A Predicting Model Based on Risk Factors for Urosepsis after One-phase Percutaneous Nephrolithotomy

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BACKGROUND

Up to one-third of Percutaneous nephrolithotomy (PCNL) patients experience some peri-operative complications, the most common being fever secondary to a urinary tract infection(21–39.8%), and between 0.3 and 9.3% of patients can develop potentially life-threatening sepsis.

To analyze the potential perioperative risk factors that affect the development of urosepsis following PCNL for upper urinary tract calculi with a regression model, and according to the identified independent risk factors, to develop a nomogram for predicting the probability of postoperative urosepsis after PCNL.

METHOD

We retrospectively analyzed the clinical data from consecutive 405 cases of upper urinary tract calculi treated by one-phase PCNL. By a logistic regression model, univariate and multivariate statistical analyses were carried out for the occurrence of postoperative urosepsis, to identify the independent risk factors affecting the development of postoperative urosepsis. From this model, a nomogram was built based on regression coefficients.

RESULTS

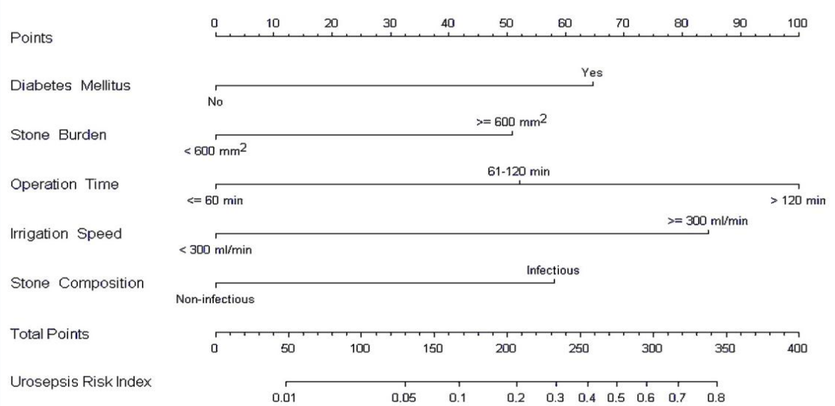
The PCNL procedures of 405 cases were performed successfully, and there were 32 cases that developed urosepsis after the PCNL, and the incidence of urosepsis was 7.9% (32/405).

The nomogram based on independent risk factors for urosepsis identified by multivariable logistic regression analysis was well fitted to predict a probability, and the concordance index (C-index) was 0.834 in the nomogram model sample and 0.802 in the internal validation sample.

RESULTS

Univariate and multivariate logistic regression analysis of clinical data and urosepsis

Variables	Univariate analysis			Multivariate analysis		
	OR	*95% CI*	*P*	*OR*	*95% CI*	*P*
Gender	1.894	0.902 - 3.977	0.092			
Age	1.021	0.991 - 1.053	0.169			
Diabetes mellitus	3.544	1.638 - 7.667	0.001	4.511	1.812 - 11.228	0.001
Renal insufficiency	1.771	0.690 - 4.547	0.235			
Hydronephrosis	1.374	0.657 - 2.873	0.399			
Stone burden	3.079	1.459 - 6.496	0.003	2.588	1.032 - 6.495	0.043
Staghorn stone	2.428	1.151 - 5.124	0.020	0.880	0.326 - 2.370	0.800
Urine culture	1.837	0.834 - 4.045	0.131			
Pyonephrosis	3.878	1.329 - 11.319	0.013	2.308	0.699 - 7.621	0.170
Access track	1.969	0.841 - 4.610	0.118			
Operation time	2.309	1.207 - 4.415	0.011	2.353	1.057 - 5.241	0.036
Irrigation rate	2.641	1.274 - 5.474	0.009	5.862	2.337 - 14.706	0.000
Blood transfusion	3.356	1.260 - 8.935	0.015	2.873	0.883 - 9.349	0.080
Residual stone	1.887	0.807 - 4.411	0.143			
Infectious stone	3.633	1.647 - 8.013	0.001	2.677	1.067 - 6.715	0.036



DISCUSSION

Despite the fact that patients with increased urine WBCs in this study received antibiotic prophylaxis, there was the incidence of urosepsis occurred. Preoperative glycemic control fails to completely eliminate the risk of urosepsis associated with the PCNL in patients with diabetes mellitus. High stone burden means not only making the operation more complex, but also potential higher risk of carrying infectious agents. Long operative times are associated with higher postoperative urosepsis rates because of a longer duration of high intra pelvic pressures and associated higher chance of pyelovenous backflow and irrigant absorption. Our nomogram provides a prediction tool for individualized risk of urosepsis after PCNL, would be beneficial for facilitating surgeons to make a safe operation plan.

CONCLUSIONS

Diabetes mellitus history, higher stone burden, longer operation time, increased intraoperative irrigation rate, and infectious stone composition are identified as independent risk factors to affect the development of urosepsis after one-phase percutaneous nephrolithotomy for upper urinary tract calculi.

A nomogram based on these perioperative clinical independent risk factors for urosepsis could be used to predict the risk of urosepsis following PCNL.

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