

Table S1 Patient demographics and left ventricular function

Parameters	All Cohorts			BAV Phenotypes				Regurgitation Status			Outcome		
	Control	BAV	P	R/L	R/N	Type0	P	BAV-No/Trivial REG	BAV-REG	P	No Surgery	Surgery	P
N (female)	25 (7)	73 (20)	-	45 (13)	10 (2)	18 (5)	-	38 (16)	35 (4)	-	49 (13)	24 (7)	-
Age (years)	38±14	50±15	0.003*	49±17	57±7	47±12	0.267	48±16	52±13	0.265	48±16	53±13	0.055
Annulus (mm/m ²)	14.91±2.18	15.36±1.8	0.34	15.64±1.89	15±1.29	14.96±1.97	0.41	14.85±2.07	15.56±1.6	0.12	14.89±1.96	15.93±1.44	0.03*
SoV (mm/m ²)	16.58±2.29	18.68±2.46	<0.001*	18.87±2.48	19.18±1.86	17.97±2.69	0.34	17.97±2.19	19.37±2.55	0.01*	18.25±2.21	19.54±2.77	0.03*
STJ (mm/m ²)	15.02±1.9	19.13±4.08	<0.001*	19.75±3.51	19.74±1.19	17.25±5.7	0.08	19.11±3.49	19.72±3.27	0.45	19.14±3.27	19.96±3.56	0.34
BSA	1.95±0.30	2.01±0.24	0.503	1.99±0.27	2.01±0.10	2.03±0.22	0.882	1.95±0.28	2.06±0.15	0.05	1.96±0.26	2.08±0.19	0.03*
Heart rate (bpm)	62.73±10.64	63.04±11.40	0.923	66.16±11.50	53.33±5.07	60.61±10.41	0.004*	64.10±10.56	61.66±12.45	0.38	61.48±12.13	65.59±9.80	0.374
SBP (mmHg)	113.41±18.62	114.07±16.20	0.899	115.66±17.26	111.66±8.01	111.25±16.94	0.587	116.26±18.64	111.20±12.02	0.208	112.88±17.27	116.09±14.72	0.235
DBP (mmHg)	62.33±16.97	67.85±12.46	0.186	66.26±13.10	73.33±9.28	68.93±11.90	0.284	71.34±12.81	63.27±10.53	0.008*	67.32±11.83	67.68±13.77	0.338
LVESV (mL)	62.06±22.12	82.38±54.19	0.124	90.36±63.86	70.88±30.94	69.06±31.23	0.302	69.70±31.74	99.29±71.52	0.023*	72.62±29.34	105.22±83.56	0.174
LVEDV (mL)	161.94±45.44	189.20±75.33	0.147	202.90±80.82	176.22±62.42	162.97±61.38	0.145	167.41±55.23	218.25±88.72	0.016*	171.40±54.23	229.13±99.36	0.163
LVEF (%)	61.87±5.93	58.21±10.26	0.151	58.01±10.29	60.83±6.36	57.39±11.92	0.704	58.95±9.41	57.23±11.38	0.493	57.92±8.98	58.23±12.92	0.751
LVCO	6.48±1.66	7.05±2.31	0.341	7.45±2.47	5.75±2.18	6.65±1.63	0.118	6.46±1.60	7.85±2.85	0.015*	6.42±1.63	8.18±2.99	0.111
LV mass (g)	102.87±32.51	132.68±50.36	0.020*	140.01±54.80	133.88±33.41	115.40±44.26	0.227	120.09±41.56	149.62±56.63	0.021*	117.83±41.18	161.41±57.19	0.026*

Values are shown as mean ±standard deviation or n. *, statistically significant results. For normally distributed variables, an unpaired two-tailed equal variance Student's t-test (significant for P<0.05) and ANOVA (Bonferroni corrected P<0.05) were applied. For skewed variables, equivalent non-parametric tests were used. BSA, body surface area; SoV, sinus of Valsalva; STJ, sinotubular junction; SBP, systolic blood pressure; DBP, diastolic blood pressure; LVEDV, left ventricular end-diastolic volume; LVEF, left ventricular ejection fraction; LVESV, left ventricular end-systolic volume; R/L, right-left coronary cusp fusion; R/N, right-noncoronary cusp fusion; LVCO, left ventricular cardiac output.

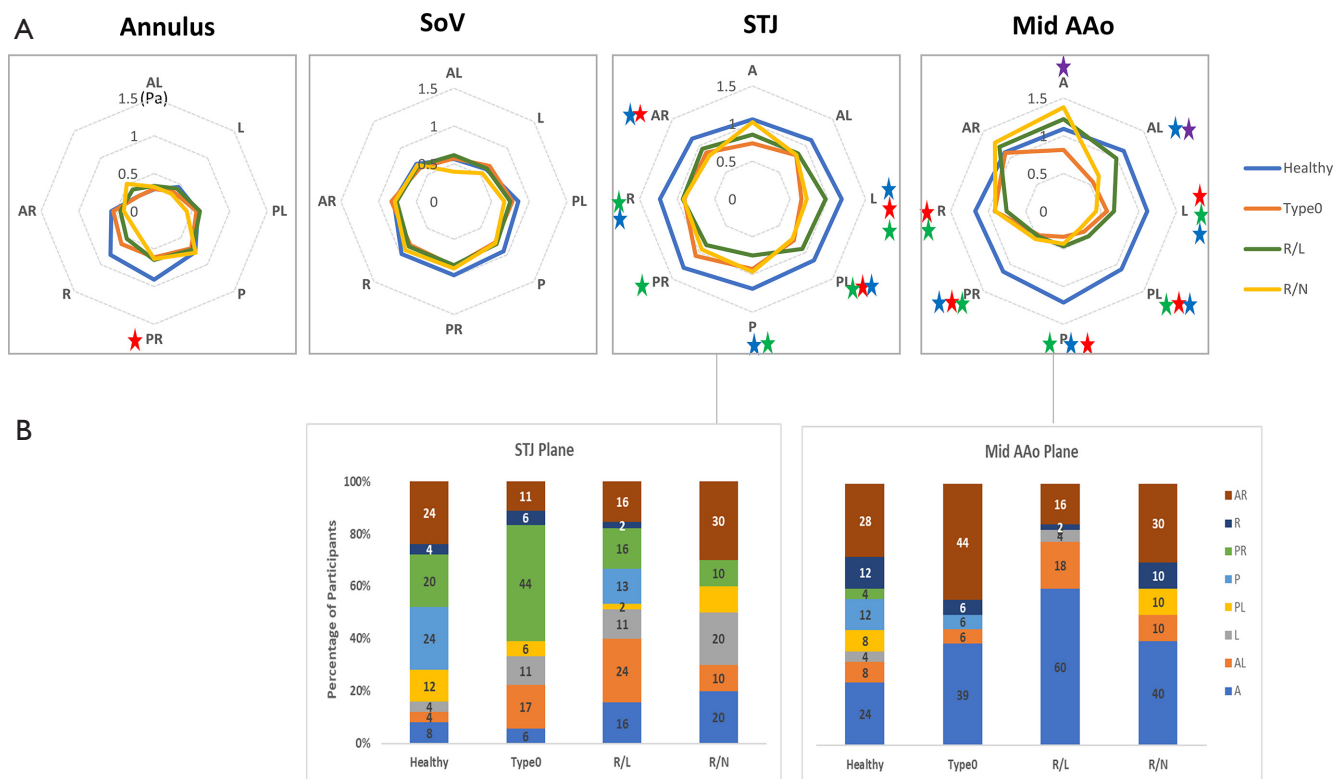


Figure S1 Planar peak systolic wall shear stress (WSS_{sys}) and flow displacement (FD_{sys}) percentage per octant for each group. (A) Peak WSS_{sys} at four predefined planes in each octant, comparing four groups: healthy control, right-left coronary (R/L) cusp fusion, right-non coronary (R/N) cusp fusion and Type0. Green star indicates significant P-value for pairwise comparison between healthy and R/L. Red star indicates significant P-value for pairwise comparison between healthy and R/N. Blue star indicates significant P-value for pairwise comparison between healthy and Type 0. Purple star indicates significant P-value for pairwise comparison between Type0 and R/L. (B) The percentage of FD_{sys} direction per octants for the groups are provided, to show the conformity of FD_{sys} direction with the areas of highest WSS_{sys} . BAV-No/Trivial REG, bicuspid aortic valve with no or trivial regurgitation; BAV-REG, bicuspid aortic valve with regurgitation; SoV, sinus of Valsalva; STJ, sinotubular junction; AAO, ascending aorta. Stars show statistically significant level <0.05 .

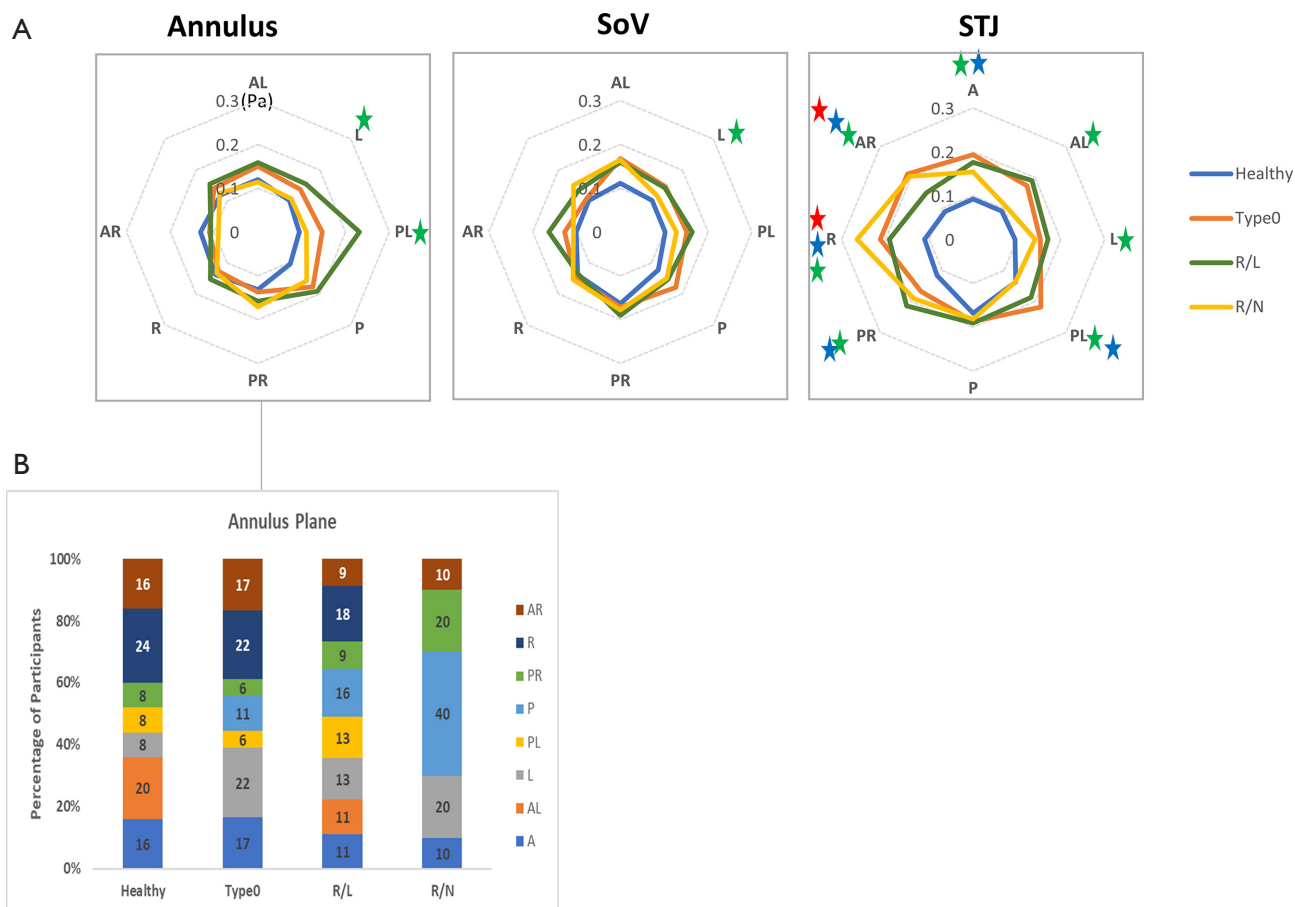


Figure S2 Planar peak regurgitant diastolic wall shear stress (WSS_{Dia}) and flow displacement (FD_{Dia}) percentage per octant for each group. (A) Peak regurgitant WSS_{Dia} at three predefined planes in each octant, comparing four groups: healthy control, right-left coronary (R/L) cusp fusion, right-noncoronary (R/N) cusp fusion and Type0. Green star indicates significant P-value for pairwise comparison between healthy and R/L. Red star indicates significant P-value for pairwise comparison between healthy and R/N. Blue star indicates significant P-value for pairwise comparison between healthy and Type 0. (B) The percentage of peak regurgitant FD_{Dia} direction per octants for the groups are provided, to show the conformity of FD_{Dia} direction with the areas of highest WSS_{Dia} . BAV-No/Trivial REG, bicuspid aortic valve with no or trivial regurgitation; BAV-REG, bicuspid aortic valve with regurgitation; SoV, sinus of valsalva; STJ, sinotubular junction. Stars show statistically significant level <0.05 .

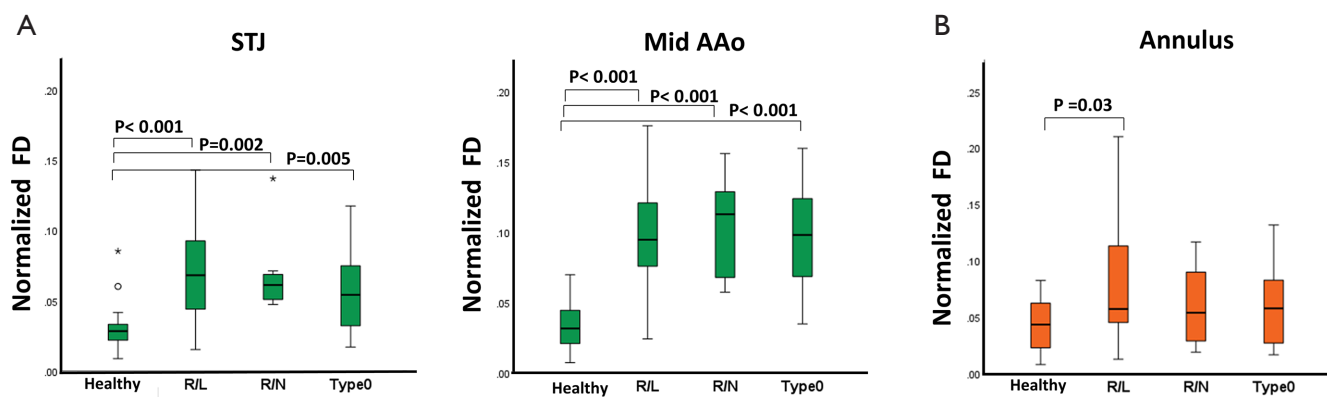


Figure S3 Comparison of normalized flow displacement (FD). (A) At peak systole (FD_{sys}) at two predefined planes (STJ and Mid-AAo), and (B) At peak regurgitant diastole (FD_{dia}) at the Annulus plane comparing four groups: healthy control, right-left (R/L) coronary cusp fusion, right-non (R/N) coronary cusp fusion and Type0. BAV, bicuspid aortic valve; STJ, sinotubular junction; AAo, ascending aorta.