

Immunohistochemical studies assessing the expression of steroid hormone receptors in urothelial cancer tissues

Author, year (reference)	N	Location	Non-tumor (non-neoplastic urothelium) vs. tumor			Gender			Tumor grade			Tumor stage			Prognostic significance (P value)
			Non-Tumor	Tumor	P value	M	F	P value	LG	HG	P value	NMI	MI	P value	
[AR]															
Boorjian, 2004 (3)	49	Bladder	86%	53%	0.001 <sup>†</sup>	61%	31%	0.104	89%	49%	0.055 <sup>†</sup>	75%	21%	0.002 <sup>†</sup>	NA
Boorjian, 2009 (4)	55	Bladder	NA	44%	0.06	NA	NA	NA	NA	NA	NA	59%	33%	0.095 <sup>†</sup>	NA
Kauffman, 2011 (5)	59	Bladder	84%	Roughly half	<0.001	NA	NA	NA	NA	NA	NA	NA	NA	0.028 (NMI > MI)	NS
Mir, 2011 (6)	472	Bladder	NA	13%	NA	14%	8%	0.159	12%	13%	0.83	9%	15%	0.058	NS
Rau, 2011 (7)	93	UUT	NA	NA	NA	NA	NA	NA	NA	NA	0.074 (LG > HG)	NA	NA	0.001 (stage II > I)	0.568
Tuygun, 2011 (8)	139	Bladder	0% (M)	51%	<0.001 <sup>†</sup>	53%	43%	0.413	64%	37%	<0.001	60%	21%	<0.001 <sup>†</sup>	0.095 (RFS); 0.110 (PFS)
Miyamoto, 2012 (9)	188	Bladder	80%	42%	<0.001	42%	43%	1.000	55%	36%	0.023	51%	33%	0.018	0.071 (PFS/MI)
Shyr, 2013 (10)	83	UUT	NA	55%	NA	–			69%	47%	0.070 <sup>†</sup>	63%	44%	0.114 <sup>†</sup>	NA
Jing, 2014 (11)	58	Bladder	NA	53%	NA	57%	43%	0.540	55%	50%	0.724	49%	69%	0.195	NA
Mashhadi, 2014 (12)	120	Bladder	0%	22%	<0.001	NA	NA	NA	NA	NA	<0.001	NA	NA	<0.001	0.02
Nam, 2014 (13)	169	Bladder	NA	37%	NA	38%	31%	0.515	39%	33%	0.269	43% (Ta); 30% (T1)	NA	0.048 (Ta vs. T1)	0.001 (RFS); 0.288 (PFS)
Williams, 2015 (14)	297	Bladder	NA	25%	NA	NA	NA	NA	NA	NA	NA	33% (Ta/Tis)	19% (T1-3)	0.010 <sup>†</sup>	NA
Williams, 2015 (14)	43	UUT	NA	16%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Kashiwagi, 2016 (15)	99	UUT	58%	20%	<0.001	27%	10%	0.072	33%	18%	0.177	14%	24%	0.301	NS
Wirth, 2017 (16)	737	UUT	NA	11%	NA	12%	10%	0.52	10%	12%	0.48	9%	13%	0.130 <sup>†</sup>	NS
Elzamy, 2018 (17)	106	Bladder	0%	35%	0.006	35%	35%	0.99	15%	51%	0.037	19%	41%	0.039	NS
Necchi, 2018 (18)	110	Bladder& UUT	NA	44%	NA	NA	NA	NA	NA	NA	NA	NA	44%	NA	NS
Tyagi, 2019 (19)	72	Bladder	33%	54%	0.104 <sup>†</sup>	61%	27%	0.021 <sup>†</sup>	NA	NA	NA	45%	65%	NA	NA
Yonekura, 2019 (20)	40	Bladder	NA	50%	NA	56%	38%	0.501	42%	62%	0.320	43% (Ta/Tis) 70% (T1)	NA	NA	0.022 (RFS)
[ERα]															
Shen, 2006 (21)	224	Bladder	NA	1%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bolenz, 2009 (22)	198	Bladder	NA	5%	0.06	5%	5%	1.000	NA	NA	NA	NA	NA	0.004 (OC > non-OC)	NS
Miyamoto, 2012 (9)	188	Bladder	50%	27%	<0.001	28%	25%	0.842	38%	23%	0.048	35%	19%	0.014	NS
Mashhadi, 2014 (12)	120	Bladder	2%	3%	0.67	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tan, 2015 (23)	410	Bladder	NA	4%	NA	NA	NA	NA	NA	NS	NA	NA	NS	NA	NA
Kashiwagi, 2016 (15)	99	UUT	40%	18%	0.001	17%	21%	0.790	27%	17%	0.465	11%	23%	0.183	NS
[ERβ]															
Croft, 2005 (24)	92	Bladder	NA	11–22% <sup>‡</sup>	NA	NA	NA	NA	6–12% <sup>‡</sup> (G1-2)	17–33% <sup>‡</sup> (G3)	0.021–0.177 <sup>††</sup>	5–9% <sup>‡</sup> (Ta)	16–33% <sup>‡</sup> (≥T1)	0.010–0.098 <sup>††</sup>	NA
Shen, 2006 (21)	224	Bladder	NA	63%	NA	NA	NA	NA	58% (G1-2)	70% (G3)	0.085	54%	80%	<0.001	NA
Kontos, 2010 (25)	111	Bladder	93%	76%	0.041 <sup>†</sup>	NA	NA	NA	95% (G1-2)	56% (G3)	<0.001 <sup>†</sup>	83% (T1)	54%	0.011 <sup>†</sup>	NA
Tuygun, 2011 (8)	139	Bladder	0% (M); 36% (F)	27–30% <sup>‡</sup>	<0.001 <sup>†</sup>	33%	24%	0.402	22–26% <sup>‡</sup>	31–34% <sup>‡</sup>	0.44–0.59 <sup>‡</sup>	24–26% <sup>‡</sup>	36–42% <sup>‡</sup>	0.16–0.24 <sup>‡</sup>	0.239 (RFS); 0.035 (PFS)
Miyamoto, 2012 (9)	188	Bladder	89%	49%	<0.001	53%	38%	0.109	29%	58%	<0.001	34%	67%	<0.001	0.007 (PFS/LG); ≤0.001 (PFS); 0.007 (CSS/MI)
Kauffman, 2013 (26)	72	Bladder	NA	NA	<0.001 (N < T)	NA	NA	NA	NA	NA	NA	NA	NA	NS	0.030 (RFS); 0.0018 (CSS)
Shyr, 2013 (10)	83	UUT	NA	43%	NA	NA	NA	NA	44%	43%	1.000 <sup>†</sup>	51%	47%	0.815 <sup>†</sup>	NA
Nam, 2014 (13)	169	Bladder	NA	31%	NA	31%	31%	1.000	27%	41%	0.043	22% (Ta); 42% (T1)	NA	0.004 (Ta vs. T1)	0.004 (RFS); 0.014 (PFS)
Tan, 2015 (23)	410	Bladder	NA	100%	NA	NA	NA	NA	100%	100%	NS	100%	100%	NS	0.055/0.087 <sup>‡</sup> (CSS)
Kashiwagi, 2016 (15)	99	UUT	85%	63%	0.001	58%	69%	0.296	73%	61%	0.402	65%	63%	1.000	NS
Luo, 2016 (27)	105	UUT (pT3)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 (local recurrence); 0.008 (distant metastasis)
[GR]															
Ishiguro, 2014 (28)	129	Bladder	96%	87%	0.026	86%	89%	0.785	96%	81%	0.011	96%	74%	<0.001	0.025 (RFS/NMI); 0.030 (PFS/MI); 0.067 (CSS/MI)
Kashiwagi, 2016 (15)	99	UUT	84%	63%	0.001	67%	56%	0.395	53%	64%	0.563	62%	63%	1.000	NS
[PR]															
Bolenz, 2009 (22)	198	Bladder	NA	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mashhadi, 2014 (12)	120	Bladder	2%	4%	0.48	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tan, 2015 (23)	410	Bladder	NA	0%	NA	NA	NA	NA	0%	0%	NS	0%	0%	NS	NA
Kashiwagi, 2016 (15)	99	UUT	13%	16%	0.487	10%	26%	0.052	7%	18%	0.453	14%	18%	0.779	0.040 (CSS/pT3-4)

AR, androgen receptor; ER, estrogen receptor; GR, glucocorticoid receptor; PR, progesterone receptor; UUT, upper urinary tract; M, male; F, female; NA, not analyzed; LG, low grade; HG, high grade; NMI, non-muscle-invasive; MI, muscle-invasive; OC, organ-confined; RFS, recurrence-free survival; PFS, progression-free survival; CSS, cancer-specific survival; NS, not significant. <sup>†</sup>We calculated two-tailed P values, using Fisher's exact test. <sup>‡</sup>Two criteria were used.