

S2 Table. Multivariate Cox regression analyses of risk factors for bladder recurrence in patients with T3-4 stage and in patients with lymph node positive

Variable	Severe stage (T3, T4) data set				Lymph node positive (pN1) data set			
	Univariate		Multiple ^{a)}		Univariate		Multiple	
	HR (95% CI)	p-value	HR (95% CI)	p-value	HR (95% CI)	p-value	HR (95% CI)	p-value
Bladder recurrence								
Operation								
ONU	1 (Ref)		1 (Ref)		1 (Ref)		1 (Ref)	
LNU	0.776 (0.592-1.015)	0.064	0.793 (0.602-1.045)	0.100	1.481 (0.683-3.211)	0.320	1.483 (0.683-3.219)	0.319
Age (yr)	1.014 (1.001-1.027)	0.041			1.003 (0.961-1.048)	0.877	-	-
Sex								
Male	1 (Ref)		1 (Ref)		1 (Ref)		-	-
Female	0.689 (0.504-0.943)	0.020	1.012 (0.999-1.026)	0.075	0.482 (0.183-1.271)	0.140	-	-
BMI (kg/m ²)	0.976 (0.936-1.017)	0.239	-	-	0.992 (0.866-1.135)	0.903	-	-
ASA score								
1	1 (Ref)		-	-	1 (Ref)		-	-
2	1.158 (0.849-1.580)	0.355	-	-	1.422 (0.538-3.758)	0.478	-	-
3	1.495 (0.842-2.652)	0.170	-	-	1.204 (0.140-10.366)	0.866	-	-
Unknown	0.624 (0.195-1.998)	0.427	-	-	1.759 (0.204-15.186)	0.607	-	-
Previous bladder cancer								
No	1 (Ref)		1 (Ref)		1 (Ref)		1 (Ref)	
Previous bladder tumor Hx.	1.555 (1.030-2.348)	0.036	0.725 (0.528-0.996)	0.047	2.606 (1.022-6.644)	0.045	2.580 (1.013-6.568)	0.047
Concomitant bladder tumor Hx.	1.778 (1.142-2.770)	0.011	1.478 (0.972-2.247)	0.068	3.976 (1.343-11.768)	0.013	4.010 (1.355-11.867)	0.012

pNx	1 (Ref)		-	-	-	-	-	-
pN0	1.143 (0.869-1.504)	0.339	-	-	-	-	-	-
pN1	0.804 (0.520-1.243)	0.326	-	-	-	-	-	-
Concomitant LVI								
No	1 (Ref)		-	-	1 (Ref)		-	-
Yes	0.869 (0.662-1.140)	0.310	-	-	1.162 (0.539-2.504)	0.702	-	-
Concomitant CIS								
No	1 (Ref)		-	-	1 (Ref)		-	-
Yes	1.015 (0.698-1.474)	0.940	-	-	0.938 (0.382-2.306)	0.889	-	-
LN dissection								
Not performed	1 (Ref)		-	-	-	-	-	-
Performed	1.052 (0.812-1.364)	0.699	-	-	-	-	-	-
Adjuvant chemotherapy								
No	1 (Ref)		1 (Ref)		1 (Ref)		-	-
Yes	0.741 (0.571-0.961)	0.024	0.750 (0.572-0.983)	0.037	1.301 (0.591-2.863)	0.514	-	-
Progression-free survival								
Operation								
ONU	1 (Ref)		1 (Ref)		1 (Ref)		-	-
LNU	0.825 (0.656-1.038)	0.101	1.003 (0.791-1.272)	0.979	1.023 (0.630-1.662)	0.927	-	-
Age (yr)	1.014 (1.003-1.025)	0.015	1.010 (0.999-1.022)	0.073	0.986 (0.962-1.011)	0.266	-	-
Sex								
Male	1 (Ref)		-	-	1 (Ref)		-	-
Female	1.004 (0.786-1.283)	0.972	-	-	0.988 (0.620-1.576)	0.960	-	-
BMI (kg/m ²)	0.981 (0.947-1.016)	0.290	-	-	0.961 (0.887-1.041)	0.328	-	-
ASA score								
1	1 (Ref)		-	-	1 (Ref)		-	-
2	0.983 (0.763-1.268)	0.897	-	-	0.809 (0.495-1.322)	0.398	-	-
3	0.744 (0.414-1.335)	0.321	-	-	0.234 (0.031-1.741)	0.156	-	-
Unknown	1.527 (0.792-2.945)	0.206	-	-	1.585 (0.543-4.628)	0.399	-	-
Previous bladder								

cancer								
No	1 (Ref)		1 (Ref)		1 (Ref)		-	-
Previous bladder tumor Hx.	1.560 (1.112-2.188)	0.010	1.278 (0.903-1.810)	0.166	1.535 (0.895-2.632)	0.119	-	-
Concomitant bladder tumor Hx.	1.660 (1.148-2.401)	0.007	1.703 (1.173-2.472)	0.005	0.824 (0.332-2.048)	0.677	-	-
Concomitant bladder cancer								
No	1 (Ref)		-	-	1 (Ref)		-	-
Yes	1.576 (1.093-2.273)	0.015	-	-	0.764 (0.310-1.886)	0.560	-	-
Tumor location								
Renal pelvis	1 (Ref)		1 (Ref)		1 (Ref)		-	-
Ureter	1.183 (0.921-1.520)	0.187	1.039 (0.805-1.342)	0.769	1.027 (0.640-1.649)	0.911	-	-
Both renal pelvis and ureter	1.363 (1.020-1.820)	0.036	1.142 (0.849-1.536)	0.381	0.804 (0.454-1.424)	0.454	-	-
Tumor grade								
I	1 (Ref)		-	-	1 (Ref)		-	-
II	0.187 (0.026-1.355)	0.097	-	-	-	-	-	-
III	0.394 (0.055-2.819)	0.354	-	-	1.095 (0.513-2.339)	0.814	-	-
Missing/unknown	0.328 (0.046-2.350)	0.267	-	-	1.222 (0.569-2.623)	0.607	-	-
Tumor grade II								
Low grade	1 (Ref)		1 (Ref)		1 (Ref)		-	-
High grade	2.197 (1.396-3.459)	0.001	1.681 (1.059-2.670)	0.028	0.666 (0.288-2.025)	0.408	-	-
Unknown	0.316 (0.042-2.352)	0.261	0.213 (0.028-1.596)	0.133	0.269 (0.002-2.532)	0.384	-	-
Pathological T category								
pTis/pTa	-	-	-	-	1 (Ref)		-	-
pT1	-	-	-	-	1.177 (0.063-171.787)	0.922	-	-

pT2	-	-	-	-	1.446 (0.184-186.411)	0.803	-	-
pT3	-	-	-	-	2.911 (0.419-367.295)	0.460	-	-
pT4	-	-	-	-	3.543 (0.439-458.493)	0.393	-	-
Unknown	-	-	-	-	-	-	-	-
Pathological N category								
pNx	1 (Ref)		1 (Ref)		-	-	-	-
pN0	0.891 (0.689-1.152)	0.379	0.838 (0.644-1.092)	0.190	-	-	-	-
pN1	2.660 (2.010-3.520)	<0.001	1.914 (1.418-2.583)	<0.001	-	-	-	-
Concomitant LVI								
No	1 (Ref)		1 (Ref)		1 (Ref)		-	-
Yes	2.272 (1.820-2.835)	<0.001	1.859 (1.464-2.360)	<0.001	1.548 (0.976-2.456)	0.063	-	-
Concomitant CIS								
No	1 (Ref)		-	-	1 (Ref)		-	-
Yes	1.253 (0.928-1.691)	0.141	-	-	0.568 (0.320-1.010)	0.054	-	-
LN dissection								
Not performed	1 (Ref)		-	-	-	-	-	-
Performed	1.252 (1.003-1.563)	0.047	-	-	-	-	-	-
Adjuvant chemotherapy								
No	1 (Ref)		-	-	1 (Ref)		-	-
Yes	1.140 (0.914-1.421)	0.245	-	-	1.329 (0.842-2.096)	0.222	-	-
Overall survival								
Operation								
ONU	1 (Ref)		1 (Ref)		1 (Ref)		1 (Ref)	
LNU	0.749 (0.584-0.962)	0.023	0.866 (0.670-1.120)	0.273	0.620 (0.339-1.134)	0.120	0.658 (0.359-1.207)	0.177
Age (yr)	1.032 (1.020-1.044)	<0.001	1.032 (1.019-1.045)	<0.001	1.011 (0.983-1.041)	0.430	-	-

Sex									
Male	1 (Ref)		-	-	1 (Ref)		-	-	
Female	0.871 (0.670-1.132)	0.301	-	-	1.020 (0.607-1.713)	0.940	-	-	
BMI (kg/m ²)	0.977 (0.942-1.014)	0.215	-	-	0.984 (0.900-1.076)	0.721	-	-	
ASA score									
1	1 (Ref)		1 (Ref)		1 (Ref)		-	-	
2	1.248 (0.942-1.654)	0.123	0.998 (0.743-1.339)	0.987	0.879 (0.504-1.534)	0.649	-	-	
3	1.279 (0.758-2.158)	0.357	1.009 (0.585-1.742)	0.974	0.342 (0.045-2.574)	0.297	-	-	
Unknown	2.890 (1.619-5.158)	<0.001	2.017 (1.118-3.641)	0.020	2.471 (0.908-6.726)	0.077	-	-	
Previous bladder cancer									
No	1 (Ref)		1 (Ref)		1 (Ref)		-	-	
Previous bladder tumor Hx.	1.644 (1.146-2.359)	0.007	1.344 (0.933-1.938)	0.113	1.715 (0.929-3.164)	0.084	-	-	
Concomitant bladder tumor Hx.	1.696 (1.158-2.483)	0.007	1.680 (1.141-2.472)	0.009	1.149 (0.459-2.879)	0.767	-	-	
Concomitant bladder cancer									
No	1 (Ref)		-	-	1 (Ref)		-	-	
Yes	1.608 (1.101-2.348)	0.014	-	-	1.055 (0.424-2.621)	0.909	-	-	
Tumor location									
Renal pelvis	1 (Ref)		-	-	1 (Ref)		-	-	
Ureter	1.177 (0.908-1.525)	0.219	-	-	1.067 (0.627-1.816)	0.810	-	-	
Both renal pelvis and ureter	1.278 (0.948-1.724)	0.107	-	-	0.883 (0.478-1.631)	0.691	-	-	
Tumor grade									
I	1 (Ref)		-	-	1 (Ref)		-	-	
II	0.346 (0.048-2.498)	0.293	-	-	-	-	-	-	
III	0.484 (0.068-3.471)	0.471	-	-	0.916 (0.394-2.129)	0.839	-	-	
	0.567 (0.079-4.052)	0.571	-	-	1.651 (0.738-3.691)	0.222	-	-	

Missing/unknown								
Tumor grade II								
Low grade	1 (Ref)		1 (Ref)		1 (Ref)		-	-
High grade	1.780 (1.179-2.686)	0.006	1.448 (0.952-2.202)	0.084	1.029 (0.403-3.741)	0.959	-	-
Unknown	1.318 (0.504-3.444)	0.573	1.011 (0.383-2.670)	0.983	0.603 (0.004-6.274)	0.742	-	-
Pathological T category								
pTis/pTa	-	-	-	-	1 (Ref)		-	-
pT1	-	-	-	-	0.879 (0.047-128.689)	0.939	-	-
pT2	-	-	-	-	0.745 (0.088-97.266)	0.844	-	-
pT3	-	-	-	-	1.906 (0.273-240.943)	0.656	-	-
pT4	-	-	-	-	3.513 (0.444-453.851)	0.396	-	-
Unknown	-	-	-	-	-	-	-	-
Pathological N category								
pNx	1 (Ref)		1 (Ref)		-	-	-	-
pN0	1.138 (0.880-1.473)	0.325	1.057 (0.810-1.381)	0.682	-	-	-	-
pN1	2.625 (1.934-3.561)	<0.001	1.966 (1.418-2.726)	<0.001	-	-	-	-
Concomitant LVI								
No	1 (Ref)		1 (Ref)		1 (Ref)		1 (Ref)	
Yes	2.247 (1.787-2.825)	<0.001	1.829 (1.430-2.338)	<0.001	1.852 (1.084-3.166)	0.024	1.789 (1.045-3.064)	0.034
Concomitant CIS								
No	1 (Ref)		-	-	1 (Ref)		-	-
Yes	1.275 (0.930-1.748)	0.131	-	-	0.677 (0.363-1.261)	0.219	-	-
LN dissection								
Not performed	1 (Ref)		-	-	-		-	-

bladder cancer									
No	1 (Ref)		-	-	1 (Ref)		-	-	
Yes	1.538 (1.016-2.326)	0.042	-	-	1.161 (0.625-2.157)	0.636	-	-	
Tumor location									
Renal pelvis	1 (Ref)		-	-	1 (Ref)		-	-	
Ureter	1.168 (0.880-1.550)	0.283	-	-	1.183 (0.802-1.744)	0.397	-	-	
Both renal pelvis and ureter	1.315 (0.952-1.817)	0.096	-	-	1.339 (0.810-2.215)	0.255	-	-	
Tumor grade									
I	1 (Ref)		-	-	1 (Ref)		-	-	
II	0.307 (0.042-2.223)	0.242	-	-	3.435 (0.467-439.372)	0.393	-	-	
III	0.447 (0.062-3.210)	0.423	-	-	4.530 (0.627-577.747)	0.295	-	-	
Missing/unknown	0.487 (0.068-3.494)	0.474	-	-	3.165 (0.462-399.934)	0.420	-	-	
Tumor grade II									
Low grade	1 (Ref)		1 (Ref)		1 (Ref)		1 (Ref)		
High grade	1.818 (1.149-2.876)	0.011	1.460 (0.916-2.329)	0.112	3.601 (2.339-5.778)	<0.001	2.037 (1.248-3.443)	0.006	
Unknown	1.341 (0.458-3.923)	0.593	0.987 (0.333-2.919)	0.981	1.125 (0.009-8.082)	0.935	0.495 (0.004-3.768)	0.630	
Pathological T category									
pTis/pTa	-	-	-	-	1 (Ref)		1 (Ref)		
pT1	-	-	-	-	0.812 (0.347-1.902)	0.631	0.680 (0.295-1.629)	0.375	
pT2	-	-	-	-	1.761 (0.777-3.989)	0.175	1.123 (0.501-2.659)	0.784	
pT3	-	-	-	-	4.949 (2.478-9.885)	<0.001	2.773 (1.386-6.130)	0.007	
pT4	-	-	-	-	9.448 (3.508-25.451)	<0.001	5.611 (1.936-15.679)	0.001	
Unknown	-	-	-	-	-	-	-	-	
Pathological N category									
pNx	1 (Ref)		1 (Ref)		-	-	-	-	
pN0	0.982 (0.740-1.304)	0.902	0.931 (0.695-	0.630	-	-	-	-	

	pN1	2.507 (1.812-3.470)	<0.001	1.247 1.878 (1.325-2.662)	<0.001	-	-	-	-
Concomitant LVI									
	No	1 (Ref)		1 (Ref)		1 (Ref)		1 (Ref)	
	Yes	2.166 (1.688-2.778)	<0.001	1.776 (1.360-2.320)	<0.001	2.801 (1.950-4.022)	<0.001	1.494 (1.006-2.200)	0.046
Concomitant CIS									
	No	1 (Ref)		-	-	1 (Ref)		1 (Ref)	
	Yes	1.360 (0.975-1.896)	0.070	-	-	1.958 (1.268-3.024)	0.002	1.393 (0.872-2.155)	0.152
LN dissection									
	Not performed	1 (Ref)		-	-	-	-	-	-
	Performed	1.290 (1.004-1.657)	0.046	-	-	-	-	-	-
Adjuvant chemotherapy									
	No	1 (Ref)		-	-	1 (Ref)		1 (Ref)	
	Yes	1.032 (0.805-1.322)	0.805	-	-	2.210 (1.487-3.284)	<0.001	0.822 (0.521-1.274)	0.394

HR, hazard ratio; CI, confidence interval; ONU, open nephroureterectomy; LNU, laparoscopic nephroureterectomy; BMI, body mass index; ASA, American Society of Anesthesiologists; Hx, history; LVI, lymphovascular invasion; CIS, carcinoma in situ; LN, lymph node. ^{a)}Firth correction for hazard ratio and 95% profile likelihood confidence interval.