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Research Article

Do Patients with Positive Urine Culture Need to Reexamine Urine Culture before Endoscopic Surgery?

Shangwen Dou; Bangfeng Liu; Gaoyuanzhi Yue; Huacai Zhu; Yeci Lei; Kaiming Li; Yongda Liu*

Department of Urology, The First Affiliated Hospital of Guangzhou Medical University, Guangzhou, 510120, China.

***Corresponding Author: Yongda Liu**

Department of Urology, The First Affiliated Hospital of Guangzhou Medical University, 151 West Yanjiang Road, Guangzhou, 510120, China.

Tel: +86-20-34287636; Email: liuydur@gzhmu.edu.cn

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Abstract

Background: UTIs emerges as a risk factor for infectious complications after endoscopic surgery. Anti-infective therapy is required for patients exhibiting positive UC. However, whether it is necessary to reexamine UC after anti-infection is still controversial. This article aims to explore whether it is necessary to reexamined UC in patients with positive UC after intravenous antibiotics.

Methods: From March 2020 to November 2022, we collected 110 patients with positive UC. According to the drug sensitivity results of UC, endoscopic surgery was performed after 7 days of anti-infection, and UC was reexamined on the 3rd and 7th days. The correlation between UC and postoperative infectious complications was analyzed.

Results: A total of 110 patients with positive preoperative UC were included in this study and given sensitive antibiotics intravenously for 7 days before endoscopic surgery. And the UC was re-tested on 3rd day and 7th day. The results of 3rd UC showed that 99 cases (90%) were negative, and 11 cases (10%) were positive. The UC was repeated on the 7th day and was negative in 105 cases (95.5%) and positive in 5 cases (0.5%). The patients had a total of 14 cases (12.7%) of postoperative SIRS and 4 cases (3.6%) of postoperative sepsis. After 7 days of anti-infection, among the 14 patients with SIRS, 2 patients (14.3%) had positive UC, and 12 patients (85.7%) had negative UC. After 7 days of anti-infection, the UC was retested, and the negative or positive UC results were not statistically significant for the occurrence of postoperative infectious complications (P =0.121)

Conclusions: This study confirmed the feasibility of surgical treatment for patients with positive UC without re-examination of UC after 7 days of anti-infection treatment with sensitive antibiotics.

Keywords: Urinary tract infection; Urine culture; Anti-infection; SIRS.

Abbreviations: UTIs: Urinary Tract Infections; UC: Urine Culture; SIRS: Systemic Inflammatory Response Syndrome; qSOFA: quick Sepsis-related Organ Failure Assessment; PCNL: Percutaneous Nephrolithotomy; RIRS: Retrograde Intrarenal Surgery; URL: Ureteroscopic Lithotripsy; HoLEP: Holmium Laser Enucleation of the Prostate.

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Introduction

As we all know, UTIs are risk factors for infectious complications after endoscopic surgery [1]. Preoperative therapeutic antibiotics are supposed to be employed to control UTIs in patients showing positive UC, but lack a clear-cut duration. An intravenous administration of sensitive antibiotics over 7 days is recommended for those with positive UC [2]. The antibiotic prophylaxis was chosen mainly decided by preoperative UC [3,4]. However, it is still controversial whether UC should be reexamined after anti-infection. The positive rate of UC will be affected during the use of antibiotics. Antibiotics should be stopped when UC is reexamined, but the results of UC need to wait for several days. In urology, most urinary tract infection sources from the urinary tract obstruction, stones or other factors. The urinary tract infection will be difficult to be cured if the obstruction is not removed punctually or the stones are not removed. In addition, considering the hospitalization days, cost, patient satisfaction and other factors, patients with positive UC in surgery often choose to receive direct surgical treatment after anti-infection in 1 week, which makes it difficult to re-examine UC after the withdrawal of antibiotics, and it needs several days to obtain the UC result [5]. Therefore, we aim to verify whether UC should be re-examined after anti-infection ≥7 days for patients with positive UC, and whether direct surgical treatment is feasible, by taking some experiments.

Methods

This real-world study was approved by the ethic board of the First Affiliated Hospital of Guangzhou Medical University. Data covering 110 patients who underwent endoscopic surgery in our hospital from March 2021 to November 2023 were collected, which have been prospectively registered. Patients with intracorporeal stents or with indwelling nephrostomy were excluded from the group. All procedures were completed by a senior urologist specializing in minimally invasive urological surgery. Urine dipstick routine analysis and UC have been conducted on all patients after admission. Sensitive antibiotics were administrated for 7 days based on the results of UC, with the dosage following the routine recommended dose of each antibiotic. The UC was re-examined on the 3rd and 7th day of antibiotic use. Endoscopic surgery was performed after 7 days of antibiotic treatment, the occurrence of postoperative infectious complications was observed. In clinical practice, SIRS serves as an urgent time window for immediate intensive measurements, which is more sensitive to mortality than uremia as a head to liver systematic review covering over 50,000 participants stated [6].As a result, SIRS was taken as the primary outcome in assessing postoperative infections. The SIRS was diagnosed by the coexistence of at least two of the following items during the whole hospitalization: body temperature >38℃ or <36℃, heart rate >90/min, respiration >20/min or $PaCO_2$< 32 mmHg, and blood leukocyte >12 × 10^9 or <4 × 10^9 /L [7]. Sepsis should be defined by life-threatening organ dysfunction elicited by a dysregulated host response to infection. Typical sepsis was defined if presenting at least two of the new bedside clinical score called the rapid sofa (qSOFA): respiratory rate ≥22 breathe/min, Altered mental status, or systolic blood pressure ≤100 mmHg [8]. SPSS 20.0 (IBM, USA) software was employed for data analysis. Continuous variables were expressed as mean (standard deviation), t-test or univariate logistic regression were performed.

Record categorical variables

Chi-square test or Fisher exact probability method were employed on the data expressed as frequency (rate/ratio). Variables with $P < 0.1$ were taken into multivariable analysis by multivariable logistic regression. $P \leq 0.05$ was defined as statistical significance.

Result

Endoscopic surgery included PCNL in 81 cases (73.6%), RIRS in 14 cases (12.7%), URL in 7 cases (6.4%), and HoLEP in 8 cases (7.3%)

The basic demographic data of patients with positive UC showed that female patients (64 cases, 58.2%) were higher than male patients (46 cases, 41.8%).

The results of UC showed that E. coli were available in 48 cases (43.6%), Proteus mirabilis (13 cases, 11.8%), Klebsiella pneumoniae (12 cases, 10.9%), Enterococcus faecalis (8 cases, 7.3%), Pseudomonas aeruginosa (6 cases,5.5%) and the other 14 bacterial flora accounted for 20.9%.

Age, gender, BMI, preoperative creatinine, preoperative hemoglobin, preoperative leukocyte, preoperative albumin and operation time were revealed without effects on the occurrence of SIRS (Table 1).

Sensitive antibiotics were administrated on all 110 patients for 7 days, and UC was rechecked on the 3rd and 7th day. On the third day the results showed that 99 cases (90%) were negative, and 11 cases (10%) were positive. A total of 14 patients developed SIRS after surgery, and the results of UC on 3rd day did not predict the occurrence of infectious complications (P>0.05) (Table 2). However, after 3 days of anti-infection, the results of UC have a warning effect on the occurrence of postoperative sepsis(P<0.05) (Table 3). The UC was repeated on the 7th day and was negative in 105 cases (95.5%) and positive in 5 cases (0.5%). After 7 days of anti-infection, regardless of whether the UC was negative or positive, the patients had a total of 14 cases (12.7%) of postoperative SIRS (P>0.05) (Table 2) and 4 cases (3.6%) of postoperative sepsis (P>0.05) (Table 3).

Discussion

Postoperative fever, SIRS and sepsis usually emerge as the common complications of endoscopic surgery. Preoperative urinary tract infection has been confirmed as a risk factor for infectious complications after endoscopic surgery, which results in the prolonged hospital stay and high medical costs [9]. However, despite the negative UC before surgery or prophylactic antibiotics, various infectious complications may still occur after the operation [10]. Currently, midstream UC is still employed as the gold standard for UTIs, which is easy to obtain and can guide urologists in advance about the occurrence of infectious complications after minimally invasive urological surgery. Preoperative UC is not sufficient to determine the infection after minimally invasive urological surgery, as the incidence of SIRS after minimally invasive surgery in the preoperative UC positive group is still found higher compared to the preoperative UC negative group even with intensive prophylactic antibiotic treatment [11]. The incidence of sepsis after endoscopic surgery is 0.3-7.6% [12-15], and the SIRS for 38.2% [2]. In the pres-

Table 1

	SIRS (n=14)	Non-SIRS (n=96)	P
Age (y)	55 ± 14.75	49.64 ± 14.72	0.059
Gender			0.098
male	3	43	
female	11	53	
BMI (kg/m^2)	23.25 ± 3.62	23.60 ± 4.58	0.716
HT	6	33	0.103
DM	2	82	0.957
Preoperative serum creatinine (μmol/L)	114.97 ± 54.53	116.67 ± 74.33	0.865
Preoperative hemoglobin (g/L)	122.71 ± 11.10	130.14 ± 18.80	0.537
Duration of operation (min)	88 ± 35.05	89.90 ± 40.80	0.879
Preoperative leukocyte (10^9/L)	7.14 ± 1.19	7.56 ± 2.29	0.515
Preoperative albumin (g)	39.38 ± 2.21	40.31 ± 4.61	0.403
Nitrite test (+)	11	56	0.240
Functional solitary kidney	38	39	

BMI: Body Mass Index; HT: Hypertension; DM: Diabetes Mellitus.
aValues are presented as mean ± SD.

Table 2

	SIRS n=14		Non-SIRS n=96		P
	UC (+)	UC (-)	UC (+)	UC (-)	
After 3 days of anti-infection	2	12	9	87	0.63
After 7 days of anti-infection	2	12	3	93	0.121

Table 3

	Sepsis (+) n=4		Sepsis (-) n=106		P
	UC (+)	UC (-)	UC (+)	UC (-)	
After 3 days of anti-infection	2	2	9	97	0.049
After 7 days of anti-infection	0	4	5	101	1

ent study, the incidence of SIRS and sepsis was revealed as 12.7% and 3.6%, respectively, which were similar to the literature. Two patients were turned to intensive care. IAU guideline suggested the administration of antibiotics before surgery on all patients with positive UC [16]. The determination of antibiotics is mainly based on UC results [17]. At present, there has no explicit evidence on the duration of preoperative antibiotics in patients with positive UC [11], but an administration of antibiotics for ≥7 days are still recommended on patients with preoperative UC [2]. However, whether to reexamine UC is still controversial [11,16] and the results of UC take several days [5], which undoubtedly increases the hospitalization costs of patients in line with the length of hospital stay. In order to elevate the patient satisfaction and alleviate the medical costs, patients should be discharged as early as possible while ensuring patient safety [18]. The notable point in this paper is that the direct surgical treatment is also feasible on patients with positive preoperative UC only need to undergo 7 days of sensitive antibiotic anti-infection treatment without re-examination of UC, which alleviate the issues above.

Our finding pointed that females are prone to positive UC, which is also consistent with the higher susceptibility of women to urinary tract infections. In our study showed that no matter the negative or positive results of UC, no statistical significance was found for postoperative SIRS and sepsis. In our study, after 3 days use of sensitive antibiotics, negative UC were performed in 99 of 110 patients, which may be related to the effective control of infection in most patients, the significantly reduced number of bacteria in the urine or the complete killed pathogens by antibiotics, or to the possible false UC negatives during the administration of antibiotics. Moreover, the increased risk of antibiosis-related side effects has been reported to be associated with preoperative antibiotics for more than 8 days [19], which induced the elevated drug resistance of patients and even a promoted postoperative complications. Therefore, we decided to perform surgical treatment in 7 days after anti-infection. According to previous reports, Escherichia coli was the most common organism isolated from cultures, which was consistent with the present study [20]. Interestingly, Pseudomonas aeruginosa has been reported the main organism to develop SIRS [13]. It is worth noting that UC was positive in 11 patients in 3 days after anti-infection treatment and negative in 99 patients in the present study. Of the 99 patients with negative UC, UC was revealed positive in 4 patients after 7 days use of anti-infection treatment. We noticed this strange phenomenon. We speculated the causes of negative UC after 3 days of anti-infection: ①false negative due to inhibition of urine bacteria by antibiotics; ②obstruction caused by stones that affected the mid-stream UC; ③false negative due to the retention of mid-stream UC standards for vulva disinfection. In the current report, the results of a UC from one patient on 7th day were inconsistent with those of the first culture, which we speculated sourcing from the contamination during the collection of mid-stream urine.

The limitation of this study is the relatively limited sample size due to its monocentric nature. In addition, the chain of evidence would be more complete if UC were reexamined on 5th of anti-infection.

Conclusion

Positive UC is a risk factor for infectious complications after endoscopic surgery, but after 7 days of anti-infection with sensitive antibiotics, endoscopic surgery can be performed directly without re-examination of urine culture

Declarations

Conflicts of interest: The authors declare that they have no competing interests.

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