

Supplemental Material

Supplemental Table 1: Pacing protocol to reproduce pentageminal PVCs (20% PVC burden) and tachycardia (rapid pacing) from 4 different origins as performed in each animal. A single PAC coupling cycle length was performed due to decremental conduction of the AV node resulting in variable and unpredictable R-R interval.

<i>Location</i>	<i>Rapid pacing</i>	<i>PVC coupling Interval (ms)</i>			
<i>LA appendage</i>	400	200	NA	NA	NA
<i>RV apex</i>	400	200	250	300	375
<i>RVOT</i>	400	200	250	300	375
<i>LV free wall</i>	400	200	250	300	375

Supplemental Table 2: Multiple comparisons of dispersion of QRS-to-Peak Strain (ms) between different PAC and PVC coupling intervals by different locations. *Significant differences are indicated by bold p-values. Inference and confidence intervals were adjusted for multiple comparisons within each location using a Bonferroni-corrected significance value of: (*) 0.005 (†) 0.05. Note: All coupling intervals (200, 250, 300, 375ms) represent ectopic beats, except for 400ms (150 bpm), which represents rapid ventricular and atrial pacing, respectively. RV= RV apex, RVOT= RV outflow tract, LV = LV free wall.*

Location	Coupling Interval Difference	Estimate	Adjusted 95% CI	P
LV PVC *	250-200	53	(-20, 124)	0.0365
	300-200	42	(-30, 114)	0.0926
	375-200	146	(67, 226)	<0.0001
	400-200	-17	(92, 59)	0.52
	300-250	-11	(-83, 61)	0.66
	375-250	94	(14, 173)	0.0011
	400-250	-69	(-144, 6)	0.0093
	375-300	104	(25, 184)	0.0004
RV PVC *	400-300	-58	(-134, -17)	0.0262
	400-375	-163	(-245, -81)	<0.0001
	250-200	18	(-54, 90)	0.47
	300-200	79	(6.4, 151)	0.0024
	375-200	125	(45, 204)	<0.0001
	400-200	10	(-65, 85)	0.69
	300-250	61	(-11, 133)	0.0166
	375-250	107	(27, 186)	0.0003
RVOT PVC *	400-250	-7.8	(-83, 67)	0.76
	375-300	46	(-33, 125)	0.0930
	400-300	-68	(-144, 6.8)	0.0100
	400-375	-163	(-245, -81)	<0.0001
	250-200	38	(-34, 110)	0.17
	300-200	46	(-26, 118)	0.0650
	375-200	106	(26, 185)	0.0003
	400-200	-21	(-96, 54)	0.41
PAC †	300-250	8.1	(-64, 80)	0.74
	375-250	68	(-12, 147)	0.0151
	400-250	-59	(-134, 16)	0.0248
	375-300	60	(-20, 139)	0.0312
	400-300	-67	(-142, 8)	0.0113
	400-375	-127	(-209, -44)	<0.0001
	375-300	30	(-43, 101)	0.42

Supplemental Table 3: Multiple comparisons of dispersion of QRS-to-Peak Strain (ms) between ectopic beats locations (LV, RV and RVOT PVC and PAC) at 200, 250, 300 and 375ms; and rapid ventricular pacing (VP) at 400ms. Significant differences are indicated by **bold p-values**. Inference and confidence intervals were adjusted for multiple comparisons within each location using a Bonferroni-corrected significance value of: (*) 0.017 (†) 0.008. RV= RV apex, RVOT= RV outflow tract, LV = LV free wall.

Coupling Interval	Location Difference	Estimate	Adjusted 95% CI	P
200 *	LV-RV	-7.3	(-68, 54)	0.77
	RVOT-LV	12	(-49, 72)	0.63
	RVOT-RV	4.4	(-56, 65)	0.86
250 *	LV-RV	27	(-33, 88)	0.27
	RVOT-LV	-3.0	(-64, 58)	0.90
	RVOT-RV	24	(-36, 85)	0.32
300 †	LV-RV	-44	(-93, 5.0)	0.0776
	LV-PAC	122	(-33, 65)	0.0004
	RVOT-LV	16	(-77, 21)	0.52
	RVOT-PAC	138	(112, 24)	<0.0001
	RVOT-RV	-28	(34, 211)	0.25
	RV-PAC	166	(-52, 84)	<0.0001
375 †	LV-RV	14	(-66, 95)	0.62
	LV-PAC	198	(78, 255)	<0.0001
	RVOT-LV	-29	(-110, 51)	0.32
	RVOT-PAC	169	(83, 254)	<0.0001
	RVOT-RV	-15	(-95, 66)	0.61
	RV-PAC	183	(98, 269)	<0.0001
400 †	LV-RV	-34	(-100, 32)	0.20
	RVOT-LV	7.2	(-58, 73)	0.79
	RVOT-RV	-27	(-92, 39)	0.31

Supplemental Table 4: Multiple comparisons of dispersion of stroke volume (mL) between different PAC and PVC coupling intervals by different locations. *Significant differences are indicated by bold p-values. Inference and confidence intervals were adjusted for multiple comparisons within each location using a Bonferroni-corrected significance value of: (*) 0.005 (†) 0.017. Note: Note: All coupling intervals (200, 250, 300, 375ms) represent ectopic beats, except for 400ms (150 bpm), which represents rapid ventricular and atrial pacing in PVCs and PAC, respectively. RV= RV apex, RVOT= RV outflow tract, LV = LV free wall.*

Location	Coupling Interval Difference	Estimate	95% CI	P
LV PVC *	250-200	2.4	(1.5, 3.4)	<0.0001
	300-200	5.7	(4.8, 6.6)	<0.0001
	375-200	9.7	(8.8, 10.6)	<0.0001
	400-200	13.9	(13.0, 14.7)	<0.0001
	300-250	3.3	(2.3, 4.2)	<0.0001
	375-250	7.3	(6.3, 8.3)	<0.0001
	400-250	11.4	(10.5, 12.4)	<0.0001
	375-300	4.0	(3.0, 5.0)	<0.0001
	400-300	8.2	(7.3, 9.1)	<0.0001
	400-375	4.2	(3.3, 5.1)	<0.0001
RV PVC *	250-200	0.8	(-0.2, 1.7)	0.0232
	300-200	4.0	(3.0, 4.2)	<0.0001
	375-200	7.7	(6.7, 8.0)	<0.0001
	400-200	14.4	(13.5, 14.5)	<0.0001
	300-250	3.2	(2.2, 4.2)	<0.0001
	375-250	7.0	(5.9, 8.0)	<0.0001
	400-250	13.7	(12.7, 14.5)	<0.0001
	375-300	3.8	(2.7, 4.8)	<0.0001
	400-300	10.4	(9.5, 11.4)	<0.0001
	400-375	6.7	(5.7, 7.7)	<0.0001
RVOT PVC *	250-200	3.1	(2.2, 4.1)	<0.0001
	300-200	4.9	(4.0, 5.9)	<0.0001
	375-200	10.7	(9.8, 11.6)	<0.0001
	400-200	13.1	(12.3, 14.0)	<0.0001
	300-250	1.8	(0.8, 2.8)	0.0001
	375-250	7.6	(6.6, 8.5)	<0.0001
	400-250	10.0	(9.1, 11.0)	<0.0001
	375-300	5.7	(4.8, 6.7)	<0.0001
	400-300	8.2	(7.3, 9.1)	<0.0001
	400-375	2.5	(1.6, 3.4)	<0.0001
PAC †	400-300	13.0	(11.9, 14.0)	<0.0001
	375-300	4.3	(3.0, 5.6)	<0.0001
	400-375	8.7	(7.6, 9.7)	<0.0001

Supplemental Table 5. Multiple comparisons of dispersion of stroke volume (mL) between ectopic beats locations (LV, RV and RVOT PVC and PAC) at 200, 250, 300 and 375ms; and rapid ventricular pacing (VP) at 400ms. Significant differences are indicated by **bold p-values**. Inference and confidence intervals were adjusted for multiple comparisons within each location using a Bonferroni-corrected significance value of: (*) 0.017 (†) 0.008. RV= RV apex, RVOT= RV outflow tract, LV = LV free wall.

Coupling Interval	Location Difference	Estimate	95% CI	P
200 *	LV-RV	0.1	(-0.7, 0.8)	0.84
	RVOT-LV	1.6	(1.0, 2.3)	<0.0001
	RVOT-RV	1.6	(1.0, 2.4)	<0.0001
250 *	LV-RV	1.7	(1.0, 2.6)	<0.0001
	RVOT-LV	2.2	(1.3, 3.1)	<0.0001
	RVOT-RV	4.0	(3.1, 4.8)	<0.0001
300 †	LV-RV	1.8	(1.0, 2.7)	<0.0001
	LV-PAC	2.9	(1.7, 4.0)	<0.0001
	RVOT-LV	0.8	(-0.1, 1.7)	0.0192
	RVOT-PAC	3.7	(2.5, 4.9)	<0.0001
	RVOT-RV	2.6	(1.6, 3.5)	<0.0001
	RV-PAC	1.2	(-0.2, 2.0)	0.0110
375 †	LV-RV	2.0	(1.0, 3.0)	<0.0001
	LV-PAC	2.6	(1.5, 3.8)	<0.0001
	RVOT-LV	2.6	(1.7, 3.4)	<0.0001
	RVOT-PAC	5.2	(4.0, 6.3)	<0.0001
	RVOT-RV	4.6	(3.6, 5.5)	<0.0001
	RV-PAC	0.6	(-0.6, 1.6)	0.16
400 †	LV-RV	-0.5	(-1.3, 0.3)	0.11
	LV-PAC	1.9	(1.0, 2.7)	<0.001
	RVOT-LV	0.8	(0.02, 1.6)	0.0067
	RVOT-PAC	1.0	(0.2, 1.9)	0.0017
	RVOT-RV	0.3	(-0.5, 1.1)	0.24
	RV-PAC	1.4	(0.5, 2.2)	<0.0001

Supplemental Table 6: Multiple comparisons of dispersion of dP/dt_{max} between different PAC and PVC coupling intervals by different locations. *Significant differences are indicated by bold p-values. Inference and confidence intervals were adjusted for multiple comparisons within each location using a Bonferroni-corrected significance value of: (*) 0.005 (†) 0.017. Note: Note: All coupling intervals (200, 250, 300, 375ms) represent ectopic beats, except for 400ms (150 bpm), which represents rapid ventricular and atrial pacing in PVCs and PAC, respectively. RV= RV apex, RVOT= RV outflow tract, LV = LV free wall.*

Location	Coupling Interval Difference	Estimate	95% CI	P
LV *	250-200	290	(201, 379)	<0.0001
	300-200	744	(654, 833)	<0.0001
	375-200	934	(845, 1023)	<0.0001
	400-200	1431	(1347, 1516)	<0.0001
	300-250	454	(370, 538)	<0.0001
	375-250	644	(561, 727)	<0.0001
	400-250	1141	(1062, 1219)	<0.0001
	375-300	190	(106, 274)	<0.0001
	400-300	687	(608, 766)	<0.0001
RV *	400-375	497	(419, 575)	<0.0001
	250-200	330	(243, 417)	<0.0001
	300-200	655	(569, 745)	<0.0001
	375-200	965	(873, 1058)	<0.0001
	400-200	1345	(1263, 1426)	<0.0001
	300-250	327	(241, 412)	<0.0001
	375-250	634	(545, 726)	<0.0001
	400-250	1015	(935, 1093)	<0.0001
	375-300	309	(218, 400)	<0.0001
RVOT *	400-300	688	(608, 767)	<0.0001
	400-375	379	(293, 464)	<0.0001
	250-200	341	(257, 326)	<0.0001
	300-200	759	(677, 841)	<0.0001
	375-200	879	(799, 960)	<0.0001
	400-200	1179	(1102, 1256)	<0.0001
	300-250	418	(331, 504)	<0.0001
	375-250	538	(452, 623)	<0.0001
	400-250	838	(757, 919)	<0.0001
PAC ^b	375-300	120	(37, 203)	<0.0001
	400-300	420	(341, 499)	<0.0001
	400-375	300	(222, 377)	<0.0001
	400-300	1316	(1196, 1437)	<0.0001
	375-300	193	(60, 326)	0.0007
	400-375	1123	(1033, 1212)	<0.0001

Supplemental Table 7: Multiple comparisons of dP/dt_{max} between ectopic beats locations (LV, RV and RVOT PVC and PAC) at 200, 250, 300 and 375ms; and rapid ventricular pacing (VP) at 400ms. *Significant differences are indicated by bold p-values. Inference and confidence intervals were adjusted for multiple comparisons within each location using a Bonferroni-corrected significance value of: (*) 0.017 (†) 0.008. RV= RV apex, RVOT= RV outflow tract, LV = LV free wall.*

Coupling Interval	Location Difference	Estimate	95% CI	P
200 *	LV-RV	42	(-234, 119)	0.18
	RVOT-LV	176	(103, 250)	<0.0001
	RVOT-RV	219	(148, 290)	<0.0001
250 *	LV-RV	2.6	(-68, 74)	0.93
	RVOT-LV	227	(155, 300)	<0.0001
	RVOT-RV	230	(157, 303)	<0.0001
300 †	LV-RV	129	(49, 210)	<0.0001
	LV-PAC	296	(161, 431)	<0.0001
	RVOT-LV	192	(112, 271)	<0.0001
	RVOT-PAC	488	(353, 622)	<0.0001
	RVOT-RV	321	(241, 401)	<0.0001
	RV-PAC	167	(68, 265)	0.0013
	RV-PAC	167	(68, 265)	0.0013
375 †	LV-RV	11	(-73, 94)	0.72
	LV-PAC	293	(194, 392)	<0.0001
	RVOT-LV	121	(45, 198)	<0.0001
	RVOT-PAC	414	(316, 513)	<0.0001
	RVOT-RV	132	(49, 216)	<0.0001
	RV-PAC	282	(178, 385)	<0.0001
	RV-PAC	282	(178, 385)	<0.0001
400 †	LV-RV	129	(60, 198)	<0.0001
	LV-PAC	333	(259, 408)	<0.0001
	RVOT-LV	75	(7, 144)	0.0038
	RVOT-PAC	409	(334, 483)	<0.0001
	RVOT-RV	53	(-15, 122)	0.0371
	RV-PAC	462	(388, 537)	<0.0001
	RV-PAC	462	(388, 537)	<0.0001

Supplemental Videos

Supplemental Video 1. Representative case (No. 6) of short-coupled PVC (200ms) from the LV free wall region. Note the segments near the origin of short-coupled PVC (LV free wall: light blue and green segments) have their peak maximum contraction immediately after peak contraction of the preceding intrinsic normal beat, which appears as a long fused peak contraction between intrinsic and PVC beat in segments near PVC origin. Few milliseconds later, the peak contraction of segments away from PVC origin (septum: red and dark blue segments) is noted, while the first segments (near PVC origin) start relaxation.

Supplemental Video 2. Representative case (No. 6) of long-coupled PVC (375ms) from the same LV free wall region. Note the segments near the origin of a late-coupled PVC (LV free wall: light blue and green segments) have their peak radial strain after relaxation of the preceding beat is completed, causing dyskinesia of the opposite segments, while the segments away from PVC origin (septum: red and dark blue segments) have their peak contraction (radial strain) when the segments near PVC origin have already completed relaxation, leading to a visually apparent LV dyssynchrony.

Supplemental Video 3 Representative case (No. 6) of rapid VP 400ms from the LV free wall region. Note that most of the segments near the origin of VP (LV free wall: light blue and green segments) initiate their contraction after relaxation of the preceding beat is completed, followed few milliseconds later by segments away (septum: red and dark blue segments) from rapid VP site with some degree of dyssynchrony but not as prominent as PVCs despite a similar R-R interval (375ms).

Supplemental Video 4. Representative case (No. 6) of PACs 200ms (R-R interval 290 ms). Note the preserved / normal LV mechanics during PAC since all 6 segments activate almost simultaneously with their peak maximum contraction immediately after peak contraction of the preceding intrinsic normal beat.