ORIGINAL ARTICLE

A Model Based on Automated Urinalysis Parameters for Urothelial Carcinoma Risk Stratification in Suspected Patients

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SUMMARY

Background: The aim of this study was to develop and validate a risk stratification model for the screening of patients with suspected urothelial carcinoma (UC).
Methods: We enrolled 671 consecutive patients with suspected UC and generated a risk stratification model based on urinary parameters by using an automated urinalysis analyzer (Sysmex UN-9000). All patients received urine cytology examination from January 1, 2019, to October 31, 2022.
Results: Out of the 671 patients, 191 (28.5%) were ultimately diagnosed with UC. The four features associated with the presence of malignancy on multivariable analysis can be summarized by using the mnemonic UC-PAAS: UC, protein vs. creatinine ratio (P/C), age, atypical cells (Atyp.C), and small round epithelial cell (SRC). Major criteria include Atyp.C ≥ 0.1/µL (2 points) and age ≥ 65 years (2 points); minor criteria include SRC ≥ 2.7/µL (1 point) and abnormal P/C results (1 point). The model evidenced good discrimination (area under the curve = 0.802, 95% confidence interval [0.756, 0.848]) in the training group. A UC-PAAS cutoff of more than 4 points identified a high-risk population, of whom 37 of 59 (62.7%) had UC; the negative predictive value was 0.867. The validation group yielded similar findings.
Conclusions: We present a urinalysis-based screening model, the UC-PAAS, that may serve as an accessory clinical tool for the evaluation of patients with suspected UC, because the model identifies patients at higher risk who require closer follow-up than others or additional examinations.
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Supplementary Data

Table S1. Univariate analyses of parameters predictive of UC in the validation group.

Parameter	Non-UC	UC	OR (95% CI)	p-value
	n = 195	n = 73		
Age (years)	61 (53 - 70)	66 (59 - 71)	1.03 (1.01 - 1.05)	0.007
Atyp.C	0.0 (0.0 - 0.0)	0.1 (0.0 - 0.4)	2.38 (1.20 - 4.72)	0.013
SRC	1.4 (0.6 - 3.2)	3.6 (1.4 - 11.7)	1.06 (1.03 - 1.10)	< 0.001
A/C (abnormal)	87 (44.6%)	46 (63.0%)	2.11 (1.22, 3.68)	0.008
PRO (abnormal)	90 (46.2%)	45 (61.6%)	1.87 (1.08, 3.25)	0.025
P/C (abnormal)	82 (42.1%)	42 (57.5%)	1.87 (1.08, 3.22)	0.025

Atyp.C - atypical cell, SRC - small round epithelial cell, A/C - albumin vs. creatinine ratio, PRO – protein, P/C - protein vs. creatinine ratio.
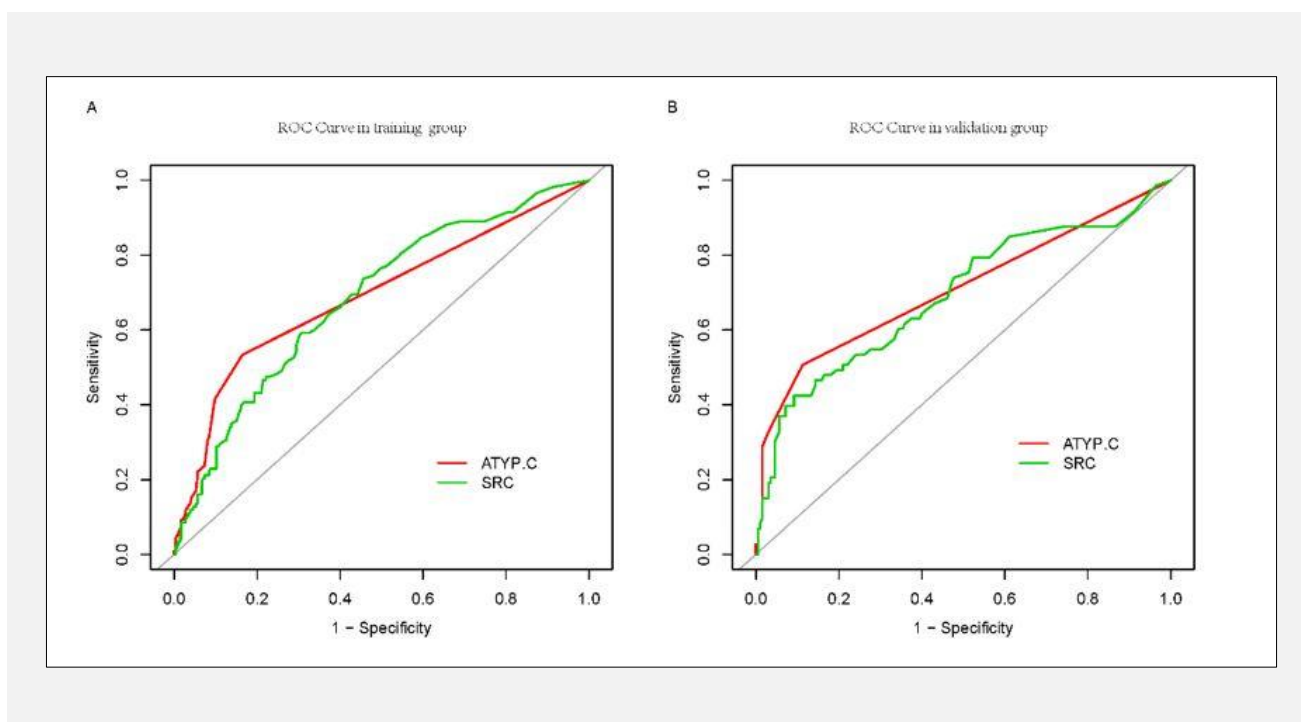

Figure S1. The AUCs of the Atyp.C and SRC parameters used for UC diagnosis.

A - Training group. B - Validation group.
Atyp.C - atypical cell, SRC - small round epithelium cell.