutaneous nephrolithotomy and 7 cases underwent bilateral percutaneous nephrolithotomy. The operation averagely took (63.8±16.2) minutes and the nephrostomy tubes were kept for 4.62±0.62 days on average. Both of the groups received combined epidural-spinal anesthesia and percutaneous nephrolithotomy. There was no significant difference in the sex, age, operative method, operation time and other general data between the two groups ($P>0.05$). The inclusion criterion was that patients had only one channel established in the operation and received percutaneous nephrolithotomy; and the exclusion criterion was that patients who had channel established in the operation but did not receive percutaneous nephrolithotomy, had two or more than two channels constructed during the percutaneous nephrolithotomy or received PCNL on the second phase.

2.2. Methods

2.2.1. Control Group

We adopted traditional change of dressings for patients in the control group. When the dressings on the stoma were totally soaked which affected the clothing, we removed the soaked dressings, cleaned the stoma, and covered the outer space using gauze with a cut in the middle. Then, we used sterile pads to absorb the seepage and changed clothing for patients.

2.2.2. Observation Group

When the patients were back to the ward from percutaneous nephrolithotomy and the dressings on the stoma were totally soaked which affected the clothing, we cleaned the stoma with traditional method but did not use gauze to cover the stoma. Instead, we used improved one-piece pouch system to collect the seepage.

(i). Improvement and Application of One-piece Pouch System

The improvement of the one-piece pouch system (patent applied for, the patent name: a pouch that retains the drainage tube and collects seepage, patent number: 201920581414.6), was mainly made at the central hole, or at the upper part of the pouch 30 degrees to the central hole either on the left or right. Based on the central hole of the pouch, we used sterile scissors to enlarge the diameter of the hole to 2 cm so as to ensure enough space for the entry of nephrostomy tube. Besides, we cut a hole of 1 cm in diameter at the upper part of the pouch 30 degrees to the center of the central hole on the left or right for the outlet of the nephrostomy tube.

(ii). Installment and Fixation of the Pouch and Management of the Seepage

When the patient assumed a lateral position on the healthy side, we removed the soaked dressings, used normal saline cotton ball to clean the drainage tube and surrounding skin of 10 cm in diameter, and then dried it with sterile gauze. After that, we closed the proximal nephrostomy tube and separated it from the drainage bag. The nephrostomy tube entered into the urostomy bag from the central hole and was drawn out from the hole on the upper part of the urostomy pouch with tweezers. When connecting the drainage bag to the end of the nephrostomy tube, we released the hemostatic forceps, peeled off the adhesive paper on the bottom of the uostomy pouch, and stuck the urostomy pouch on the skin with the nephrostomy tube as the center. The sticking was done from the bottom to the top with fingers pressing in a circle outward for 5 min to increase the adhesion of the urostomy pouch to the skin. We also sealed the opening of the stoma with transparent dressings to prevent the urostomy pouch from being broken. The end of the urostomy pouch was connected to the drainage bag to collect the seepage, which would reduce the weight of the urostomy pouch and increase patient's comfort.

2.3. Outcome Measurements

2.3.1. Occurrence of Dermatitis Around the Stoma

We observed the condition of the skin around the nephrostomy tube each time we changed dressings or urostomy pouch. When the skin was intact and there was no redness or other uncomfortable symptoms, there was no occurrence of dermatitis and vice versa. The dermatitis was classified according to the grading standard for incontinence dermatitis: level I: intact skin with mild redness and discomfort; level II: moderate redness, skin peeling, vesicles or localized cortex damaged with pain or discomfort; level III: dark red or scarlet skin with extensive skin peeling and damaged, blisters and exudation [6, 7].

2.3.2. Comparison of Discomfort of the Stoma Between Two Groups

The patients were asked to report their uncomfortable feeling around the stoma including humidity, itch and unpleasant odor, etc.

2.3.3. Medial Staff's Satisfaction with Collection of Seepage

When the nephrostomy tube was removed, medical staff assessed the collection of seepage in two groups following 4-point Likert scale including "very satisfied", "satisfied", "partly satisfied" and "dissatisfied" [8].

2.3.4. Frequency and Cost of Caring for the Stoma

We figured up the average frequency and cost of caring for the stoma and expenditure for each patient.

2.4. Statistical Methods

We used SPSS 22.0 for statistical analysis. The data were shown as mean±standard deviation. The T test was adopted to compare the means of the two samples and χ^2 test for comparison of enumeration data.

3. Results

3.1. Comparison of Occurrence of Dermatitis Between the Two Groups

In the observation group, the improved urostomy pouches were used to collect the seepage to separate it from the skin and thus reduce occurrence of dermatitis around the stoma. The occurrence of dermatitis in the observation group was 9.4% (5/53) and, compared with the control group, there was a significant difference (χ^2=87.724, P=0.000) as shown in the Table 1.

Table 1. *Comparison of Occurrence of Dermatitis around the Stoma between the Two Groups.*

Groups	N	Occurrence of Dermatitis		
		Level I	Level II	Level III
Control group	53	37 (69.8%)	15 (28.3%)	1 (1.9%)
Observation group	53	5 (9.4%)	0 (0%)	0 (0%)
$\chi 2$		87.724		
P		0.000		

3.2. Comparison of Discomfort of the Stoma Between the Two Groups

As in the observation group there was no gauze to absorb seepage and thus the seepage directly flew into the urostomy pouches, the occurrence of humidity, itch and unpleasant odor of the stoma in the observation group was lower than that in the control group with a significant difference as shown in the Table 2.

Table 2. *Comparison of Discomfort of Stoma between the Two Groups.*

Groups	N	Humidity	Itch	Unpleasant odor
Control group	53	40	37	15
Observation group	53	0	5	0
χ^2		64.242	40.381	17.473
P		0.000	0.000	0.000

3.3. Medical Staff's Satisfaction with Collection of Seepage

In the observation group, all the seepage flew into the urostomy pouches, so the amount of it could be measured accurately. In the control group, the amount of the seepage could only be estimated through weighing the dressings. Accordingly, medical staff's satisfaction with collection of seepage in the observation group was 100% (53/53) which was greatly higher than the 69.8% (37/53) in the control group with a significant difference (χ^2=56.841, P=0.000) as shown in the Table 3.

Table 3. *Comparison of Medical Staff's Satisfaction with Collection of Seepage between the Two Groups.*

Groups	N	Very satisfied	satisfied	Partly satisfied	Dissatisfied
Control group	53	0	37	15	1
Observation group	53	48	5	0	0
χ^2		56.841			
P		0.000			

3.4. Comparison of Frequency and Cost of Caring for the Stoma and Capital Expenditure Between the Two Groups

The average frequency and cost of caring for the stoma and expenditure in the observation group were lower than those in the control group. The two-sample comparison T test showed t=(8.482, 28.219, 41.440) and P=0.000. There was a significant difference between the two groups as shown in the Table 4.

Table 4. *Comparison of Frequency and Cost of Caring for the Stoma and Expenditure between the Two Groups.*

Groups	N	Frequency of caring for the stoma (time/case)	Cost of caring for the stoma (yuan/case)	Expenditure (yuan/case)
Control group	53	6.03±1.84	101.18±8.85	22.81±2.61
Observation group	53	2.94±1.90	61.89±4.92	5.72±1.48
t		8.482	28.219	41.440
P		0.000	0.000	0.000

4. Discussion

4.1. Collecting the Seepage to Ensure No Effusion in the Stoma and Avoid Dermatitis

After PCNL, the nephrostomy tube is routinely indwelled for 5-7 days for drainage of urine, hemostasis by compression, and secondary lithotomy through primary fistula. In order to maintain clear endoscopic vision and flush out broken pieces of stones during surgery, irrigation by a large amount of normal saline under high pressure is adopted. When the pressure is too high, the irrigation fluid infiltrates through the dilated cutaneous and renal channels to the periphery of the kidneys, causing seepage from the stoma in some patients. On the other hand, the fact that residual small stones or tissue fragments after operation obstruct the nephrostomy tube or improper placement of nephrostomy tube result in poor drainage, which also causes leakage of seepage from the fistula. The seepage directly soaks the stoma dressings and clothing and thus reduces the patient's comfort and increases the anxiety of patients and their family members. In addition, long-time contact with the seepage causes dermatitis, itch and other uncomfortable symptoms which leads to increase in the psychological burden of patients [9, 10].

In the current study, the improved urostomy pouches are used to retain the nephrostomy tube and at the same time to ensure the leakproofness of the urinary system. The system of improved urostomy pouch conforms to the nature that water flows downwards. It is adhered and fixed around the nephrostomy tube to collect the seepage from the stoma, preventing inflammation caused by direct skin contact with the seepage. We change dressings following traditional methods for patients in the control group to treat the stoma seepage, but it is difficult to replace the stoma dressing immediately. Due to long time skin contact with the seepage, 53 patients have dermatitis to different degrees. On the contrary, in the observation group, the urostomy pouches collect the stoma seepage to reduce the chance of the seepage contacting the skin, thereby reducing the occurrence of dermatitis around the catheter. The incidence of dermatitis in the observation group is 9.4% (5/53), compared with the control group, there was a significant difference (χ^2=87.724, *P*=0.000).

4.2. Collecting Seepage in a Closed System to Improve Patient's Skin Comfort around the Stoma

The improved urostomy pouch is a closed and anti-reflux system. In addition, the adherence of the base plate of the urostomy pouch to the skin is strong [11, 12], which can effectively block the seepage from the fistula and direct it to the urostomy pouch. The improved urostomy pouch will not be affected by patient's posture in decubitus, so it can increase the comfort of the patient. Directed collection of seepage reduces its contact with the skin around the stoma, and the local discomfort of the patient such as the feelings of humidity and itch. As the Table 2 shows, in the observation group, as there is no gauze to absorb the seepage, it directly flows into the urostomy pouch. The discomfort of humidity and itch in the observation group is thus lower than that in the control group with a significant difference (P=0.000). Besides, 15 patients in the control group have unpleasant odor, with an incidence of 28.3%, while in the observation group, there is no occurrence of unpleasant odor. There is a significant difference (P=0.000). The unpleasant odor of the seepage stored in the drainage bag cannot be smelt, and the drainage will not flow back to the stoma because of the change of body position so that the stoma can be kept from being polluted [13]. Patients whose condition allows can carry the bag to leave the bed, which not only reduces the patient's psychological burden, but also improves the patient's comfort and self-care ability. What's more, it also reduces the frequency of changing medicines and clothes, so that patients have sufficient rest after surgery, which improves the patient's comfort as well [14, 15], and thus improves patient's and his/her family's satisfaction.

4.3. Saving Cost and Resources

Traditional method to deal with wound seepage is to change dressings. We simulate the traditional dressing thickness and replace the seepage with normal saline. When the dressing absorba 55ml of normal saline, it reaches a saturated condition. According to collection of seepage in the observation group, the least amount of seepage is 80ml and the most amount is up to 2100ml. As a result, the cost of changing dressings will increase by 2-40 times, which will obviously increase the patient's expenses. Changing dressing for a patient each time will consume a disposable dressing bag and a cotton pad,

increasing expenditure of the department. As shown in the Table 4, the cost of treating the stoma in the control group is 101.18±8.85, while that in the observation group is 61.89±4.92. There is a significant difference (P=0.000). The expenditure of the control group is 22.81±2.61, while in the observation group it is 5.72±1.48, and there is a significant difference (P=0.000).

5. Conclusions

In conclusion, the advantages of the improved urostomy pouches in the collection of seepage from the nephrostomy tube entry after percutaneous nephrolithotomy stand out. The improved urostomy pouch can ensure the expected healing of the stoma and reduce the occurrence of local dermatitis and its complications. Besides, it is also conducive to accurate monitoring of seepage, to improving patient's comfort and satisfaction, and reducing the workload of medical staff and patient's costs, achieving good results in clinical practice. In this study, we find that the effect of the improved urostomy pouch on the collection of seepage after the removal of nephrostomy tube is also good. Therefore, the improved urostomy pouch is worth application in collection of seepage in other indwelling catheters clinically.

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