

# Effects of Systematic Nursing on the Stress Response, Psychological State, Postoperative Complications, and Nursing Satisfaction of Patients with Ureteral Calculi Undergoing Holmium Laser Lithotripsy with Flexible Ureteroscope under General Anesthesia

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## Abstract

**Objective:** To explore the effects of systematic nursing on the stress response, psychological state, postoperative complications, and nursing satisfaction of patients with ureteral calculi undergoing holmium laser lithotripsy with flexible ureteroscope under general anesthesia. **Methods:** A total of 152 patients with ureteral calculi treated with holmium laser lithotripsy with ureteroscope in our hospital from July 2017 to June 2019 were enrolled, of which 80 patients were assigned to an observation group nursed under a systematic nursing mode and 72 patients were assigned to a control group nursed under a routine nursing mode. Operation indications of the two groups including hospitalization time and operation time were evaluated and compared and the stone-free rate of the two groups were compared. The levels of superoxide dismutase (SOD), plasma cortisol (Cor), and malondialdehyde (MDA) of patients in the two groups were determined, and the psychological quality of them were scored by the self-rating anxiety scale (SAS) and self-rating depression scale (SDS), and compared. In addition, the treatment cooperation degree of patients in the two groups after 24 hours of treatment and the nursing compliance of them after 7 days of nursing were evaluated, and the complications of the two groups were compared. Moreover, the nursing satisfaction of the patients was explored at the discharge of them. **Results:** The observation group experienced shorter hospitalization time and operation time and showed higher stone-free rate than the control group. After treatment, the SOD and Cor levels in the observation group were lower than those in the control group, while the MDA level in the observation group was higher than that in the control group. In addition, the observation group got lower SAS and SDS scores, and showed higher treatment cooperation degree and nursing compliance, less complications, and higher nursing satisfaction than the control group. **Conclusion:** Systematic nursing can effectively improve the stress response and psychological state of patients with ureteral calculi undergoing holmium laser lithotripsy with flexible ureteroscope under general anesthesia and reduce the incidence of postoperative complications in them, which contributes to a higher nursing satisfaction and is worthy of clinical promotion.

**Keywords:** Holmium laser, lithotripsy, ureteroscope, systematic nursing

## Introduction

Urinary system stone diseases are common, especially among men (Lei et al., 2016; Curhan, 2007; Anan et al., 2019). Diabetes mellitus, obesity, and

increased metabolism can all give rise to stone diseases (Meltzer et al., 2019; Tasian et al., 2017), which may result in uremia in severe cases

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(Tambo et al.,2014; Papagiannopoulos et al.,2016). Stone diseases are manifested as symptoms including pain from groin to external genitalia. Although some patients with ureteral calculi may not show symptoms, most of patients will feel pain and seek treatment and nursing generally(Campschroer et al.,2018). Clinically, urinary calculi are mainly treated by extracorporeal shock wave lithotripsy, ureteroscopy, percutaneous nephrolithotomy, laparotomy, laparoscopic surgery or robot-assisted surgery(Assimos et al.,2016).

In recent years, with the development of flexible ureteroscopy and auxiliary equipment, the combination of flexible ureteroscope and holmium laser lithotripsy has become increasingly mature, and has gradually become an ideal choice for the treatment of urinary calculi(Hussain et al.,2019; Xu et al.,2017). The high-power laser system can realize the strategies of "dust removal" and "blasting", breaking stones into submillimeter particles, and then it is assisted with dust removal measures to remove dust. However, the heat the system generates will cause damage to urothelium, renal parenchyma, and ureter(Aldoukhi et al.,2018), which is due to the fact that laser treatment is prone to bring about thermal damage to mucous membranes and bleeding(Foreman et al.,2014; Binbay et al.,2011). Therefore, postoperative nursing for patients is particularly crucial, and systematic nursing is one of the nursing choices. This kind of nursing is frequent in psychiatric diseases and pulmonary infection(Li,2018; Zhang et al.,2017). However, there are few related clinical studies on the effect of systematic nursing on patients undergoing laser treatment. Therefore, this study aimed to explore the effects of systematic nursing on patients with ureteral calculi undergoing holmium laser lithotripsy with flexible ureteroscope under general anesthesia in terms of stress response, psychological state, postoperative complications, and nursing satisfaction.

## 1 Objects and methods

### 1.1 General information of nursing objects

A total of 152 patients with ureteral calculi admitted to our hospital from July 2017 to June 2019 were enrolled, and treated with holmium laser lithotripsy with ureteroscope. Eighty patients were assigned to an observation group, including 59 males and 21 females between 35 and 74 years old, with an average age of (49.97±2.79) years, and 72 patients were assigned to a control group, including 54 males and 18 females between 38 and

72 years old, with an average age of (50.78±2.55) years.

### 1.2 Inclusion and exclusion criteria

The inclusion criteria of the patients: Patients meeting surgical indications, patients without other diseases that affected the study, patients without communication obstacle, patients whose stone was located in the middle and upper ureter according to X-ray irradiation, and those whose family members agreed to participate in the study and signed relevant agreements. The exclusion criteria of the patients: Patients suffering from severe heart or lung function diseases and unable to endure surgery, patient with other diseases that affected the study, patients who could not lie prone due to severe kyphosis, and those who were so obese that it was difficult to establish a percutaneous renal access. This study was approved by the Ethics Committee of our hospital.

### 1.3 Nursing methods

Patients in both groups were treated with holmium laser lithotripsy with flexible ureteroscope under general anesthesia. Patients in the control group were given routine nursing mainly as follows: Nursing staff were arranged to give health education to the patients, impart knowledge related to urinary system stone diseases to them so that they can get familiar to the matters needing attention in the operation and fully cooperate in the operation process. The nursing staff were also arranged to guide the patients in body position, complications, and diet after the operation. Patients in the observation group were given systematic nursing as follows: The nursing staff were arranged to help each patient complete routine examination and specialized examination to determine the location and size of his/her stone and renal function of him/her, and ask him/her to have a light high-density diet containing no crude fiber and lie down to avoid stone movement after the stone location was determined. In addition, the nursing staff were arranged to take care of patient's mental health and given explanation to him/her patiently to eliminate his/her doubts and anxieties about surgery. During lithotripsy, the nursing staff were also arranged to help each patient keep in a trendelenburg position, take routine sterilization measures, set the holmium laser parameter at 6-12 Hz, and monitor the vital signs of the patient with the anesthesiologist. Moreover, the nursing staff were arranged to observe and control various procedures during the operation, adopt physiological saline for continuous flushing to

ensure a clear operative field and smooth operation during the operation, and the nursing staff were also arranged to monitor and handle the changes of vital signs of each patient after operation. The patient was allowed to eat when his/her intestinal peristalsis recovered after operation, and he/she was encouraged to drink more water to reduce urinary tract infection and discharge residual stones. The nursing staff were arranged to observe the urine color, urine volume, nature and abdominal signs of the patient to prevent massive hemorrhage and urinary extravasation caused by ureteral perforation, and encourage the patient to get out of bed and move moderately 1-2 days after operation to prevent complications including pressure score, retrograde urinary tract infection, ureteral perforation, and bladder irritation sign.

Operation indications of the two groups including hospitalization time and operation time were evaluated and compared and the stone-free rate of the two groups were compared. The levels of oxidative stress parameters including superoxide dismutase (SOD), plasma cortisol (Cor), and malondialdehyde (MDA) of patients in the two groups were determined, and the psychological quality of them were scored by the self-rating anxiety scale (SAS) and self-rating depression scale (SDS)(Dunstan and Scott,2020; Chung et al.,2018), and compared. In addition, the treatment cooperation degree of patients in the two groups during treatment and after 24 hours of treatment was evaluated. The situation where the patient actively cooperated with clinical treatment was considered as complete cooperation. The situation where the patient occasionally showed non-standard compliance behavior during surgical treatment, but showed compliance after being given reminding or explanation was considered as partial cooperation, and the situation where the patient often did not follow clinical surgical

treatment or the treatment was interrupted halfway due to his/her non-cooperation was considered as non-cooperation. Afterwards, the nursing compliance of them after 7 days of nursing was evaluated. The situation where the patient actively and strictly followed the doctor's advice and actively cooperated with nursing was considered as complete compliance. The situation where the patient occasionally disobeyed the doctor's advices during treatment, but obeyed them after being reminded was considered as partial compliance, and the situation where the patient often did not follow the doctor's advice or refuse nursing was considered as non-compliance. Moreover, the incidence of complications such as

pressure score, retrograde urinary tract infection, ureteral perforation, and bladder irritation sign of the two groups were compared. Finally, the satisfaction degree of the patients was investigated using a self-made questionnaire at the time of discharge of them. The questionnaire was designed to use a score of 100-90 points for satisfaction, a score of 70-90 points for moderate satisfaction, and a score less than 70 points for dissatisfaction.

#### 1.4 Statistical analysis

The data were analyzed comprehensively and statistically using SPSS19.0 (Asia Analytics Formerly SPSS, China). The enumeration data were analyzed using X<sup>2</sup>, and measurement data were expressed as the ( $X \pm S$ ), and analyzed by t test.  $P < 0.05$  suggests a significant difference.

### Results

#### 2.1 General data

There was no significant difference between the two groups in general data including sex, age, body mass index (BMI), stone location, stone size, and obesity (all  $p > 0.05$ ). Table 1.

#### 2.2 Operation indications of the observation group are better than those of the control group

The hospitalization time and operation time of the observation group were ( $5.28 \pm 1.13$ ) d and ( $48.65 \pm 6.08$ ) min, respectively, and the hospitalization time and operation time of the control group were ( $7.65 \pm 3.87$ ) d and ( $63.59 \pm 8.34$ ) min, respectively, so the observation group experienced shorter hospitalization time and operation time than the control group (both  $p < 0.05$ ). Figure 1.

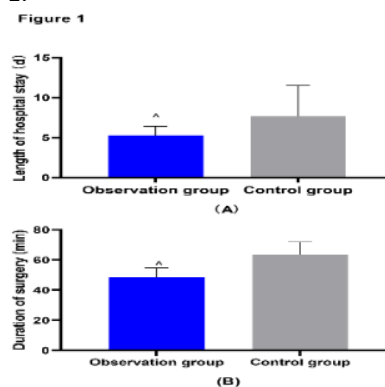


Figure 1. **Operation indications of the two groups. A, Hospitalization time of the two groups: The observation group experienced shorter hospitalization time than the control group ( $p < 0.05$ ). B, Operation time of the two groups: The observation group experienced shorter operation**

time than the control group ( $p<0.05$ ). Note: ^ indicates  $p<0.05$  vs. the control group.

### 2.3 The stone-free rate of the observation group is higher than that of the control group

The observation group showed a stone-free rate of 97.50%, with 59 cases of middle ureteral stones

removed and 17 cases of upper ureteral stones removed, while the control group showed a stone-free rate of 83.33%, with 49 cases of middle ureteral stones removed and 11 cases of upper ureteral stones removed, so the stone-free rate of the observation group was significantly higher than that of the control group ( $p<0.05$ ). Table 2.

Table 1. General data of the two groups

Item	The observation group (n=80)	The control group (n=72)	t/X <sup>2</sup>	P-value
Sex			0.03	0.860
Male	59 (73.75)	54 (75.00)		
Female	21 (26.25)	18 (25.00)		
Age (Y)	49.97±2.79	50.78±2.55	1.86	0.065
BMI (kg/m <sup>2</sup> )	22.21±3.48	21.86±4.12	0.57	0.571
Stone site			0.31	0.577
Middle ureteral stone	18 (22.50)	19 (26.39)		
Upper ureteral stone	62 (77.50)	53 (73.61)		
Stone size			0.02	0.892
<20mm	14 (17.50)	12 (16.67)		
>20mm	66 (82.50)	60 (83.33)		
Hyperlipidemia			0.17	0.679
Yes	46 (57.50)	39 (54.17)		
No	34 (42.50)	33 (45.83)		
Hypertension			0.02	0.878
Yes	41 (51.25)	36 (58.33)		
No	39 (48.75)	36 (41.67)		
Diabetes mellitus			0.04	0.847
Yes	31 (38.75)	29 (40.28)		
No	49 (62.25)	43 (59.72)		

Table 2. Stone-free rate of the two groups

Item	The observation group (n=80)	The control group (n=72)	X <sup>2</sup>	P-value
Middle ureteral stone	59 (73.75)	49 (68.05)		
Upper ureteral stone	17 (23.75)	11 (15.28)		
Total stone-free rate	76 (97.50)	60 (83.33)	5.48	0.02

### 2.4 The levels of oxidative stress parameters in the observation group were better than those in the control group

The SOD level in the observation group before operation and at 24 h after operation was (213.78±21.23) ng/ml and (232.97±24.59) ng/ml,

respectively; the Cor level in the observation group before operation and at 24 h after operation was (3.40±0.67) nmol/l and (6.26±1.48) nmol/l, respectively, and the MDA level in the group before operation and at 24 h after operation was (82.76±20.34) NU/ml and (69.24±16.64) NU/ml, respectively. In contrast, the SOD level in the control group before operation and at 24 h after operation

was (209.86±24.57) ng/ml and (245.56±24.59) ng/ml, respectively; the Cor level in the control group before operation and at 24 h after operation was (3.23±0.78) nmol/l and (8.36±2.15) nmol/l, respectively, and the MDA level in the control group before operation and at 24 h after operation was (83.43±21.67) NU/ml and (60.45±13.57) NU/ml, respectively. Therefore, before operation, there was no significant difference between the two groups in the levels of oxidative stress parameters, while after operation, the levels of SOD and Cor in the observation group were lower than those in the control group, while the level of MDA was higher than that in the control group (all  $p<0.05$ ). Figure 2.

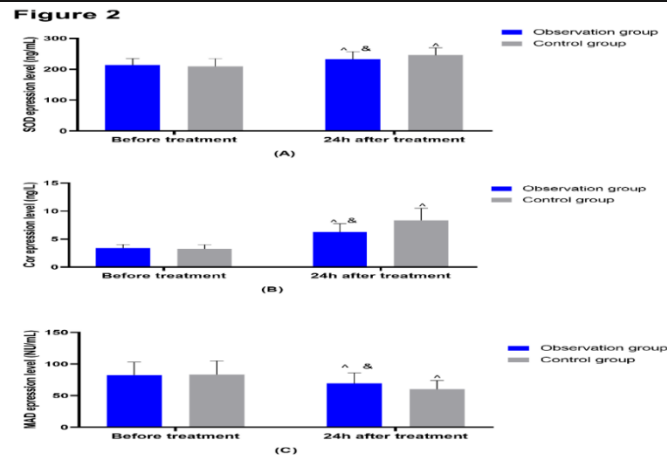


Figure 2. The levels of oxidative stress parameters in the two groups. A, before operation, there was no significant difference between the two groups in the level of SOD, while after operation, the SOD level in the observation group was lower than that in the control group ( $p < 0.05$ ). B, before operation, there was no significant difference between the two groups in the level of Cor, while after operation, the Cor level in the observation group was lower than that in the control group ( $p < 0.05$ ). C, before operation, there was no significant difference between the two groups in the level of MDA, while after operation, the MDA level in the observation group was higher than that in the control group ( $p < 0.05$ ). Note: <sup>^</sup> indicates  $P < 0.05$  vs. the situation before treatment, and <sup>&</sup> indicates  $P < 0.05$  vs. the control group.

## 2.5 The psychological quality of the observation group is better than that of the control group

After 3 months of nursing, the SAS and SDS scores of both groups decreased, and the scores of the

observation group were both significantly lower than those of the control group (both  $p < 0.05$ ). Figure 3.

**Figure 3**

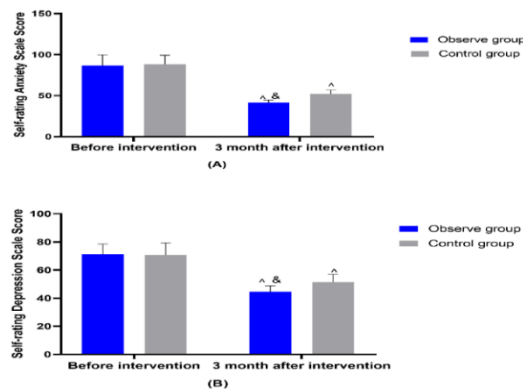


Figure 3. Psychological quality of the two groups. A, after 3 months of nursing, the SAS score of both groups decreased, and the score of the observation group was significantly lower than that of the control group ( $p < 0.05$ ). B, after 3 months of nursing, the SDS score of both patient groups decreased, and the score of the observation group was significantly lower than that of the control group ( $p < 0.05$ ). Note: <sup>^</sup> indicates  $p < 0.05$  vs. the situation before treatment, and <sup>&</sup> indicates  $p < 0.05$  vs. the control group.

## 2.6 The cooperation degree and compliance of the observation group are both better than those of the control group

### (1) Cooperation degree during operation

The observation group showed a total cooperation rate of 97.50%, with 62 cases of complete cooperation, 16 cases of partial cooperation, and 2 non-cooperation cases, while the

control group showed a total cooperation rate of 84.72%, with 48 cases of complete cooperation, 13 cases of partial cooperation, and 11 non-cooperation cases, so the cooperation degree of the observation group was significantly higher than that of the control group ( $p < 0.05$ ). Table 3.

### (2) Nursing compliance after operation

The observation group showed a total compliance rate of 92.50%, with 65 cases of complete compliance, 9 cases of partial compliance, and 6 non-compliance cases, while the control group showed a total compliance rate of 77.78%, with 44 cases of

complete compliance, 12 cases of partial compliance, and 16 non-compliance cases, so the overall compliance rate of the observation group was significantly higher than that of the control group ( $p < 0.05$ ). Table 4.

**Table 3. Cooperation degree of the two groups**

Item	The observation group (n=80)	The control group (n=72)	X <sup>2</sup>	P-value
Complete cooperation	62 (77.50)	48 (66.67)	-	-
Partial cooperation	16 (20.00)	13 (18.05)	-	-
Non-cooperation	2 (2.50)	11 (15.28)	-	-
Cooperation degree (%)	78 (97.50)	61 (84.72)	7.91	0.005

**Table 4. Compliance of the two groups**

Item	The observation group (n=80)	The control group (n=72)	X <sup>2</sup>	P-value
Complete compliance	65 (70.42)	44 (61.11)	-	-
Partial compliance	9 (27.46)	12 (16.67)	-	-
Non-compliance	6 (2.12)	16 (22.22)	-	-
Overall compliance rate (%)	74 (92.50)	56 (77.78)	6.64	0.01

### 2.7 The incidence of complications in the observation group was lower than that in the control group

The observation group showed an incidence of complications of 3.52%, with 3 cases of pressure score, 1 case of retrograde urinary tract infection, 0 cases of ureteral perforation and bladder irritation

sign, while the control group showed an incidence of complications of 16.67%, with 6 cases of pressure score, 4 cases of retrograde urinary tract infection, 1 case of ureteral perforation, and 1 case of bladder irritation sign, so the postoperative complication rate of the observation group was significantly lower than that of the control group ( $p < 0.05$ ). Table 5.

**Table 5. Incidence of complications of the two groups**

Item	The observation group	The control group	X <sup>2</sup>	P-value
Pressure sore (%)	3 (0.70)	6 (8.33)	-	-
Retrograde urinary tract infection (%)	1 (0.70)	4 (5.56)	-	-
Ureteral perforation (%)	0 (0.00)	1 (1.39)	-	-
Bladder irritation sign (%)	0 (0.00)	1 (1.39)	-	-
Incidence of complications (%)	4 (5.00)	12 (16.67)	5.48	0.02

**Table 6. Satisfaction of the two groups**

Item	The observation group (n=80)	The control group (n=72)	X <sup>2</sup>	P-value
Satisfaction	60 (75.00)	42 (58.33)	-	-
Moderate satisfaction	15 (27.46)	17 (23.61)	-	-
Dissatisfaction	5 (6.25)	13 (18.06)	-	-
Overall satisfaction rate (%)	75 (93.75)	59 (81.94)	5.06	0.02

### 2.8 The nursing satisfaction of the observation group is higher than that of the control group

The observation group showed a satisfaction of 92.50%, with 65 cases satisfied with nursing, 15 cases moderately satisfied with nursing, and 5 cases dissatisfied with nursing, while the control group showed a nursing satisfaction of 81.94%, with 42 cases satisfied with nursing, 17 cases moderately satisfied with nursing, and 13 cases dissatisfied with nursing, so the nursing satisfaction of the observation group was significantly higher than that of the control group ( $p < 0.05$ ). Table 6.

### 3 Discussion

Ureteroscopy is the gold standard treatment for urinary calculi, and ureteroscopy combined with holmium laser is more effective (Mullerad et al., 2017). However, the combination use of them will bring about a series of problems such as pain and ureteral perforation after the operation (Zheng et al., 2020). Therefore, it is extremely crucial to nurse the patients before, during, and after the operation. In this study, we compared the operation time and hospitalization time of the two groups, finding that



the observation group nursed under systematic nursing mode experienced shorter operation time. Ureteroscopy combined with holmium laser therapy is a greatly efficient treatment method itself, under which high-power laser activation-based pulse action is applied for 5 to 10 seconds, and pulses are utilized in a rapid and continuous manner to fracture stones (Humphreys et al., 2018; Aldoukhi et al., 2017). Moreover, ureteroscope can contribute to a better visibility, increase stone-free rate, reduce the risks of infection and hemorrhage, lower pelvic flushing pressure, and further shorten the total operation time (Breda et al., 2016; Zilberman et al., 2019). Therefore, combination of the two can shorten the hospitalization time and operation time for patients. In addition, the difference of the two groups in hospitalization time and operation time can be analyzed based on the cooperation degree and nursing compliance of the two groups during operation. The cooperation degree during operation and nursing compliance of the observation group were both higher than those of the control group. Moreover, it can be seen that for patients in the observation group, during the operation, the nursing staff had a relatively high degree of control over each step of the patients' operation process, and the staff had patiently given each patient an explanation of the operation steps before the operation, which helped the patient eliminate all doubts about the operation. Therefore, during the operation, the patients would cooperate more with the operation measures of the medical staff, which could explain why the operation time and hospitalization time of the observation group were shorter. Moreover, although the occurrence probability of various complications will be reduced, if the operation procedures are improper during operation, some complications will still occur after the operation, such as mild mucosal injury, calculus migration, slight hematuria, ureteral perforation, ureteral rupture, serious septicemia, and even death (Dogan et al., 2011; Topaktas et al., 2019). In this study, the observation group had fewer complications. From the perspective of the nursing compliance and the cooperation degree of the observation group during operation, the doubts of patients in the observation were dispelled before the operation and they cooperated well during the operation, so there were not many complications. We also compared the levels of oxidative stress parameters and the stone-free rate of the two groups, and found that the levels of oxidative stress parameters in the observation group were better than those in the control group, and the stone-free rate of the observation group was higher than that of the control group. The changes of Cor, MDA and SOD

and the level of blood pressure index can partly reflect the stress level of human body. Surgery and trauma can cause the release of these factors, which in turn can result in endothelial dysfunction and hemorheological changes. If the changes are large, it means that the stress response is strong (Liu and Zhang, 2009; TKuang et al., 2012). One study has verified that ureteroscopic laser lithotripsy gives rise to less stress reaction and side effects, which is beneficial to postoperative recovery (Chen et al., 2012). According to our study, under the effective nursing and the better cooperation degree of patients during operation, the stress response of patients nursed under systematic nursing mode was weaker. From the previous content, it can be acquired that this lithotripsy technology was efficient and rapid, and the stone-free rate of patients in the observation group under systematic nursing was significantly higher, so patients in the observation group were more satisfied with nursing. However, due to some restrictions, we have not determined the molecules behind the control of the corresponding oxidative stress parameters, such as miRNA, and we have also not further studied the molecular mechanism of calculus, which is indeed a deficiency of this study. In future experiments, the specific molecular mechanism of calculus and molecules including miRNA that affect oxidation indicators under systematic nursing will be studied, so as to better improve the clinical effects of the nursing method.

To sum up, systematic nursing can effectively improve the stress response and psychological state of patients with ureteral calculi undergoing holmium laser lithotripsy with flexible ureteroscope under general anesthesia and reduce the incidence of postoperative complications in them, which contributes to a higher nursing satisfaction and is worthy of clinical promotion.

## References

- [1] Aldoukhi AH, Hall TL, Ghani KR, Maxwell AD, MacConaghy B and Roberts WW (2018). Caliceal Fluid Temperature During High-Power Holmium Laser Lithotripsy in an In Vivo Porcine Model. *J Endourol*; 32: 724-729. <https://doi.org/10.1089/end.2018.0395>
- [2] Assimos D, Krambeck A, Miller NL, Monga M, Murad MH, Nelson CP, Pace KT, Pais VM, Jr., Pearle MS, Preminger GM, Razvi H, Shah O and Matlaga BR (2016). Surgical Management of Stones: American Urological Association/Endourological Society Guideline, PART II. *J Urol*; 196: 1161-1169. <https://doi.org/10.1016/j.juro.2016.05.09>

- 0  
Anan G, Yoneyama T, Noro D, Tobisawa Y, Hatakeyama S, Sutoh Yoneyama M, Yamamoto H, Imai A, Iwamura H, Kohada Y, Mikami J, Ito J, Kaiho Y, Yoneyama T, Hashimoto Y, Sato M and Ohyama C(2019).The Impact of Glycosylation of Osteopontin on Urinary Stone Formation. *Int J Mol Sci*; 21:https://doi.org/10.3390/ijms21010093
- [3] Aldoukhi AH, Ghani KR, Hall TL and Roberts WW (2017). Thermal Response to High-Power Holmium Laser Lithotripsy. *J Endourol* ; 31: 1308-1312.https://doi.org/10.1089/end.2017.0679.
- [4] Breda A, Territo A and Lopez-Martinez JM (2016). Benefits and risks of ureteral access sheaths for retrograde renal access. *Curr Opin Urol* ; 26: 70–75.doi: 10.1097/MOU.0000000000000233.
- [5] Binbay M, Tepeler A, Singh A, Akman T, Tekinaslan E, Sarilar O, Baykal M and Muslumanoglu AY(2011). Evaluation of pneumatic versus holmium:YAG laser lithotripsy for impacted ureteral stones. *Int Urol Nephrol* ; 43: 989-995.https://doi.org/10.1007/s11255-011-9951-8
- [6] Chen GD, Dong J, Ding J and Li GB(2012). Influence of ureter mirror holmium laser lithotripsy on blood rheology and oxidative stress in patients with upper ureteral calculi. *Journal of Hainan Medical University*; 22.11: 55-58.
- [7] Campschroer T, Zhu X, Vernooij RW and Lock MT(2018). Alpha-blockers as medical expulsive therapy for ureteral stones. *Cochrane Database Syst Rev* ; 4: CD008509.https://doi.org/10.1002/14651858.CD008509.pub3
- [8] Chung K, Jeon MJ, Park J, Lee S, Kim CO and Park JY(2018). Development and evaluation of a mobile-optimized daily self-rating depression screening app: A preliminary study. *PLoS One* ; 13: e0199118.https://doi.org/10.1371/journal.pone.0199118.
- [9] Curhan GC ( 2007). Epidemiology of stone disease. *Urol Clin North Am*; 34: 287-293.https://doi.org/10.1016/j.ucl.2007.04.003
- [10] Dogan HS, Onal B, Satar N, Aygun C, Piskin M, Tanriverdi O, Gurocak S, Gunay LM, Burgu B, Ozden E, Nazli O, Erdem E, Yucel S, Kefi A, Demirci D, Uluocak N, Aridogan IA, Turunc T, Yalcin V, Kilinc M, Horasanli K, Tan MO, Soygur T, Sarikaya S, Kilicarslan H, Turna B, Doruk HE and Tekgul S(2011). Factors affecting complication rates of ureteroscopic lithotripsy in children: results of multi-institutional retrospective analysis by Pediatric Stone Disease Study Group of Turkish Pediatric Urology Society. *J Urol* ; 186: 1035-1040.https://doi.org/10.1016/j.juro.2011.04.09
7.  
[11] Dunstan DA and Scott N (2020). Norms for Zung's Self-rating Anxiety Scale. *BMC Psychiatry*; 20: 90.https://doi.org/10.1186/s12888-019-2427-6
- [12] Foreman D, Plagakis S and Fuller AT(2014). Should we routinely stent after ureteropyeloscopy? *BJU Int* ; 114 Suppl 1: 6-8. https://doi.org/10.1111/bju.12708.
- [13] Humphreys MR, Shah OD, Monga M, Chang YH, Krambeck AE, Sur RL, Miller NL, Knudsen BE, Eisner BH, Matlaga BR and Chew BH(2018). Dusting versus Basketing during Ureteroscopy-Which Technique is More Efficacious? A Prospective Multicenter Trial from the EDGE Research Consortium. *J Urol* ; 199: 1272-1276.https://doi.org/10.1016/j.juro.2017.11.126.
- [14] Hussain M, Acher P, Penev B and Cynk M( 2011). Redefining the limits of flexible ureterorenoscopy. *J Endourol*; 25: 45-49.https://doi.org/10.1089/end.2010.0236
- [15] Kuang GZ, Liang SL, Xu JW(2012). Dynamic changes of hemorheology before and after operation for hip fracture. *Chin J Joint Surg* ; 06(4): 537-540.
- [16] Li F(2018). The application effect of systematic nursing intervention in schizophrenics during convalescence. *Nursing Practice and Research* ; 14: 70.
- [17] Lei WY, Chang CY, Wu JH, Lin FH, Hsu Chen C, Chang CF, Lin YR and Wu HP (2016). An Initial Attack of Urinary Stone Disease Is Associated with an Increased Risk of Developing New-Onset Irritable Bowel Syndrome: Nationwide Population-Based Study. *PLoS One* ; 11: e0157701.https://doi.org/10.1371/journal.pone.0157701
- [18] Liu Y and Zhang SF(2009). Influence of operative stress on serum levels of adrenocorticotrophic hormone, cortisol, atrial natriuretic peptide, and interleukin-6 in children with abdominal neoplasms after operation. *Appl Clin Pediatr* ; 24: 1811-1812,1825.
- [19] Mullerad M, Aguinaga JRA, Aro T, Kastin A, Goldin O, Kravtsov A, Assadi A, Badaan S and Amiel GE(2017). Initial Clinical Experience with a Modulated Holmium Laser Pulse-Moses Technology: Does It Enhance Laser Lithotripsy Efficacy? *Rambam Maimonides Med J* ; 8: e0038. doi: 10.5041/RMMJ.10315.
- [20] Meltzer AC, Burrows PK, Wolfson AB, Hollander JE, Kurz M, Kirkali Z, Kusek JW, Mufarrij P, Jackman SV and Brown J(2018). Effect of Tamsulosin on Passage of Symptomatic Ureteral Stones: A Randomized Clinical Trial. *JAMA Intern*



- Med* ;178: 1051-1057.doi:10.1001/jamainternmed.2018.2259
- [21] Papagiannopoulos D, Whelan P, Ahmad W, Rybak J, Hota B, Deane L and Nehra A(2016). Procalcitonin is a strong predictor of urine culture results in patients with obstructing ureteral stones: A prospective, pilot study. *Urol Ann* ; 8: 277-280.doi: 10.4103/0974-7796.184877
- [22] Topaktas R, Aydin C, Altin S, Akkoc A, Aydin ZB and Urkmez A(2019). The Efficacy of Ultra-thin Semi-rigid Ureteroscopy with Holmium Laser Lithotripsy in Pediatric Ureteral Stones: A Single-center Experience. *Cureus* ; 11: e5496.doi: 10.7759/cureus.5496.
- [23] Tasian GE, Kabarriti AE, Kalmus A and Furth SL(2017). Kidney Stone Recurrence among Children and Adolescents. *J Urol* ; 197: 246-252.https://doi.org/10.1016/j.juro.2016.07.090
- Tambo M, Okegawa T, Shishido T, Higashihara E and Nutahara K(2014). Predictors of septic shock in obstructive acute pyelonephritis. *World J Urol* ; 32: 803-811.https://doi.org/10.1007/s00345-013-1166-4.
- [24] Xu K, Ding J, Shi B, Wu Y and Huang Y( 2011). Flexible ureteroscopic holmium laser lithotripsy with PolyScope for senile patients with renal calculi. *Exp Ther Medx*; 16: 1723-1728.https://doi.org/10.3892/etm.2018.6369
- [25] Zhang, W, Wu H, Fu X, Liu L( 2017). Clinical research of early systematic nursing intervention for ICU patients with pulmonary infection. *Biomedical Research*; 28: 16.
- [26] Zheng J, Wang Y, Chen B, Wang H, Liu R, Duan B and Xing J(2020). Risk factors for ureteroscopic lithotripsy: a case-control study and analysis of 385 cases of holmium laser ureterolithotripsy. *Wideochir Inne Tech Maloinwazyjne* ; 15: 185-191.doi: 10.5114/wiitm.2019.85360.
- [27] Zilberman DE, Lazarovich A, Winkler H and Kleinmann N(2019). Practice patterns of ureteral access sheath during ureteroscopy for nephrolithiasis: a survey among endourologists worldwide. *BMC Urol* ; 19: 58.https://doi.org/10.1186/s12894-019-0489-x