

## Effect of right bundle branch block on T peak to end interval

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The interval between the peak and end of the T wave (TpTe) is an index of spatial dispersion in transmural cardiac repolarization (SDR). Children post cardiac surgery with right bundle branch block (RBBB) may have an altered SDR. Patients with right bundle branch block are purported to be at higher risk for arrhythmia. The measurement of TpTe in these children is potentially useful in assessment of arrhythmia risk.

**Aim:** We examined the behaviour of TpTe in the presence of right bundle branch block (RBBB) as a potential marker for arrhythmogenesis as compared to normal children.

**Methods:** We prospectively enrolled 45 children with RBBB for the study. In 3 non-surgical patients, RBBB occurred secondary to an underlying dilated cardiomyopathy (secondary to anthracycline in 2). In the other 42 patients, RBBB occurred following cardiac surgery. In this group, 15 had a Tetralogy of Fallot repair, 5 repair of double outlet right ventricle with pulmonary stenosis, 7 isolated large VSD repair, 3 patients had undergone a Rastelli operation for pulmonary atresia and VSD, 2 arterial switch operation for transposition of the great arteries, with VSD and pulmonary stenosis and pulmonary conduit, in 4 post complete atrio-ventricular septal defect repair. A cohort of 400 normal children served as controls. While in a quiet state a digital 12 lead electrocardiogram (ECG) was recorded using a MAC 5500 (Marquette Medical Systems) at a speed of 50 mm/s. ECG's were stored on a server and subsequently retrieved for measurement. In the RBBB patients, the right ventricular (RV) echocardiographic end diastolic dimension was measured (average of 3 cycles) from a parasternal long axis M mode view using a GE Vivid 7 echocardiography machine, and a Z score was calculated (Kampmann C et al, Heart 2000; 83(6): 667–72).

The following parameters were measured using on screen callipers. From the 12-lead resting digital ECG; TpTe, RR, QT, and JT intervals were measured (leads II and V5). To correct for heart rate effects we applied the Bazett formula ( $TpTe/RR^{1/2}$ ), TpTe B; and the Fridericia formula ( $TpTe/RR^{1/3}$ ) TpTe F, and calculated the TpTe/QT and TpTe/JT. Results were compared to normal data obtained from 400 children in whom the same parameters were measured. RV Z scores were tested against measured parameters. Descriptive and analytical statistics were conducted using SPSS version 19 software with significance level set at  $p < 0.05$ .

**Results:** median age of patients was 7,6 years  $SD \pm 5,9$  years. For controls 5,3 years  $\pm 5,1$ (range 0.1 to 16.7 years). Median age at operation was 0,6 years  $\pm 1,6$  years. At examination follow up time post operation was median 7,4 years  $\pm 5,0$ . Mean QRS duration in RBBB group 120ms (range 88-168 ms). Mean age for the controls was 5.3 years, median 4.4 years, range 0.1 to 16.7 years. TpTe in leads II and V5 was significantly longer in RBBB patients compared to controls. TpTeB, and TpTeF in leads II and V5 significantly longer than controls. The TpTe/JT (leads II and V5) higher in RBBB patients than controls (this ratio was utilised to eliminate potential effects of QRS prolongation on TpTe/QT). Median RV Z score 4.05 ( $\pm 2.2$ ) The Z score correlated poorly with TpTe and derived ratios. All measured values in RBBB patients were significantly different from controls  $p < 0.05$ . No patients have thus far presented with life threatening arrhythmias.

Discussion: The TpTe reflects global myocardial repolarization and is a surrogate diagnostic parameter. In our cohort of RBBB patients, TpTe and ratio to JT and QT were found to be prolonged when compared to control subjects. TpTe parameters did not correlate well with RV size although sample numbers may play a factor. No patients to date have developed important ventricular arrhythmia. The role of right ventricular haemodynamics on TpTe is under further investigation.

**Table 1 Results of measured and calculated intervals**

	<u>Controls</u>	<u>RBBB</u>
Age years	5,3 ± 5.1	7,6 ± 5,9*
TpTe II	69 ± 10	93 ± 15*
TpTe V5	69 ± 10	95 ± 14*
TpTe B II	89,6 ± 13	118 ± 23*
TpTe B V5	89 ± 13	120 ± 20*
TpTe F II	82 ± 11	111 ± 17*
TpTe/JT II	0,28 ± 0,04	0,42 ± 0,1*
TpTe/JT V5	0,28 ± 0,04	0,42 ± 0,1*

\* P>0.,05

B = Bazett F = Fridericia







