

Automatic Detection of Prostate Tumor Habitats using Diffusion MRI

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Supplementary Table 1. Summary of radical prostatectomy ROIs.

Patient	ROI	Location	Volume	GS pattern	GS
1	1	TZ	0.38	3+3	6
1	2	TZ	0	3+3	6
2	1	TZ	3.61	3+4	7
2	2	PZ	0.31	3+3	6
2	3	PZ	3.46	3+4	7
2	4	PZ	0.51	3+3	6
3	1	PZ	1.2	4+5	9
3	2	PZ	1.29	3+4	7
3	3	TZ	0.18	3+3	6
3	4	TZ	0.69	3+4	7
4	1	TZ	43.84	5+5	10
4	2	PZ	0.68	3+3	6
5	1	TZ	3.57	3+4	7
5	2	PZ	0.34	3+3	6
5	3	TZ	0.18	3+3	6
5	4	TZ	0	3+4	7
5	5	TZ	0.37	3+4	7
5	6	PZ	0.06	3+3	6
6	1	TZ	6.37	4+5	9
6	2	TZ	0.29	3+3	6
6	3	PZ	0.263	3+4	7
7	1	TZ	2.48	4+5	9
7	2	PZ	0.87	3+4	7
7	3	PZ	0.64	3+4	7
8	1	TZ	2.16	3+4	7
8	2	PZ	0.54	3+3	6
8	3	PZ	0.36	3+3	6
9	1	TZ	6.63	4+5	9
10	1	TZ	7.42	3+4	7
10	2	TZ	0.27	3+3	6
10	3	PZ	0.68	3+3	6
10	4	PZ	0.27	3+3	6

Patient	ROI	Location	Volume	GS pattern	GS
11	1	PZ	1.98	3+4	7
11	2	PZ	0.63	3+4	7
11	3	TZ	0.39	3+3	6
11	4	PZ	0.2	3+3	6
11	5	TZ	0.07	3+3	6
12	1	PZ	0.59	3+4	7
12	2	PZ	0.31	3+3	6
12	3	PZ	0.21	3+3	6
13	1	TZ	4.72	4+5	9
14	1	PZ	0.76	3+4	7
14	2	TZ	0.75	3+3	6
14	3	PZ	0	3+3	6
14	4	PZ	0.23	3+3	6
15	1	PZ	1.44	5+4	9
15	2	TZ	0.22	3+3	6
16	1	TZ	7.83	4+5	9
16	2	PZ	0.35	3+4	7
17	1	TZ	2.55	3+4	7
17	2	TZ	0.51	3+3	6
17	3	PZ	0.22	3+3	6
18	1	PZ	1.08	4+4	8

Supplementary Table S2. ADC thresholds for determining volumes at high risk (PZ/TZ=900/800 $\mu\text{m}^2/\text{s}$)

PZ	TZ	Statistics	700	750	800	850	900	950	1000
600		Spearman's ρ	0.442	0.504	0.526	0.536	0.583	0.516	0.478
		p-value	9.28E-04	1.20E-04	5.13E-05	3.51E-05	4.65E-06	7.60E-05	2.95E-04
		Volume (cc)	0.038	0.044	0.058	0.069	0.085	0.108	0.142
		True Positive/False Negative/False Positive	5/48/0	5/48/1	10/43/1	11/42/1	11/42/2	11/42/5	12/42/7
		Pearson's r	0.852	0.851	0.889	0.882	0.88	0.91	0.9
		GS True Positive / GS False Positive	8/6.73	8/6.73	7.3/6.74	7.27/6.74	7.27/6.74	7/6.81	7/6.81
650		Spearman's ρ	0.502	0.555	0.577	0.591	0.631	0.571	0.494
		p-value	1.30E-04	1.60E-05	6.08E-06	3.13E-06	3.99E-07	8.05E-06	1.68E-04
		Volume (cc)	0.063	0.069	0.083	0.094	0.110	0.133	0.166
		True Positive/False Negative/False Positive	5/48/1	5/48/2	10/43/2	11/42/2	12/41/2	12/41/5	12/42/8
		Pearson's r	0.896	0.896	0.912	0.904	0.887	0.907	0.909
		GS True Positive / GS False Positive	8/6.73	8/6.73	7.3/6.74	7.27/6.74	7.42/6.68	7.17/6.76	7/6.81
700		Spearman's ρ		0.608	0.641	0.641	0.688	0.625	0.559
		p-value		1.38E-06	2.31E-07	2.31E-07	1.26E-08	5.60E-07	1.33E-05
		Volume (cc)		0.118	0.133	0.143	0.160	0.184	0.217
		True Positive/False Negative/False Positive		5/48/4	12/41/4	12/41/4	14/39/3	14/39/5	15/39/6
		Pearson's r		0.899	0.884	0.889	0.871	0.895	0.884
		GS True Positive / GS False Positive		8.6/6.67	7.5/6.66	7.5/6.66	7.71/6.54	7.5/6.62	7.47/6.62
750		Spearman's ρ			0.593	0.598	0.651	0.621	0.574
		p-value			2.92E-06	2.31E-06	1.30E-07	7.19E-07	6.96E-06
		Volume (cc)			0.208	0.219	0.235	0.258	0.292
		True Positive/False Negative/False Positive			18/36/3	17/37/4	17/37/5	19/35/6	20/35/8
		Pearson's r			0.87	0.884	0.888	0.887	0.881
		GS True Positive / GS False Positive			7.72/6.47	7.71/6.51	7.71/6.51	7.58/6.51	7.55/6.51
800		Spearman's ρ				0.727	0.771	0.737	0.659
		p-value				6.88E-10	1.49E-11	3.09E-10	8.20E-08
		Volume (cc)				0.350	0.367	0.391	0.427
		True Positive/False Negative/False Positive				18/36/2	17/37/4	20/34/5	20/35/8
		Pearson's r				0.889	0.903	0.896	0.893
		GS True Positive / GS False Positive				7.72/6.47	7.71/6.51	7.6/6.47	7.55/6.51
850		Spearman's ρ					0.745	0.701	0.666
		p-value					1.54E-10	5.06E-09	5.34E-08
		Volume (cc)					0.524	0.549	0.584
		True Positive/False Negative/False Positive					19/35/4	23/33/5	21/34/9
		Pearson's r					0.904	0.89	0.901
		GS True Positive / GS False Positive					7.79/6.4	7.65/6.39	7.62/6.44
900		Spearman's ρ						0.684	0.667
		p-value						1.63E-08	5.07E-08
		Volume (cc)						0.727	0.765
		True Positive/False Negative/False Positive						24/33/5	24/32/6
		Pearson's r						0.916	0.912
		GS True Positive / GS False Positive						7.67/6.42	7.62/6.41

The following six parameters were calculated for each tested pair of PZ/TZ thresholds:

1. Spearman correlation coefficient ρ between the size of the resultant VOIs and GS of the corresponding RP lesion;
2. P-value of the Spearman's ρ ;
3. Average volume of VOIs;
4. True positive = VOI is matching RP lesion; False negative = there is no VOI that matches the RP lesion; False positive = there is no RP lesion that matches the VOI;
5. Pearson correlation coefficient r between the fractions of VOIs and RP lesion in the quadrants;
6. Average GS of True Positive VOIs / Average GS of False Positive VOIs

Supplementary Table S3. ADC thresholds for determining volumes at intermediate risk (PZ/TZ=1100/850 $\mu\text{m}^2/\text{s}$)

PZ	TZ	Statistics	900	950	1000	1050	1100	1150	1200
800		Spearman's ρ	0.671	0.714	0.686	0.704	0.761	0.704	0.697
		p-value	3.90E-08	1.94E-09	1.39E-08	4.16E-09	3.83E-11	4.05E-09	6.76E-09
		Volume (cc)	0.356	0.378	0.407	0.438	0.494	0.607	0.795
		True Positive/False Negative/False Positive	17/37/1	18/36/2	18/36/3	20/35/2	23/31/2	24/30/7	24/31/9
		Pearson's r	0.899	0.894	0.895	0.900	0.892	0.909	0.928
		GS True Positive / GS False Positive	7.71/6.3	7.67/6.31	7.67/6.26	7.55/6.28	7.57/6.59	7.42/6.52	7.21/6.62
850		Spearman's ρ	0.714	0.755	0.729	0.750	0.778	0.722	0.703
		p-value	1.94E-09	6.42E-11	6.11E-10	1.06E-10	7.13E-12	1.06E-09	4.24E-09
		Volume (cc)	0.510	0.532	0.561	0.592	0.649	0.767	0.952
		True Positive/False Negative/False Positive	19/35/0	19/35/1	18/36/3	20/34/2	24/30/2	26/29/7	27/28/8
		Pearson's r	0.901	0.904	0.915	0.917	0.900	0.909	0.917
		GS True Positive / GS False Positive	7.79/6.3	7.79/6.35	7.78/6.3	7.65/6.52	7.62/6.61	7.54/6.53	7.3/6.62
900		Spearman's ρ		0.769	0.745	0.766	0.738	0.747	0.710
		p-value		1.71E-11	1.54E-10	2.27E-11	2.83E-10	1.28E-10	2.63E-09
		Volume (cc)		0.712	0.744	0.777	0.840	0.956	1.133
		True Positive/False Negative/False Positive		20/35/2	19/35/3	22/33/2	24/30/5	27/28/7	28/27/8
		Pearson's r		0.922	0.927	0.915	0.914	0.925	0.925
		GS True Positive / GS False Positive		7.8/6.36	7.79/6.32	7.64/6.32	7.67/6.64	7.48/6.57	7.29/6.57
950		Spearman's ρ			0.740	0.723	0.701	0.733	0.698
		p-value			2.46E-10	9.45E-10	5.13E-09	4.52E-10	6.22E-09
		Volume (cc)			0.929	0.964	1.028	1.147	1.322
		True Positive/False Negative/False Positive			22/33/3	22/33/4	25/29/5	29/26/5	31/24/6
		Pearson's r			0.920	0.936	0.923	0.932	0.926
		GS True Positive / GS False Positive			7.59/6.27	7.59/6.3	7.6/6.55	7.41/6.6	7.26/6.6
1000		Spearman's ρ				0.708	0.670	0.732	0.694
		p-value				2.97E-09	4.17E-08	4.64E-10	8.24E-09
		Volume (cc)				1.155	1.221	1.329	1.506
		True Positive/False Negative/False Positive				24/31/3	28/27/4	30/26/4	33/23/3
		Pearson's r				0.940	0.930	0.933	0.921
		GS True Positive / GS False Positive				7.42/6.33	7.43/6.62	7.37/6.54	7.24/6.63

The following six parameters were calculated for each tested pair of PZ/TZ thresholds:

1. Spearman correlation coefficient ρ between the size of the resultant VOIs and GS of the corresponding RP lesion;
2. P-value of the Spearman's ρ ;
3. Average volume of VOIs;
4. True positive = VOI is matching RP lesion; False negative = there is no VOI that matches the RP lesion; False positive = there is no RP lesion that matches the VOI;
5. Pearson correlation coefficient r between the fractions of VOIs and RP lesion in the quadrants;
6. Average GS of True Positive VOIs / Average GS of False Positive VOIs

Supplementary Table S4. ADC thresholds for determining volumes at low risk (PZ/TZ=1300/1050 $\mu\text{m}^2/\text{s}$)

PZ \ TZ	Statistics	1100	1150	1200	1250	1300	1350	1400
1000	Spearman's ρ	0.670	0.732	0.694	0.713	0.641	0.632	0.671
	p-value	4.17E-08	4.64E-10	8.24E-09	2.14E-09	2.29E-07	3.78E-07	3.88E-08
	Volume (cc)	1.221	1.329	1.506	1.738	2.075	2.404	2.725
	True Positive/False Negative/False Positive	30/25/2	34/23/4	37/21/3	32/24/4	35/25/4	32/26/5	25/30/6
	Pearson's r	0.911	0.900	0.893	0.904	0.876	0.871	0.860
	GS True Positive / GS False Positive	7.37/6.28	7.29/6.26	7.27/6.19	7.31/6.25	7.09/6.6	7.06/6.58	7.24/6.57
1050	Spearman's ρ	0.650	0.678	0.677	0.667	0.629	0.618	0.666
	p-value	1.43E-07	2.52E-08	2.67E-08	5.06E-08	4.64E-07	8.07E-07	5.21E-08
	Volume (cc)	1.438	1.552	1.728	2.014	2.296	2.616	2.938
	True Positive/False Negative/False Positive	33/24/3	40/19/4	42/18/3	34/23/2	39/23/3	36/24/5	27/28/6
	Pearson's r	0.898	0.892	0.884	0.885	0.865	0.862	0.847
	GS True Positive / GS False Positive	7.3/6.25	7.15/6.26	7.17/6.17	7.18/6.3	7.08/6.52	6.97/6.62	7.19/6.57
1100	Spearman's ρ		0.661	0.663	0.631	0.616	0.638	0.673
	p-value		7.21E-08	6.35E-08	4.02E-07	9.00E-07	2.73E-07	3.49E-08
	Volume (cc)		1.844	2.024	2.267	2.552	2.870	3.190
	True Positive/False Negative/False Positive		40/19/3	40/19/3	35/22/2	35/24/3	33/24/4	27/27/5
	Pearson's r		0.881	0.887	0.881	0.874	0.871	0.846
	GS True Positive / GS False Positive		7.08/6.26	7.1/6.26	7.2/6.23	7.14/6.54	7.12/6.5	7.15/6.63
1150	Spearman's ρ			0.685	0.643	0.638	0.661	0.673
	p-value			1.56E-08	2.12E-07	2.79E-07	7.16E-08	3.49E-08
	Volume (cc)			2.364	2.600	2.898	3.199	3.519
	True Positive/False Negative/False Positive			37/21/3	34/21/2	34/25/4	29/28/6	27/27/7
	Pearson's r			0.905	0.898	0.872	0.886	0.851
	GS True Positive / GS False Positive			7.14/6.29	7.21/6.24	7.15/6.56	7.17/6.54	7.15/6.63
1200	Spearman's ρ				0.642	0.610	0.651	0.659
	p-value				2.17E-07	1.27E-06	1.31E-07	8.10E-08
	Volume (cc)				2.963	3.260	3.573	3.898
	True Positive/False Negative/False Positive				35/20/2	38/20/4	30/27/6	26/27/6
	Pearson's r				0.907	0.859	0.873	0.865
	GS True Positive / GS False Positive				7.17/6.25	7.05/6.5	7.13/6.56	7.12/6.59

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