

Interobserver and sequence variability in the delineation of pelvic organs at risk on magnetic resonance images

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SUPPLEMENTARY TABLE 1. Comparison of the volume of each organ delineated by two observers and auto-segmentation

		Bladder	Rectum	Anal canal	Femoral head _L	Femoral head _R
Volume(cm3)						
R1	T1WI	237.074±132.318	45.463±16.434	7.299±1.620	75.951±12.772	74.035±11.360
	T1dixonc	305.863±152.644	48.239±18.382	7.329±1.819	75.778±12.034	75.460±12.089
	T2WI	213.734±125.164	46.598±16.412	9.590±2.668	71.780±12.155	72.197±10.626
R2	T1WI	237.357±127.505	44.884±14.573	7.407±1.552	80.358±12.151	79.621±10.993
	T1dixonc	296.087±146.813	46.393±15.176	7.584±1.717	75.115±12.403	76.751±11.427
	T2WI	225.209±125.934	43.601±12.268	8.273±1.843	80.944±12.236	80.292±10.921
Auto	T1WI	237.919±119.003	39.586±13.126	7.047±1.970	71.209±16.449	70.697±11.696
	T1dixonc	288.749±137.264	29.838±10.975	8.369±2.892	72.994±11.003	76.307±12.378
	T2WI	205.746±121.853	37.329±12.193	9.816±2.492	77.165±12.275	75.199±10.544
P value						
R1-R2	T1WI	0.770	0.888	0.888	0.003	0.001
	T1dixonc	0.024	0.443	0.871	0.673	0.170
	T2WI	0.001	0.068	0.048	< 0.001	< 0.001
R2-R2	T1WI- T1dixonc	< 0.001	0.031	0.888	< 0.001	< 0.001
	T1WI- T2WI	< 0.001	0.370	0.006	0.011	0.325
	T2WI- T1dixonc	< 0.001	0.021	0.011	< 0.001	< 0.001
R1-Auto	T1WI	0.538	0.033	0.535	0.083	0.056
	T1dixonc	0.030	< 0.001	0.123	0.088	0.670
	T2WI	0.139	0.001	0.871	0.007	0.035
R2-Auto	T1WI	0.820	0.026	< 0.001	< 0.001	< 0.001
	T1dixonc	0.251	< 0.001	0.179	0.112	0.766
	T2WI	< 0.001	0.004	0.005	< 0.001	< 0.001
Auto-Auto	T1WI- T1dixonc	0.001	< 0.001	0.005	0.567	< 0.001
	T1WI- T2WI	< 0.001	0.041	< 0.001	< 0.001	< 0.001
	T2WI- T1dixonc	< 0.001	< 0.001	0.002	0.001	0.405

L = left; R = right; R1 and R2 = two observers, pelvic oncologists; T1dixonc = contrast enhanced Dixon T1-weighted; T1WI = T1-weighted; T2WI = T2-weighted

SUPPLEMENTARY TABLE 2. Intraclass correlation coefficients (ICCs) for the volume of organs at risk (OARs) between different sequences for observer R2

	T1WI-T1dixonc	T1WI-T2WI	T2WI-T1dixonc
OARs	ICC (95% CI)	ICC (95% CI)	ICC (95% CI)
Bladder	0.833 (0.291–0.943) p < 0.001	0.992 (0.907–0.998) p < 0.001	0.788 (0.127–0.930) p < 0.001
Rectum	0.965 (0.921–0.984) p < 0.001	0.948 (0.891–0.975) p < 0.001	0.892 (0.757–0.951) p < 0.001
Anal canal	0.660 (0.393–0.824) p < 0.001	0.614 (0.236–0.814) p < 0.001	0.418 (0.086–0.672) p = 0.007
Femoral head _L	0.894 (0.001–0.975) p < 0.001	0.993 (0.983–0.997) p < 0.001	0.873 (–0.019–0.969) p < 0.001
Femoral head _R	0.935 (0.612–0.979) p < 0.001	0.988 (0.972–0.995) p < 0.001	0.909 (0.446–0.972) p < 0.001

CI: confidence interval; L = left; R = right; T1dixonc = contrast enhanced Dixon T1-weighted; T1WI = T1-weighted; T2WI = T2-weighted

SUPPLEMENTARY TABLE 3. Intraclass correlation coefficients (ICC) between automatic segmentation and manual contour volumes delineated by different observers (R1, R2) in three sequences

		T1WI		T1dixonc		T2WI	
	OARs	ICC (95%CI)	P	ICC (95%CI)	P	ICC (95%CI)	P
R1-Auto	Bladder	0.933 (0.863–0.968)	<0.001	0.956 (0.900–0.980)	<0.001	0.983 (0.962–0.992)	<0.001
	Rectum	0.517 (0.198–0.738)	0.001	0.272 (–0.097–0.593)	0.005	0.446 (0.069–0.704)	0.001
	Anal canal	0.028 (–0.085–0.591)	0.063	0.002 (–0.037–0.077)	0.468	0.026 (–0.353–0.390)	0.447
	Femoral head _L	0.517 (0.203–0.737)	0.001	0.715 (0.478–0.855)	<0.001	0.616 (0.285–0.807)	<0.001
	Femoral head _R	0.673 (0.444–0.844)	<0.001	0.631 (0.348–0.809)	<0.001	0.694 (0.440–0.844)	<0.001
R2-Auto	Bladder	0.937 (0.871–0.970)	<0.001	0.971 (0.941–0.986)	<0.001	0.975 (0.823–0.992)	<0.001
	Rectum	0.581 (0.274–0.780)	<0.001	0.245 (–0.097–0.561)	0.009	0.548 (0.191–0.768)	<0.001
	Anal canal	0.510 (0.188–0.734)	0.002	0.166 (–0.192–0.492)	0.184	0.345 (–0.004–0.624)	0.010
	Femoral head _L	0.534 (0.108–0.773)	<0.001	0.816 (0.645–0.909)	<0.001	0.909 (0.492–0.971)	<0.001
	Femoral head _R	0.645 (–0.069–0.881)	<0.001	0.783 (0.587–0.892)	<0.001	0.837 (0.106–0.952)	<0.001

OARs = organs at risk; T1dixonc = contrast enhanced Dixon T1-weighted; T1WI = T1-weighted; T2WI = T2-weighted

SUPPLEMENTARY TABLE 4. Comparison of two observers, R1 and R2, with automatic segmentation (Mean $\pm$ SD)

		R1-automatic segmentation			R2-automatic segmentation		
OARs		T1WI	T1dixonc	T2WI	T1WI	T1dixonc	T2WI
DSC	Bladder	0.877 $\pm$ 0.192	0.882 $\pm$ 0.181	0.891 $\pm$ 0.182	0.878 $\pm$ 0.192	0.884 $\pm$ 0.180	0.891 $\pm$ 0.183
	Rectum	0.739 $\pm$ 0.185	0.664 $\pm$ 0.177	0.725 $\pm$ 0.172	0.750 $\pm$ 0.189	0.673 $\pm$ 0.189	0.763 $\pm$ 0.177
	Anal canal	0.662 $\pm$ 0.162	0.647 $\pm$ 0.172	0.669 $\pm$ 0.157	0.649 $\pm$ 0.163	0.647 $\pm$ 0.186	0.696 $\pm$ 0.153
	Femoral head _L	0.856 $\pm$ 0.182	0.876 $\pm$ 0.164	0.886 $\pm$ 0.166	0.881 $\pm$ 0.193	0.890 $\pm$ 0.167	0.922 $\pm$ 0.172
	Femoral head _R	0.878 $\pm$ 0.168	0.866 $\pm$ 0.163	0.900 $\pm$ 0.163	0.881 $\pm$ 0.171	0.893 $\pm$ 0.168	0.915 $\pm$ 0.171
	Averaged DSC	0.802 $\pm$ 0.130	0.787 $\pm$ 0.140	0.815 $\pm$ 0.122	0.809 $\pm$ 0.141	0.796 $\pm$ 0.149	0.838 $\pm$ 0.115
95% HD (mm)	Bladder	10.695 $\pm$ 11.041	10.631 $\pm$ 10.463	6.900 $\pm$ 5.718	10.577 $\pm$ 10.939	10.906 $\pm$ 0.654	6.641 $\pm$ 5.916
	Rectum	12.589 $\pm$ 10.885	10.877 $\pm$ 6.362	11.238 $\pm$ 6.499	10.655 $\pm$ 10.383	9.668 $\pm$ 4.817	7.945 $\pm$ 4.674
	Anal canal	5.596 $\pm$ 2.713	6.308 $\pm$ 3.074	6.548 $\pm$ 2.426	5.911 $\pm$ 2.664	6.212 $\pm$ 2.771	5.166 $\pm$ 1.981
	Femoral head _L	5.047 $\pm$ 2.432	4.611 $\pm$ 1.866	5.386 $\pm$ 2.290	4.304 $\pm$ 1.618	4.314 $\pm$ 1.618	3.198 $\pm$ 1.193
	Femoral head _R	4.890 $\pm$ 1.901	6.292 $\pm$ 5.230	4.208 $\pm$ 1.855	4.336 $\pm$ 2.025	4.751 $\pm$ 4.263	3.172 $\pm$ 1.036
	Averaged 95% HD	7.763 $\pm$ 7.781	7.744 $\pm$ 6.593	6.856 $\pm$ 4.810	7.157 $\pm$ 7.509	7.170 $\pm$ 6.260	5.224 $\pm$ 3.984

DSC = dice similarity coefficient; HD = Hausdorff distance; T1dixonc = contrast enhanced Dixon T1-weighted; T1WI = T1-weighted; T2WI = T2-weighted

SUPPLEMENTARY TABLE 4. Intraclass correlation coefficients (ICC) for the volume between the different sequences for automatic segmentation

T1WI-T1dixonc			T1WI -T2WI		T2WI-T1dixonc	
OARs	ICC (95%CI)	P	ICC (95%CI)	P	ICC (95%CI)	P
Bladder	0.807 (0.424~0.924)	< 0.001	0.909 (0.660~0.966)	<0.001	0.754 (-0.040~0.927)	< 0.001
Rectum	0.565 (-0.039~0.826)	< 0.001	0.897 (0.778~0.952)	<0.001	0.632 (0.083~0.849)	< 0.001
Anal canal	0.539 (0.173~0.764)	< 0.001	0.377 (-0.106~0.718)	<0.001	0.588 (0.200~0.799)	< 0.001
Femoral head _L	0.637 (0.361~0.811)	< 0.001	0.696 (0.374~0.856)	<0.001	0.834 (0.495~0.935)	< 0.001
Femoral head _R	0.779 (0.285~0.917)	< 0.001	0.852 (0.314~0.951)	<0.001	0.871 (0.747~0.937)	< 0.001