

Conditional Survival and Associated Prognostic Factors in Patients with Upper Tract Urothelial Carcinoma after Radical Nephroureterectomy: A Retrospective Study at a Single Institution

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Supplementary Table 1. Conditional cancer-specific survival (CSS) for additional periods by time since surgery

Years survived after surgery (No. at risk)	Conditional CSS (95% confidence interval, %)				
	1 yr	2 yr	3 yr	4 yr	5 yr
0 yr (330)	95.4 (94.2-96.6)	89.8 (88.1-91.5)	84.2 (82.1-86.3)	78.8 (76.5-81.1)	73.7 (71.1-76.3)
1 yr (309)	94.1 (92.8-95.4)	88.3 (86.4-90.2)	82.6 (80.4-84.8)	77.2 (74.6-79.8)	74.7 (72.0-77.4)
2 yr (287)	93.8 (92.3-95.3)	87.8 (85.8-89.8)	82.0 (79.5-84.5)	79.3 (76.6-82.0)	77.4 (74.6-80.2)
3 yr (244)	93.6 (92.0-95.2)	87.5 (85.2-89.8)	84.6 (82.1-87.1)	82.5 (79.8-85.2)	80.9 (78.0-83.8)
4 yr (196)	93.5 (91.7-95.3)	90.4 (88.2-92.6)	88.2 (85.7-90.7)	86.4 (83.7-89.1)	84.5 (81.5-87.5)
5 yr (163)	97.4 (96.1-98.7)	94.3 (92.3-96.3)	92.5 (90.2-94.8)	90.4 (87.7-93.1)	90.4 (87.7-93.1)

Supplementary Table 2. Conditional overall survival (OS) for additional periods by time since surgery

Years survived after surgery (No. at risk)	Conditional OS (95% confidence interval, %)				
	1 yr	2 yr	3 yr	4 yr	5 yr
0 yr (330)	93.9 (91.4-96.4)	87.5 (84.0-91.0)	79.7 (75.4-84.0)	74.2 (69.3-79.1)	67.9 (62.6-73.2)
1 yr (309)	93.2 (90.5-95.9)	84.8 (80.7-88.9)	79.0 (74.3-83.7)	72.3 (67.0-77.6)	69.9 (64.4-75.4)
2 yr (287)	91.0 (87.7-94.3)	84.8 (80.5-89.1)	77.6 (72.2-82.7)	75.0 (69.5-80.5)	72.6 (66.7-78.5)
3 yr (244)	93.1 (89.8-96.4)	85.2 (80.5-92.4)	82.4 (79.7-89.9)	79.8 (74.1-85.5)	77.5 (71.2-83.8)
4 yr (196)	91.5 (87.6-95.4)	88.5 (83.8-93.2)	85.6 (80.3-90.9)	83.2 (77.3-89.1)	79.4 (72.7-86.1)
5 yr (163)	96.7 (93.8-99.6)	93.6 (89.5-97.7)	90.9 (86.0-95.8)	86.7 (80.4-93.0)	83.0 (75.7-90.3)

Supplementary Table 3. Conditional intravesical recurrence-free survival (IVRFS) for additional periods by time since surgery

Years survived after surgery (No. at risk)	Conditional IVRFS (95% confidence interval, %)				
	1 yr	2 yr	3 yr	4 yr	5 yr
0 yr (330)	72.9 (70.4-75.4)	62.1 (59.3-64.9)	58.9 (56.0-61.8)	57.2 (54.2-60.2)	56.5 (53.4-59.6)
1 yr (208)	85.3 (82.8-87.8)	81.0 (78.1-83.9)	79.6 (76.6-82.6)	77.6 (74.4-80.8)	77.6 (74.4-80.8)
2 yr (145)	94.9 (93.0-96.8)	93.3 (91.1-95.5)	91.0 (88.3-93.7)	91.0 (88.3-93.7)	91.0 (88.3-93.7)
3 yr (114)	98.2 (97.0-99.4)	95.8 (93.7-97.9)	95.8 (93.7-97.9)	95.8 (93.7-97.9)	95.8 (93.7-97.9)
4 yr (91)	97.6 (95.9-99.3)	97.6 (95.9-99.3)	97.6 (95.9-99.3)	97.6 (95.9-99.3)	94.6 (91.2-98.0)
5 yr (71)	100 (no events)	100 (no events)	100 (no events)	97.0 (94.0-100.0)	97.0 (94.0-100.0)

Supplementary Table 4. Five-year conditional cancer-specific survival rates according to clinicopathological characteristics

Variable	Years survived after surgery					
	Baseline	1 yr	2 yr	3 yr	4 yr	5 yr
Cohort	330	309	287	244	196	163
Age (yr)						
< 65	77.8±3.3	78.0±3.4	80.2±3.4	83.6±3.4	88.5±3.2	94.1±2.6
≥ 65	68.1±4.3	69.9±4.6	73.1±4.9	76.5±5.2	77.8±5.9	84.0±5.7
p-value	0.012	0.028	0.111	0.126	0.153	0.111
Sex						
Male	72.8±3.0	74.3±3.1	75.7±3.3	79.4±3.3	84.2±3.3	91.0±2.9
Female	77.3±5.4	76.1±5.7	83.9±5.3	86.8±5.7	86.2±6.6	88.4±6.4
p-value	0.699	0.856	0.583	0.375	0.551	0.861
BMI (kg/m ²)						
< 25	67.8±3.7	69.5±3.9	72.3±4.1	77.4±4.2	82.1±4.3	89.5±3.9
≥ 25	81.6±3.6	81.1±3.8	83.6±3.8	84.7±4.1	86.9±4.2	91.2±3.8
p-value	0.010	0.037	0.048	0.200	0.382	0.722
ASA score						
0-1	73.9±4.3	75.0±4.5	77.4±4.7	83.4±4.5	88.4±4.2	94.0±3.4
2-3	73.5±3.3	74.5±3.4	77.4±3.6	79.5±3.8	82.5±4.0	88.6±3.6
p-value	0.842	0.706	0.758	0.505	0.519	0.474
History of bladder cancer						
Negative	76.6±2.8	77.0±2.9	77.9±3.1	82.7±3.1	85.3±3.2	90.0±2.9
Positive	60.3±7.1	63.7±7.2	75.0±7.3	72.0±8.2	80.7±8.0	93.8±6.1
p-value	0.045	0.036	0.592	0.174	0.407	0.537
Ureteroscopy						
Not done	73.8±2.9	75.6±3.0	79.3±3.0	84.1±3.0	88.7±2.9	93.9±2.4
Done	73.4±6.0	71.1±6.4	70.5±7.0	69.9±7.5	70.5±8.0	78.5±7.9
p-value	0.419	0.256	0.252	0.049	0.012	0.015
Concomitant CIS						
Negative	74.0±2.8	75.4±2.9	78.6±2.9	81.6±3.0	86.9±2.9	92.1±2.6
Positive	71.2±8.2	69.3±8.6	68.2±9.6	76.1±9.6	65.2±13.0	74.7±13.7
p-value	0.404	0.404	0.226	0.405	0.033	0.094
Hydronephrosis						
Negative	79.0±3.3	78.6±3.5	80.4±3.5	84.5±3.5	89.3±3.2	93.8±2.3
Positive	67.4±4.1	69.8±4.3	73.4±4.6	76.0±4.9	78.0±5.4	85.7±5.1
p-value	0.009	0.033	0.171	0.071	0.091	0.210
Multifocal tumor						
Negative	75.4±2.8	76.4±2.9	79.5±3.0	82.8±3.1	87.2±2.9	93.8±2.3
Positive	64.7±6.9	65.8±7.3	67.0±7.6	72.3±8.0	75.4±8.8	78.2±8.7
p-value	0.021	0.021	0.010	0.045	0.313	0.043
Location						
Renal pelvis	79.4±3.4	81.4±3.4	83.4±3.5	88.5±3.2	92.3±2.8	97.3±1.9
Ureter	69.7±4.6	69.6±4.9	71.5±5.4	76.8±5.5	81.7±5.4	90.5±4.5
Both	63.7±7.6	63.6±8.2	68.8±8.3	64.5±9.2	65.4±10.8	68.3±10.9
p-value	0.002	0.005	0.010	0.002	0.025	0.002
pT stage						
≤ pT2	86.1±2.8	84.3±3.1	84.1±3.3	86.2±3.2	87.2±3.6	91.2±3.3
≥ pT3	57.1±4.5	60.5±4.8	66.3±5.1	71.6±5.6	79.5±5.4	88.9±4.8
p-value	< 0.001	< 0.001	< 0.001	0.029	0.128	0.691
Tumor grade						
Low	90.2±3.0	90.6±3.0	91.4±2.9	95.1±2.4	94.0±3.0	96.4±2.5
High	64.5±3.6	65.3±3.8	64.0±4.5	70.9±4.5	77.0±4.7	85.1±4.4
p-value	< 0.001	< 0.001	< 0.001	< 0.001	0.004	0.028

Supplementary Table 4. Continued

Variable	Years survived after surgery					
	Baseline	1 yr	2 yr	3 yr	4 yr	5 yr
LVI						
Negative	80.4±2.7	79.7±2.8	81.1±2.9	83.7±3.0	86.4±3.2	90.5±2.9
Positive	48.2±6.6	53.1±7.2	59.1±8.1	66.4±8.4	74.5±8.5	90.0±6.8
p-value	0.001	< 0.001	0.005	0.018	0.039	0.797
Margin status						
Negative	75.7±2.6	75.8±2.8	77.6±2.9	80.9±3.0	84.3±3.0	90.3±2.7
Positive	26.2±12.8	47.4±15.5	70.0±18.2	80.0±17.9	-	-
p-value	< 0.001	0.001	0.421	0.790	-	-
LN status						
Negative	74.9±2.6	75.8±2.8	77.6±2.9	81.2±3.0	84.6±3.0	90.2±2.7
Positive	45.1±14.2	48.6±14.8	72.9±16.5	72.9±16.5	83.3±15.2	-
p-value	0.009	0.008	0.695	0.319	0.607	
ACH						
Not done	81.9±2.7	81.8±2.9	82.5±3.1	83.5±3.3	84.8±3.5	88.6±3.3
Done	50.7±5.8	53.6±6.1	60.7±6.4	70.9±6.6	82.6±6.0	97.0±3.0
p-value	< 0.001	< 0.001	< 0.001	0.022	0.361	0.243

BMI, body mass index; ASA, American Society of Anesthesiologists; CIS, carcinoma *in situ*; LVI, lymphovascular invasion; LN, lymph node; ACH, adjuvant chemotherapy.

Supplementary Table 5. Five-year conditional overall survival rates according to clinicopathological characteristics

Variable	Years survived after surgery					
	Baseline	1 yr	2 yr	3 yr	4 yr	5 yr
Cohort	330	309	287	244	196	163
Age (yr)						
< 65	75.7±3.3	75.8±3.5	77.9±3.5	82.3±3.5	87.1±3.3	94.1±2.6
≥ 65	58.2±4.3	61.9±4.6	64.9±5.0	70.2±5.5	67.0±6.7	64.5±8.0
p-value	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Sex						
Male	67.4±3.1	69.9±3.2	70.8±3.4	76.2±3.5	80.0±3.7	84.6±3.9
Female	70.0±5.8	69.9±6.0	79.7±5.8	82.4±6.2	81.9±7.0	77.1±9.4
p-value	0.850	0.462	0.849	0.920	0.541	0.354
BMI (kg/m ²)						
< 25	61.8±3.7	64.8±3.9	66.7±4.2	72.1±4.5	76.5±4.6	81.9±5.1
≥ 25	76.8±3.8	77.0±4.0	80.6±4.0	83.8±4.1	82.4±5.0	84.0±5.3
p-value	0.015	0.066	0.059	0.183	0.247	0.902
ASA score						
0-1	68.7±4.5	71.6±4.6	74.6±4.8	81.1±4.7	87.1±4.3	94.0±3.4
2-3	67.5±3.4	69.0±3.5	71.6±3.7	75.6±4.0	75.4±4.6	77.2±5.2
p-value	0.340	0.153	0.138	0.132	0.067	0.041
History of bladder cancer						
Negative	71.4±2.9	72.7±3.0	73.4±3.2	79.2±3.3	81.0±3.6	82.8±3.9
Positive	52.2±6.9	57.1±7.2	68.8±7.6	69.4±8.3	70.1±10.4	84.4±10.4
p-value	0.005	0.007	0.200	0.061	0.111	0.588
Ureteroscopy						
Not done	66.7±3.0	69.6±3.1	73.2±3.2	79.7±3.3	81.9±3.7	84.3±4.1
Done	73.4±6.0	71.1±6.4	70.5±7.0	69.9±7.5	70.5±8.0	78.5±7.9
p-value	0.425	0.674	0.664	0.606	0.480	0.605
Concomitant CIS						
Negative	68.2±2.9	70.7±3.0	73.8±3.1	76.9±3.3	80.0±2.6	84.0±3.8
Positive	66.2±8.3	64.4±8.7	63.4±9.5	76.1±9.6	65.2±13.0	74.7±13.7
p-value	0.490	0.271	0.197	0.599	0.118	0.161
Hydronephrosis						
Negative	73.4±3.5	73.8±3.6	76.0±3.7	83.1±3.6	86.6±3.8	87.6±4.3
Positive	61.5±4.2	65.0±4.4	68.1±4.8	70.2±5.2	69.9±5.9	76.7±6.4
p-value	0.006	0.024	0.141	0.020	0.016	0.077
Multifocal tumor						
Negative	70.1±2.9	72.0±3.0	74.8±3.2	79.2±3.3	81.2±3.6	84.3±4.0
Positive	56.9±7.0	59.1±7.3	61.5±7.6	69.8±8.1	72.8±8.9	78.2±8.7
p-value	0.045	0.053	0.054	0.245	0.784	0.561
Location						
Renal pelvis	73.1±3.6	76.4±3.6	78.2±3.8	84.7±3.6	87.3±3.7	89.6±4.1
Ureter	66.6±4.7	67.0±5.0	68.9±5.5	75.6±5.5	77.0±6.1	86.7±5.7
Both	53.2±7.5	54.4±8.0	60.4±8.3	58.6±9.3	59.5±10.6	57.5±11.8
p-value	0.001	0.003	0.007	0.010	0.070	0.031
pT stage						
≤ pT2	81.1±3.1	80.3±3.3	80.1±3.5	82.4±3.5	82.3±4.1	82.0±5.0
≥ pT3	51.0±4.4	55.2±4.7	60.7±5.1	68.9±5.7	76.4±5.6	84.2±5.6
p-value	< 0.001	< 0.001	< 0.001	0.066	0.187	0.537
Tumor grade						
Low	85.8±3.4	87.7±3.4	87.1±3.5	90.8±3.4	89.8±3.7	84.9±5.5
High	58.3±3.6	59.8±3.8	63.3±4.1	68.4±4.5	71.4±5.1	81.1±5.0
p-value	< 0.001	< 0.001	< 0.001	< 0.001	0.010	0.088

Supplementary Table 5. Continued

Variable	Years survived after surgery					
	Baseline	1 yr	2 yr	3 yr	4 yr	5 yr
LVI						
Negative	74.4±2.9	75.0±3.0	75.9±3.1	79.6±3.3	80.3±3.7	81.8±4.1
Positive	43.7±6.3	48.9±6.9	56.5±8.0	66.4±8.4	74.5±8.5	90.0±6.8
p-value	< 0.001	0.001	0.097	0.388	0.726	0.302
Margin status						
Negative	70.5±2.7	71.8±2.8	73.4±3.0	77.9±3.1	79.4±3.4	82.7±3.8
Positive	21.2±10.4	27.7±13.1	45.0±18.8	60.0±21.9	75.0±21.7	50.0±35.4
p-value	< 0.001	< 0.001	0.016	0.108	0.242	0.603
LN status						
Negative	69.1±2.7	70.8±2.9	72.7±3.0	77.7±3.1	79.3±3.4	82.7±3.8
Positive	41.7±13.5	48.6±14.8	72.9±16.5	72.9±16.5	83.3±15.2	-
p-value	0.038	0.104	0.781	0.797	0.825	0.367
ACH						
Not done	75.0±2.9	76.2±3.1	77.1±3.3	79.2±3.5	78.1±4.1	78.9±4.6
Done	47.8±5.7	51.2±6.0	58.0±6.3	70.9±6.6	82.6±6.0	97.0±3.0
p-value	< 0.001	0.001	0.007	0.235	0.966	0.179

BMI, body mass index; ASA, American Society of Anesthesiologists; CIS, carcinoma *in situ*; LVI, lymphovascular invasion; LN, lymph node; ACH, adjuvant chemotherapy.

Supplementary Table 6. Five-year conditional intravesical recurrence-free survival rates according to clinicopathological characteristics

Variable	Years survived after surgery					
	Baseline	1 yr	2 yr	3 yr	4 yr	5 yr
Cohort	330	208	145	114	91	71
Age (yr)						
< 65	60.4±4.0	76.2±4.2	89.8±3.6	93.7±3.1	96.2±2.6	87.5±11.7
≥ 65	51.7±4.7	80.1±5.1	93.2±3.8	87.5±11.7	87.5±11.7	-
p-value	0.016	0.839	0.990	0.552	0.962	-
Gender						
Male	54.1±3.5	75.9±3.8	90.7±3.2	94.4±2.8	92.7±4.4	96.0±3.9
Female	65.0±6.3	83.0±5.9	91.1±4.9	-	-	-
p-value	0.143	0.346	0.952	-	-	-
BMI (kg/m ²)						
< 25	52.3±4.1	77.1±4.7	89.9±4.1	93.7±3.6	90.7±6.8	93.3±6.4
≥ 25	62.5±4.6	77.9±4.6	91.8±3.5	97.9±2.1	97.9±2.1	-
p-value	0.028	0.804	0.597	0.157	0.493	-
ASA score						
0-1	57.4±5.3	68.5±6.2	86.3±6.0	89.9±5.6	92.4±5.2	-
2-3	56.9±3.7	83.0±3.6	93.1±2.7	98.7±1.3	95.7±4.3	95.7±4.3
p-value	0.447	0.045	0.554	0.184	0.185	-
History of bladder cancer						
Negative	59.4±3.3	78.4±3.4	92.3±2.7	96.3±2.1	94.0±3.7	96.7±3.3
Positive	42.9±7.5	72.4±9.8	82.5±9.3	92.9±6.9	-	-
p-value	0.009	0.806	0.178	0.522	-	-
Ureteroscopy						
Not done	57.4±3.4	79.9±3.5	91.6±2.9	94.9±2.5	97.0±2.1	-
Done	52.1±7.0	68.7±7.6	88.1±6.4	85.7±13.2	85.7±13.2	85.7±13.2
p-value	0.512	0.038	0.169	0.940	0.537	-
Concomitant CIS						
Negative	57.3±3.2	77.8±3.3	91.9±2.6	96.7±1.9	95.6±3.3	96.9±3.1
Positive	46.5±11.3	70.4±14.6	78.4±15.1	83.3±15.2	83.3±15.2	-
p-value	0.378	0.908	0.541	0.433	0.096	-
Hydronephrosis						
Negative	60.5±4.1	82.7±4.0	93.7±3.1	94.8±3.0	96.1±2.7	-
Positive	51.0±4.7	70.5±5.3	86.4±4.8	97.4±2.5	92.9±6.9	92.9±6.9
p-value	0.179	0.021	0.037	0.908	0.830	-
Multifocal tumor						
Negative	57.3±3.3	78.6±3.5	91.8±2.9	95.1±2.4	93.2±4.3	96.0±3.9
Positive	52.6±7.5	73.1±8.2	86.7±7.1	-	-	-
p-value	0.548	0.548	0.392	-	-	-
Location						
Renal pelvis	59.6±4.3	80.2±4.4	91.7±3.7	92.8±3.5	90.3±5.9	94.4±5.4
Ureter	52.5±5.2	72.0±5.8	90.2±4.7	-	-	-
Both	54.7±8.2	81.7±8.3	89.2±7.2	-	-	-
p-value	0.632	0.348	0.862	-	-	-
pT stage						
≤ pT2	51.7±4.0	73.1±4.4	90.4±3.5	95.1±2.8	98.1±1.9	-
≥ pT3	63.5±4.7	84.1±4.7	91.9±4.1	96.8±3.2	90.7±6.6	93.8±6.1
p-value	0.081	0.080	0.973	0.905	0.424	-

Supplementary Table 6. Continued

Variable	Years survived after surgery					
	Baseline	1 yr	2 yr	3 yr	4 yr	5 yr
Tumor grade						
Low	59.2±5.0	80.8±4.9	92.2±3.8	97.4±2.6	97.4±2.6	-
High	54.8±3.9	75.7±4.2	90.1±3.6	94.8±3.0	93.0±5.2	95.0±4.9
p-value	0.487	0.301	0.497	0.256	0.665	-
LVI						
Negative	54.5±3.4	76.6±3.7	89.9±3.1	94.9±2.5	93.5±4.0	96.3±3.6
Positive	65.5±6.4	82.6±6.0	96.3±3.6	-	-	-
p-value	0.184	0.654	0.366	-	-	-
Margin status						
Negative	56.5±3.1	77.7±3.3	91.5±2.6	95.8±2.1	94.6±3.4	97.0±3.0
Positive	49.7±21.6	66.7±27.2	66.7±27.2	-	-	-
p-value	0.969	0.917	0.067	-	-	-
LN status						
Negative	55.4±3.1	76.7±3.3	90.6±2.7	95.7±2.1	94.5±3.4	96.9±3.1
Positive	84.4±10.2	-	-	-	-	-
p-value	0.103	-	-	-	-	-
ACH						
Not done	54.1±3.5	77.0±3.7	92.2±2.9	96.1±2.2	98.5±1.5	-
Done	63.0±6.4	79.2±6.6	87.7±6.1	95.0±4.9	85.5±10.0	90.0±9.5
p-value	0.079	0.636	0.259	0.516	0.135	-

BMI, body mass index; ASA, American Society of Anesthesiologists; CIS, carcinoma *in situ*; LVI, lymphovascular invasion; LN, lymph node; ACH, adjuvant chemotherapy.