

The Therapeutic Effect of Early Ureteroscopic Indwelling Catheter Surgery on Urethral Injury After Pelvic Fractures

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Introduction. To explore the diagnostic and therapeutic effects of early ureteroscopic indwelling catheter surgery on urethral injury after pelvic fractures.

Methods. The 30 cases that met the inclusion criteria are equally divided into three groups, each containing 5 male and 5 female cases. The patients in experimental group 1 adopts the early ureteroscopic indwelling catheter surgery method proposed by the project. In the experimental group 2, cystostomy was performed at the early stage, and urethrotomy was performed at the second stage after 3-6 months. The control group uses delayed plasty treatment methods. After 3 weeks of treatment for three groups of patients, observe the continuity of the patient's urethra and follow up on complications such as urethral stricture and renal bladder calculus. Compare the chi square values of these data with *P*, and determine whether they meet the statistical data requirements and differences. Compare their scores before and after treatment to identify the treatment status.

Results. The smoothness and color health scores of urine in experimental group 1 were the highest among the three groups of patients, with values of 67.42 ± 3.094 and 71.52 ± 3.198 . The total effective cure rate was 94%, with the highest cure rate among the three groups of experiments. The decrease in complication score in this group was also the most significant, from 9.45 ± 1.04 to 2.07 ± 0.93 , with the best performance among the three groups.

Conclusion. The early implementation of ureteroscopic indwelling catheter surgery proposed in this study can effectively treat patients with urethral injury and improve their clinical performance. It can effectively avoid complications such as renal bladder calculus in patients after treatment, and has the value of promotion and use.

Keywords. Under ureteroscopy; Indwelling catheter surgery; Pelvic fracture; Urethral injury; Complications

INTRODUCTION

The human pelvis is relatively fragile, and this area is susceptible to external forces, which can cause urethral damage to patients. It not only affects patient urination, but also has a series of complications [1-4]. Due to difficulty urinating in patients with urethral injury, the duration of bladder fluid accumulation is too long, which can lead to complications such as urethral stricture and renal bladder calculus [5-6]. The treatment methods for urethral injury include conservative treatment, surgical repair, and medication, among which indwelling a catheter is a commonly used treatment method. This method can temporarily maintain urethral patency, reduce the stimulation of urine on urethral injury, and promote wound healing [7-8]. At present, the preferred treatment method in hospitals is to take primary colostomy for treatment.

But the cure cycle of this method is too long, and the complications cannot be effectively suppressed [9]. To shorten the treatment duration of patients, this study pioneered the use of early ureteroscopy to improve indwelling catheter surgery. This method can provide real-time monitoring of the patient's affected area during use, and effectively suppress rejection reactions such as intraoperative bleeding by accelerating the healing time. This project was conducted in the urology department of the hospital. Thirty patients with urethral injury after pelvic fractures who received treatment from January 2021 to December 2021 were selected. The patient's urethral stricture and other complications, as well as urethral urination function, were followed up. The practical significance of the project is to further explore the treatment methods and strategies for urethral injury by analyzing their therapeutic effects.

MATERIALS AND METHODS

General Information

The urology department of the hospital selected patients with urethral injuries from January 2022 to September 2023, including a total of 30 male and female patients. After confirmation by the project, they all suffered varying degrees of damage to the urethra after pelvic fractures. This project divides them into three groups based on different treatment methods, namely experimental group 1 (E1), experimental group 2 (E2), and control group (Cg). In these three groups, each group contains 10 cases, with 5 cases for each male and 5 cases for each female, and each group contains patients with similar physical conditions. After 3 weeks of early treatment with ureteroscopic indwelling catheter for E1 patients, the continuity of the patient's urethra is observed, and complications such as urethral stricture and renal bladder calculus are followed up. The experimental group 2 was treated with early cystostomy for 3-6 months, and then underwent urethral anastomosis in the second stage, the continuity of the patient's urethra is observed, and complications such as urethral stricture and renal bladder calculus are followed up. After 3 weeks of delayed plasty treatment, the continuity of the patient's urethra is observed and complications such as urethral stricture and renal bladder calculus are followed up in patients with Cg. In E1, the maximum age of patients is 64 years old, the minimum age is 28 years old, and the average age is 41.37 ± 5.17 years old, generally ranging from 35 to 45 years old. In E2, the maximum age of patients is 67 years old, the minimum is 31 years old, and the average age is 40.56 ± 4.89 years old, generally ranging from 37 to 42 years old. In Cg, the maximum age of patients is 71 years old, the minimum is 25 years old, with an average of 41.33 ± 5.01 years old, generally between 30 and 36 years old. This project has been approved by the Hospital Medical Theory Committee, and all patients and their families have signed informed consent forms.

Inclusion criteria: ① Age range from 20 to 80 years old (including 20 and 80 years old). ② The patient's urethral injury is due to compression caused by pelvic fractures. ③ The patient's blood routine, urine routine, renal function testing, and abdominal dialysis confirmed that the urethral injury is true. ④ The patient's educational level is at primary school or above. ⑤ The patient's physical condition is suitable for early ureteroscopic indwelling catheter surgery. ⑥ The patient is able to communicate

normally, is aware of and agrees to this topic. ⑦ There are no other symptoms in the patient's kidney. ⑧ The patient's urination organs are not significantly deformed.

Exclusion criteria: ① The patient has insufficient cardiopulmonary function and blood pressure does not comply with routine procedures. ② Patients who hold a skeptical attitude towards this method and are unwilling to cooperate with this project due to other reasons. ③ Patients who are unclear about their physical condition, falsely report their physical condition, or have been tested and confirmed to have no urinary tract injury. ④ Patients with severe renal dysfunction confirmed by doctors. ⑤ Patients with severe illnesses in other organs of the patient's body. ⑥ Pregnant or expectant patients. ⑦ Patients aged <20 years old or >80 years old. ⑧ Patients who are allergic to early ureteroscopic indwelling catheterization.

Dropout criteria: ① Patients with severe complications during the surgical process. ② Patients who have not been treated according to the prescribed treatment methods.

Diagnosis And Treatment Methods

Before treatment, urine routine and urine culture were used to judge whether the patients in experimental group 1 had urinary tract infection, and the infected patients were treated with sensitive antibiotics. After treatment, the uninfected patients were treated with early ureteroscopy indwelling catheter [10-12]. In this operation, a catheter is placed in the ureter to restore the normal flow of urine. Firstly, the patient received general anesthesia, and the position of urinary tract obstruction was confirmed by clinical symptoms, urine analysis and urography. Then use ureteroscope to enter the patient's bladder, and observe the degree of urinary tract obstruction through the ureteral orifice. In the position of ureteral obstruction, the topic uses ureteroscope to introduce zebra guide wire into the obstruction, and then inserts indwelling catheter into the catheter along the guide wire until urine can flow freely. Under the condition of cystoscopy, the subject judges the position of indwelling catheter to ensure that urine can be discharged smoothly. Finally, the indwelling catheter is fixed near the inner wall of bladder to prevent it from falling off or shifting. After placing the indwelling catheter, the subject takes out the cystoscope or ureteroscope and ends the operation. When the patient's recovery is normal, it is expected that the patient's catheter will be pulled out after 2-3 days and the discharge formalities will be handled. Before leaving the hospital, the doctor in charge of the patient should confirm that the patient's urinary tract is unobstructed and there are no other complications [13]. Early indwelling catheter under ureteroscope is a safe treatment method, which can quickly relieve urinary tract obstruction and its complications and restore normal urine discharge. Postoperative patients need to closely observe the urine output, check regularly to ensure the patency of indwelling catheter, and decide whether further treatment is needed according to the specific situation. Matters needing attention in the process of diagnosis and treatment: Before the patient underwent early ureteroscopic indwelling catheter, the relevant doctors should be trained and the patient should be informed of the relevant knowledge of the operation [14-16]. Urology-related medical staff should be trained in urinary tract, and patients' families have the right to know the purpose of operation and adverse reactions, and they agree to cooperate with this topic.

Observation Target

Safety observation indicators: rejection response indicators, intraoperative bleeding

volume of patients, urine routine, blood routine, and renal function indicators. Efficacy observation indicators: to observe the color and smoothness of the patient's urine before and after treatment, and the smoothness is mapped by the volume flow rate per unit time. Cure criteria for urethral injury: whether the patient's urination is smooth, the volume flow rate is higher than 24 mL/s, and the patient has no other complications. Long term treatment situation: after six months of treatment, to observe the color and smoothness of the patient's urine again, and determine whether the patient has complications such as urethral stricture and renal bladder calculus.

Efficacy Evaluation Criteria

Cure criteria: The patient's urethral injury has recovered without any other complications. The patient urinates normally, there is no infection at the surgical site, and the use of urinary tract injury drugs is stopped. Effective standard: The patient still has urinary disorders for some time or the urine color is light red, but most of the time the patient urinates smoothly and the color is light yellow. There is no infection or mild complications in the patient's wound. The use of urinary tract injury drugs by patients is reduced, which does not affect their daily life. Invalid standard: The patient still has urinary tract obstruction after testing, and the urine color is mostly light red. The patient has no postoperative infection, but has complications such as urethral stricture or renal bladder calculus. There is no significant decrease or increase in the use of urinary tract injury drugs by patients, and it will have an impact on their normal life. The cure criteria for long-term efficacy: Patients who underwent early ureteroscopic indwelling catheter surgery for six months after the follow-up of the study did not have complications such as urethral stricture and renal bladder calculus. Recurrence criteria for long-term efficacy: Patients who underwent early ureteroscopic indwelling catheter surgery six months after treatment were tested for complications such as urethral stricture or renal bladder calculus.

Statistical Methods

This project uses EpiData3.2 to establish a dataset and presents it in a data format of mean \pm standard deviation. Statistical analysis is conducted using SPSS22.00 software to express the counting data and component comparison. Use chi square test and proportional number to determine the exact probability. When $P < 0.05$ or $P < 0.01$, the study believes that the data has statistical significance and can be subjected to independent sample t-tests.

RESULTS

General Data Analysis

A total of 30 patients participated in the survey, including 15 male and 15 female patients. Among patients, the study divided them equally into three groups, namely E1, E2, and Cg. And based on their different levels of illness, this study maintained approximately the same patient level among the three groups. Table 1 shows the general information parameters of patients.

Table 1 General data analysis of patients

Gender	Male	Female	Age (average)	Course of Disease (Months)
E1	4	4	48	1-12
E2	5	3	44	4-12
Cg	2	3	47	6-15
Chi square value	0.427	-0.405	-0.612	0.427
<i>P</i>	0.416	0.562	0.459	0.578

Table 1 summarizes the age, duration of illness, and other information of patients. The phenomenon of detachment occurred in all three groups, with 2, 2, and 5 cases of E1, E2, and Cg detachment, respectively. The chi square and P values calculated from these data indicate that the gender, age, and duration of illness data of patients are not statistically significant ($P>0.05$). This indicates that there are no differences in the distribution of gender, age, and duration of illness among the three groups of patients.

Comparison of Clinical Manifestations of Patients Before And After Treatment

This project compares the physical conditions of 30 patients before and after treatment to analyze the therapeutic effects of the three methods. For the patient's physical condition, the analyzed data includes the Urine Exception Smoothness Score (UESS) and Urine Color Health Score (UCHS). This study conducted a comprehensive evaluation of patients using two scores, and Table 2 shows the collected data information.

Table 2 Comparison of clinical manifestations of patients before and after treatment

Time interval	Before treatment		After treatment		Chi square value	<i>P</i>
Index	UESS	UCHS	UESS	UCHS	-	-
E1	35	41	67	71	5.146	<0.05
E2	37	44	42	47	5.049	<0.05
Cg	34	39	36	39	3.285	<0.05

In Table 2, E1 showed an increasing effect on both UESS and UCHS after treatment. Although the two values of E2 did not decrease significantly, they were still better than the experimental results of Cg. The two values of Cg have not changed much. The chi square value of E1 is 5.146, which performs best among the three groups. The chi square values of the other two groups are 5.049 and 3.285, respectively. The UESS and UCHS scores of the three groups of patients were statistically significant ($P<0.05$), indicating their differences. For three sets of data, this study can plot images between mean and standard deviation, as shown in Figure 1.

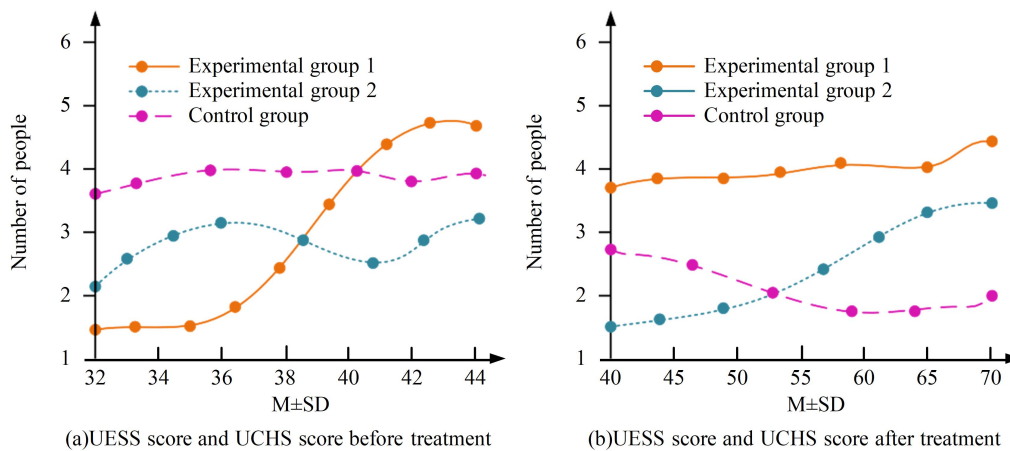


Fig.1 The relationship between the average UESS and UCHS scores before and after treatment and the standard deviation of the three groups of patients

In Figure 1 (a), the relationship between the mean and standard deviation of UESS and UCHS scores of E1 before early ureteroscopic indwelling catheter surgery was 31.62 ± 4.273 and 40.93 ± 4.427 , respectively; E2 was 36.56 ± 4.128 and 41.29 ± 4.635 , respectively; Cg is 34.32 ± 5.074 and 39.87 ± 5.164 . In Figure 1 (b), the relationship between the two values of E1 after patient treatment is 67.42 ± 3.094 and 71.52 ± 3.198 ; E2 is 42.01 ± 7.265 and 47.65 ± 7.639 ; Cg is 36.85 ± 8.168 and 38.87 ± 7.928 . This project establishes the relationship between the data through the chi square values and standard deviations of these values, as shown in Table 3.

Table 3 Chi-square value and standard deviation of numerical value

Time interval	Before treatment		After treatment		t	P
Patient's time	UESS	UCHS	UESS	UCHS	/	/
E1	31.62 ± 4.273	40.93 ± 4.427	67.42 ± 3.094	71.52 ± 3.198	4.27	<0.05
E2	36.56 ± 4.128	41.29 ± 4.635	42.01 ± 7.265	47.65 ± 7.639	4.14	<0.05
Cg	34.32 ± 5.074	39.87 ± 5.164	36.85 ± 8.168	38.87 ± 7.928	3.65	<0.05

In Table 3, the chi square value of the mean and standard deviation of UESS and UCHS scores for E1 is 4.27, which is the highest value among the three groups of patients. And the $P < 0.05$ in this group indicates that the difference is statistically significant. The other two groups had two values of 4.14 and 3.65, both of which were $P < 0.05$, indicating that their differences were statistically significant. Therefore, after treatment, E1 patients showed the most significant improvement in the mean and standard deviation of UESS and UCHS scores, performing the best among the three groups.

Patient's Physical Condition During Treatment

During the treatment period of this project, the treatment of urethral injury in E1: 63% of patients showed significant efficacy, 27% showed efficacy, and 4% showed no efficacy. The cured and relapsed patients with long-term efficacy accounted for 4% and 1% respectively. The proportion of patients with total effective cure and total ineffective cure is 94% and 5%, respectively. The treatment of urethral injury in E2: 14%, 25%, and 28% showed significant, effective, and ineffective results. The cure rate and recurrence rate of long-term efficacy are 4% and 17%, respectively. The total effective cure rate and total ineffective cure rate are 53% and 45%, respectively. The rates of significant, effective, and ineffective treatment for urinary tract injury in Cg were 7%, 14%, and 65%. The long-term cure rate and recurrence rate are 5% and 7%, respectively. The total effective cure rate is 26%, and the total ineffective cure rate is 72%. This indicates that after the same treatment time, the cure rate of patients in E1 is relatively higher. Table 4 shows the relationship between the proportions of the three groups of patients.

Table 4 Comparison of the proportion of effective and ineffective treatment among three groups of patients

Index	Effective treatment	Treatment usefully	Ineffective treatment	Long-term cure	Long-term recurrence	t	P
E1	63%	27%	4%	4%	1%	6.428	<0.05
E2	14%	25%	28%	4%	17%	6.017	<0.05
Cg	7%	14%	65%	5%	7%	5.869	<0.05

Note: The chi square value is 10.492, $P < 0.05$.

In Table 4, the cure method of E1 has the highest cure rate for patients, at 94%. The cure rates of the other two groups are 53% and 26%, respectively. And the $P < 0.05$ for the three groups shows statistical significance. Under the same conditions, the early ureteroscopic indwelling catheter surgery proposed in this study is more effective in treating urinary tract injury after pelvic fractures. To verify the patient's recovery status, this study analyzed the urine routine of patients before and after treatment, and drew a result graph as shown in Figure 2.

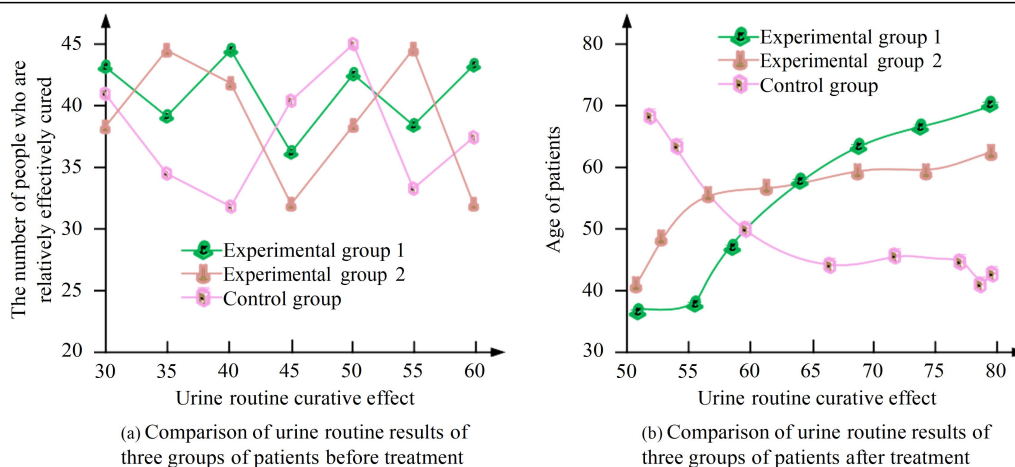


Fig.2 Comparison of ECG between three groups of patients before and after treatment

Figure 2 shows the comparison of urine routine results before and after treatment among three groups of patients. After early treatment with ureteroscopic indwelling catheter, patients with E1 had the healthiest urine routine. For urinary tract injury diseases, patients with E2 and Cg have a relatively higher recurrence rate.

Patient's Physical Recovery After Treatment

During the recovery period after early ureteroscopic indwelling catheter surgery, the patient's symptoms include wound infection, intraoperative bleeding, urinary occult blood, and urinary tract pain. This project compares the scores of these four symptoms, and the experimental results are shown in Figure 3.

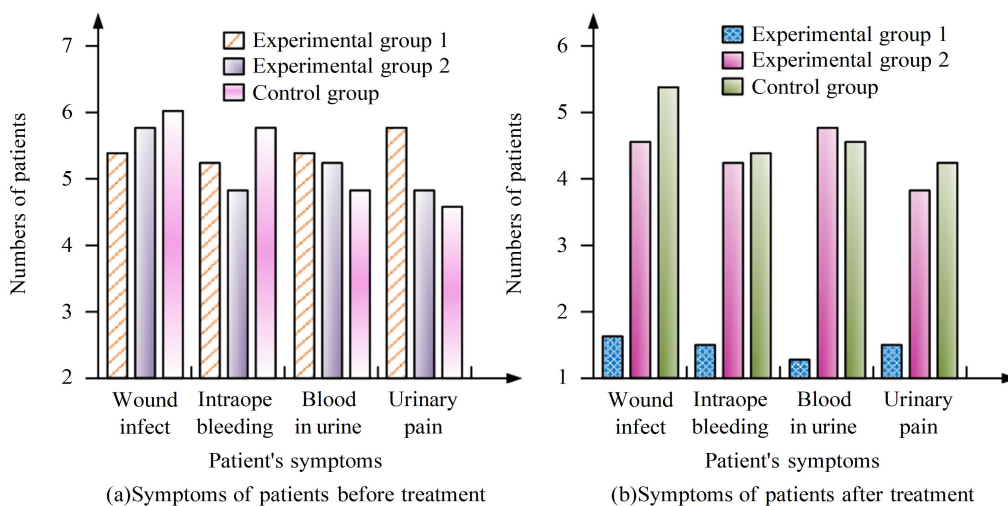


Fig.3 Comparison of the scores of four symptoms before and after treatment

Figure 3 shows the comparison results of patient points. As shown in Figure 3, there are various complications in patients with urinary tract injury before treatment. With the treatment of E1 in the project, the number of patients with complications is about

3, and the percentage of patients with reduced complications accounts for 92% of the total number. The mean reduction rates for patients in the other two groups were 48% and 25%, respectively. It indicates that after early ureteroscopic indwelling catheter surgery, the patient has the best recovery effect for complications. The project calculates these data to obtain integrals, and Table 5 shows the comparison results.

Table 5 Four kinds of complications of patients before and after treatment

Integration	Number of cases	Total symptom score		t	P
		Before treatment	After treatment		
E1	8	9.45±1.04	2.07±0.93*#	6.828	0.004
E2	8	9.36±1.17	3.56±1.12*#	6.146	0.020
Cg	5	9.28±1.25	3.84±2.09*	5.983	0.017

Note: "*" represents the comparison of scores between groups after treatment, $P < 0.01$. '#' represents the comparison of points within the group before treatment, $P < 0.01$.

Table 5 compares the complication score results of three groups of patients after treatment. After early ureteroscopic indwelling catheter surgery, the E1 patients decreased from 9.45 ± 1.04 before treatment to 2.07 ± 0.93 after treatment, with the most significant reduction effect among the three groups of patients. The decrease in E2 and Cg patients was 9.36 ± 1.17 and 3.56 ± 1.12 , respectively, indicating that early ureteroscopic indwelling catheter surgery is the best treatment for patients with urethral injury among the three groups of patients. The chi square value of E1 is 6.828, which is the highest among the three groups of patients. The chi square values of the other two groups of patients were 6.146 and 5.983, respectively, and their P values were 0.004, 0.020, and 0.017, respectively. This indicates that these data have statistical significance ($P < 0.05$).

Long Term Complications After Patient Treatment

Research has shown that long-term complications in patients after treatment include urethral stricture and renal bladder calculus. After treating 30 patients for six months, this project tested their urethral stricture and renal bladder calculus, and observed their degree of urinary tract patency and recovery from injury. The study scores these data and aggregates them into Table 6.

Table 6 Patient's self-acceptance score

Group	Urethral stenosis	Calyx calculus score	Urinary tract patency score	Injury recovery score
E1	15±3.04	18±1.25	71±4.41	89.72±3.73
E2	27±4.07	35±2.07	42±2.19	45.87±3.85
Cg	33±3.83	49±1.14	38±4.65	31.28±2.07
t	6.837	6.281	5.943	4.174
P	0.004	0.006	0.005	-

After treatment in Table 6, E1 patients had the lowest scores for urethral stricture and renal caliceal stone complications among the three groups of patients, and had the best performance in terms of urinary tract patency and recovery from injury. The chi square values of the three groups of patients were 6.837, 6.281, and 5.943, respectively. Their chi square values were 0.004, 0.006, and 0.005, respectively, indicating statistical significance ($P < 0.01$). In order to objectively evaluate the therapeutic effect of early ureteroscopic indwelling catheter surgery, the project has plotted them as Figure 4.

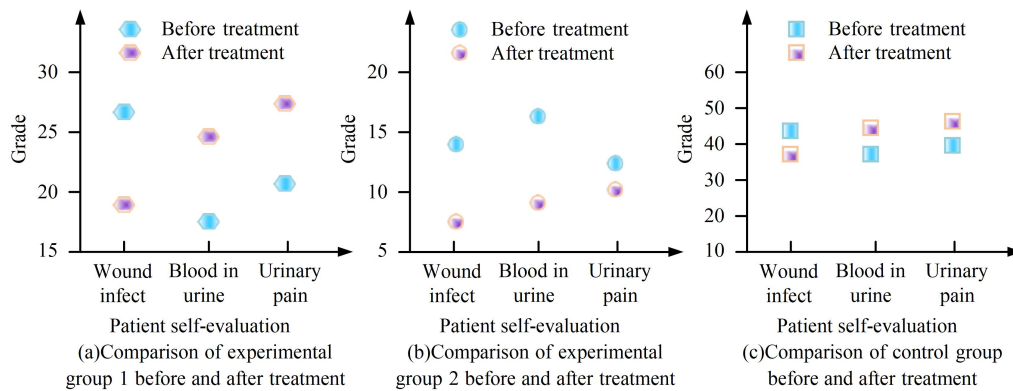


Fig.4 Comparison of data between three groups of patients before and after treatment

For the three groups of patients in Figure 4, the score of the affected area shows a downward trend after treatment, while the degree of urinary tract patency and recovery of the injured area shows an upward trend, indicating that this situation is gradually recovering. Among them, patients with E1 shows the most significant improvement, with a value of 63.5 ± 2.47 . The changes in E2 and Cg are 27 ± 2.08 and 5 ± 3.73 , respectively. After early treatment with ureteroscopic indwelling catheter, the patient's recovery from urethral injury is optimal.

CONCLUSION

Urethral injury refers to the damage to the urethra caused by external forces or other factors. The urethra is a conduit that connects the bladder and the body, responsible for urination. The common cause of urethral injury is due to its effects, such as in car accidents [17-20]. In order to treat this condition, this study selected 30 patients with urethral injury after pelvic fractures and divided them equally into three groups. According to the data, their age ranges from 20 to 80 years old [21-23]. The diagnosis and treatment method studied is to perform early ureteroscopic indwelling catheter surgery, and compare the clinical manifestations, physical condition, recovery, and long-term complications of patients before and after treatment. Urethral injury after pelvic fracture is a serious situation, and the common treatment is conservative treatment, mainly for mild urethral injury. This includes bed rest and other steps. This method drains urine through catheter, which reduces the irritation of urine to urethral

injury and promotes wound healing. In order to prevent or treat urinary tract infection and avoid the spread of infection or complications, this method will also use trace antibiotics. For patients with UESS and UCHS, their chi square values are 5.146, 5.049, and 3.285, respectively. The UESS and UCHS scores of the three groups of patients were statistically significant ($P < 0.05$), indicating their differences. The relationship between the mean and standard deviation of UESS scores for E1, E2, and Cg before treatment was 31.62 ± 4.273 , 36.56 ± 4.128 , and 34.32 ± 5.074 , respectively. The relationship between the mean UCHS score and standard deviation was 40.93 ± 4.427 , 41.29 ± 4.635 , and 39.87 ± 5.164 , respectively. After treatment, the relationship between the mean and standard deviation of UESS and UCHS scores in E1 was 67.42 ± 3.094 and 71.52 ± 3.198 , respectively; E2 is 42.01 ± 7.265 and 47.65 ± 7.639 ; Cg is 36.85 ± 8.168 and 38.87 ± 7.928 . The chi square values of the two values in E1, E2, and Cg are 4.27, 4.14, and 3.65, and their P values are all < 0.05 , indicating that their differences are statistically significant. The results of this study are consistent with those of Neu et al [24].

At the same time, analgesic drugs are used to relieve pain, so as to improve the comfort of patients. And through pelvic floor muscle exercise, enhance muscle strength and promote the healing of urethral injury. This treatment method is suitable for patients with minor urethral injury and no obvious urethral stricture or other complications. For severe urethral injury, the method proposed by experts is surgical repair. For the clinical manifestations of patients, 94% of patients with urethral injuries in E1 have been effectively cured, while 5% of patients have not been effectively cured; The proportion of E2 is 53% and 45%, respectively; 26% and 72% in Cg. The data shows that after the same treatment method, E1 has the highest cure rate for patients, at 94%. The cure rates for the other two groups are 53% and 26%, respectively. And the $P < 0.05$ for the three groups showed statistical significance. Under the same conditions, the early ureteroscopic indwelling catheter surgery proposed in this study is more effective in treating urinary tract injury after pelvic fractures [25-27]. Before treatment, there are various complications in patients with urinary tract injury. With the treatment of E1 in the project, the number of patients with complications is about 3, and the percentage of patients with reduced complications accounts for 92% of the total number. The mean reduction rates for patients in the other two groups were 48% and 25%, respectively. It indicates that after early ureteroscopic indwelling catheter surgery, the patient has the best recovery effect for complications. Surgical repair includes urethral suture, urethral stricture repair or other urethral injury repair, which is usually carried out at the same time in pelvic fracture repair surgery. Acimovic et al have also reached the same conclusion as this study [28].

In some complicated cases of urethral injury, some studies put forward urethroplasty. In urethroplasty, surgeons will use tissue transplantation or artificial materials to reconstruct urethra to restore its normal shape and function. At the same time, urethroplasty is used to transplant tissue to the urethral injury site, and then form a valve to prevent urine reflux. In addition, this study also discussed symptom scores

for patients in three groups. After early ureteroscopic indwelling catheter surgery, the E1 patients decreased from 9.45 ± 1.04 before treatment to 2.07 ± 0.93 after treatment, with the most significant reduction effect among the three groups of patients. The decrease results for E2 and Cg patients were 9.36 ± 1.17 and 3.56 ± 1.12 , respectively. For patients with urethral injury, early ureteroscopic indwelling catheter surgery has the best treatment effect among the three groups of patients. The chi square value of E1 is 6.828, which is the highest among the three groups of patients. The chi square values of the other two groups of patients were 6.146 and 5.983, respectively, and their P values were 0.004, 0.020, and 0.017, indicating statistical significance ($P < 0.05$). In order to verify the accuracy of this treatment method, this study compared the long-term symptoms after treatment [29]. The chi square values of the three groups of patients were 6.837, 6.281, and 5.943, respectively, and their chi square values were 0.004, 0.006, and 0.005, indicating statistical significance ($P < 0.01$). For the three groups of patients, the score of the affected area showed a downward trend after treatment, while the degree of urinary tract patency and the recovery of the injured area showed an upward trend, indicating that this situation is gradually recovering. Among them, E1 patients showed the most significant improvement, with a value of 63.5 ± 2.47 . The changes in E2 and Cg were 27 ± 2.08 and 5 ± 3.73 , respectively. After early treatment with ureteroscopic indwelling catheter, the patient's recovery from urethral injury is optimal. For patients with large urethral tissue defect, some experts put forward urethral transplantation. This method usually uses autologous tissue transplantation, such as oral mucosa or skin, to reconstruct urethra. In some special cases, such as urethral tissue can not provide enough graft materials, some literatures use artificial materials to repair urethra. Common artificial materials include hoses or artificial urethra, which are soft and not easy to corrode. At the same time, it is found that the experimental conclusion of Lu et al is the same as that of this study [30].

In summary, the early implementation of ureteroscopic indwelling catheter surgery proposed in the study has improved the clinical manifestations, physical condition, recovery, and long-term complications of patients before and after treatment. And it is superior to traditional methods and the treatment method of taking primary colostomy. However, this study only selected patients included in our hospital, and for urethral injuries, different physical conditions may have an impact on the experimental results. This is because the patient's physical parameters belong to personal privacy and should be protected. As the project progresses, this issue will continue to be addressed in future research.

FUNDING STATEMENT

This study was supported by Open Program of State Key Laboratory of Trauma, Burns and Combined Injury (SKLKF202122).

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