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QRS 3D VOLTAGE TIME INTEGRAL (3D QRS AREA) IN CARDIOMYOPATHY AND NARROW QRS COMPLEX

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Background

- The instantaneous absolute 3D ECG voltage integrated over the duration of QRS (VTI_{QRS-3D}), also measured as 3D QRS area, is a novel marker that is more sophisticated than either QRS duration or voltage [3].
- Recent literature has evaluated 3D QRS area in heart failure patients with prolonged QRS duration to evaluate response to cardiac resynchronization therapy[1,2,4].

Research Question

VTI_{QRS-3D} has not been evaluated in cardiomyopathy patients with **normal** QRS duration (≤120 ms).

Methods and Materials

ECGs and 2D Echos from 314 subjects with systolic cardiomyopathy were retrospectively reviewed

Baseline 12-lead ECGs were converted to orthogonal X, Y, Z leads using Kors matrix.

VTI_{QRS-3D} was obtained by voltage time integral of the root-mean-squared 3D ECG.

VTI_{QRS-3D} distribution was obtained and correlated with demographic, anthropometric and echocardiographic variables

Main Findings

1. VTI_{QRS-3D} was significantly **larger in patients with cardiomyopathy** compared to controls (48 ± 21 vs. 38 ± 9, p<0.0001).
2. VTI_{QRS-3D} was **negatively correlated** with LVEF and **positively correlated** with LV dimensions (all p<0.0001).
3. VTI_{QRS-3D} was **lower** for females, whites and those with ischemic cardiomyopathy (Table).

Conclusion

VTI_{QRS-3D} is increased in patients with systolic cardiomyopathy. Further, it is strongly correlated with echocardiography. It remains to be seen if automated calculation of VTI_{QRS-3D} on routine ECG can facilitate early recognition of cardiomyopathy.

Table

Table. Demographic and echocardiographic associations with QRS 3D voltage time integral

Variable	n	VTI_{QRS-3D}, μVs Mean ± SD or β -coefficient	p-value
Patients with systolic cardiomyopathy (n=314)			
Age, years	314	-0.02	0.8
Sex			0.9
Male	206	48 ± 19	
Female	108	49 ± 25	
Race			**0.004**
White	197	45 ± 18	
Black	79	54 ± 24	
Other/unknown	38	53 ± 28	
Type of cardiomyopathy			**0.001**
Ischemic	168	45 ± 18	
Non-ischemic	146	52 ± 24	
Echocardiography	444		
LV ejection fraction, %		-0.42	**<0.0001**
LVIDd, cm		7.9	**<0.0001**
LVIDs, cm		8.1	**<0.0001**
Interventricular septum, cm		21	**<0.0001**
LV posterior wall, cm		33	**<0.0001**

IDd, internal dimension in diastole; IDs, internal dimension in systole; LV, left ventricular; VTI, voltage time integral

References

Disclosures

Nothing to disclose

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