

# MEXILETINE: A TREATMENT FOR ALL CAUSE QT PROLONGATION

**Muhammad Abubakar Shakir, MD; Jacob Reiss, MD;  
Meghan Buckley, MS; William Surkis, MD; Gan-Xin Yan,  
MD, PhD**  
Lankenau Medical Center/Main Line Health, Wynnewood, PA

## BACKGROUND

- Prolongation of QT interval on electrocardiogram (EKG) can be acquired or congenital. It is associated with a lethal ventricular arrhythmia termed Torsades de Pointes (TdP).
- Mexiletine, a class 1b antiarrhythmic, is a blocker of the late sodium current ( $I_{Na,L}$ ) and has shown a QT shortening effect (1).

The aim of our study was to evaluate the role of mexiletine in shortening QT interval in patients with acquired QT prolongation regardless of etiology.

## METHODS

- From October 2010 to March 2019, 27 patients with acquired QT prolongation were treated with mexiletine 150mg twice daily to 300mg twice daily.
- Causes of QT prolongation included stress-induced cardiomyopathy, drug induced QT prolongation, and QT prolongation from an unidentified etiology.
- To evaluate QT shortening effects, a 12 lead EKG was obtained before and after mexiletine initiation and the following parameters were compared: QTc interval using Bazett formula, QRS duration, Jpoint-Tpeak (J-Tp), and Tpeak-Tend (Tp-Te).
- All variables were expressed as mean  $\pm$  standard error or frequency (%). A 2-sided t-test was used to compare the pre and post-mexiletine parameters with significance assessed at the 0.05 level.

## RESULTS

### Demographics:

- 16 (59%) male patients with an average age of 63 years old.
- 11 (41%) female patients with an average age of 71 years old.

### Causes of QTc prolongation in patients:

- Dofetilide in 18 (67%), stress induced cardiomyopathy in 2 (7%), amiodarone and levofloxacin in 2 (7%), amiodarone alone in 1 (4%), arsenic in 1 (4%), sotalol in 1 (4%), and unidentified in 2 (7%).

### Pre and Post-Mexiletine Parameters:

- QTc interval:  $542 \pm 17$  ms to  $477 \pm 9$  ms ( $p < 0.05$ ),  $\Delta$ QTc:  $65 \pm 12$  ms
- J-Tp:  $282 \pm 15$  ms to  $243 \pm 11$  ms ( $p < 0.05$ )
- Tp-Te:  $108 \pm 9$  ms to  $91 \pm 4$  ms ( $p < 0.05$ )
- QRS duration:  $111 \pm 5$  ms to  $109 \pm 5$  ms ( $p = 0.71$ )

## DISCLOSURE INFORMATION

Author Disclosures: None.

# MEXILETINE SHORTENS QT INTERVAL

## REGARDLESS OF ETIOLOGY OF QT PROLONGATION.

## THIS HAS THE POTENTIAL TO PREVENT TORSADES DE POINTES.

For more information and detailed results, please scan the QR code:



SCAN ME

Email: [abubakar.shakir@gmail.com](mailto:abubakar.shakir@gmail.com)  
Twitter: [@mashakir\\_md](https://twitter.com/mashakir_md)

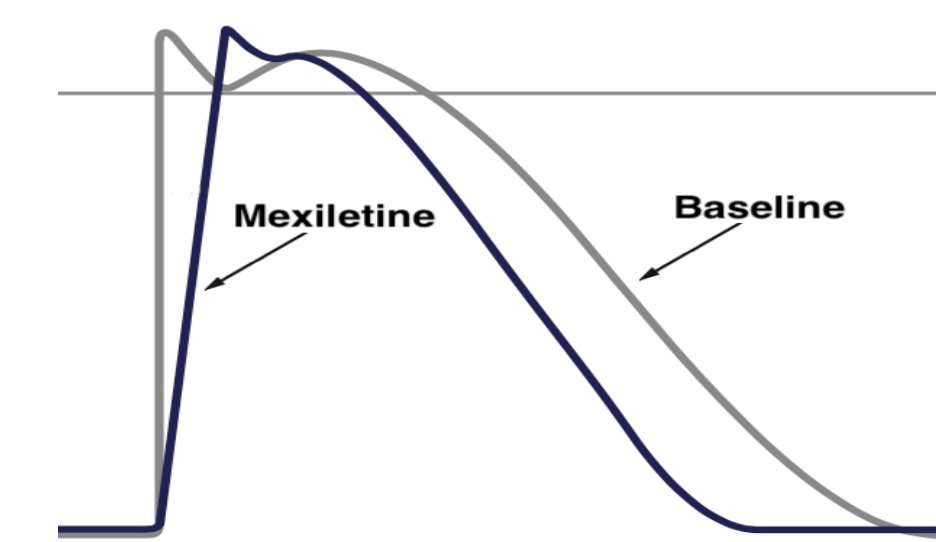
## DISCUSSION

- Mexiletine is an  $I_{Na,L}$  blocker. This leads to decreased spatial repolarization and prevention of early afterdepolarizations (EADs), both of which are crucial factors for the origination of Torsades de Pointes (TdP) (2,3).
- Based on guidelines, Mexiletine can be used in the therapy of ventricular arrhythmias and to shorten QT interval in patients with congenital LQT3 syndrome (4).
- More recently, it has also been shown to shorten drug-induced QT prolongation in clinical and animal models.  $I_{Na,L}$  is a common pharmacotherapeutic target for QT prolongation and TdP (1,5).
- Our study shows that mexiletine may have a role in the shortening of QT interval in a clinical setting, regardless of etiology of prolongation. This in turn has the potential to prevent lethal ventricular arrhythmias.

## CONCLUSION

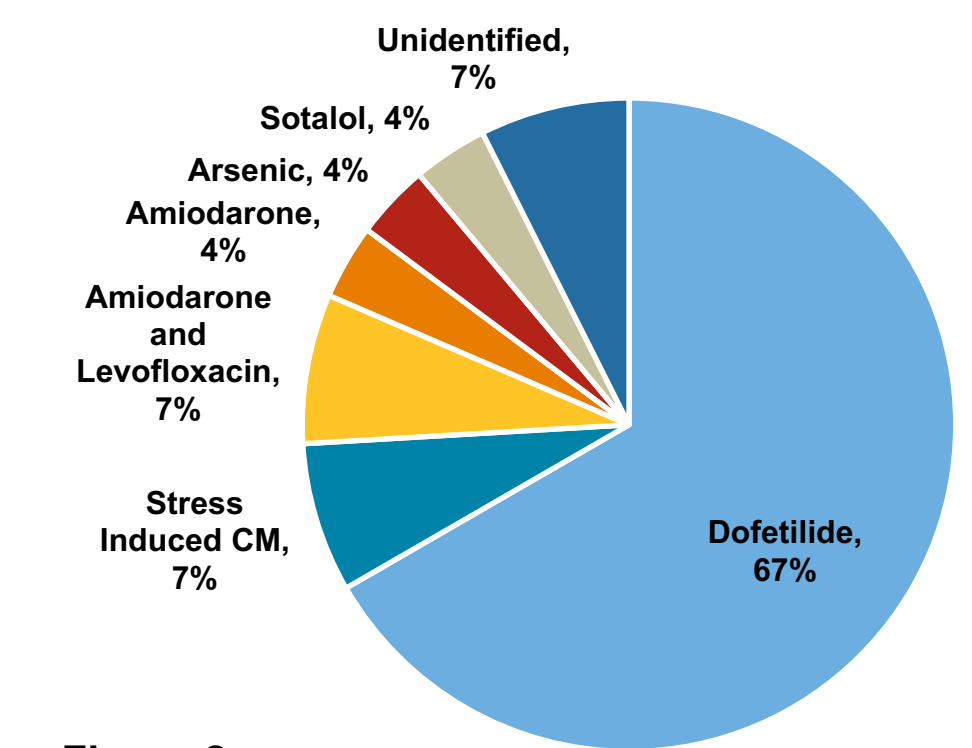
In patients presenting with acquired QT prolongation of various etiologies, mexiletine is an effective treatment approach to shorten QT interval, and hence prevent TdP.

## MEXILETINE ACTION POTENTIAL



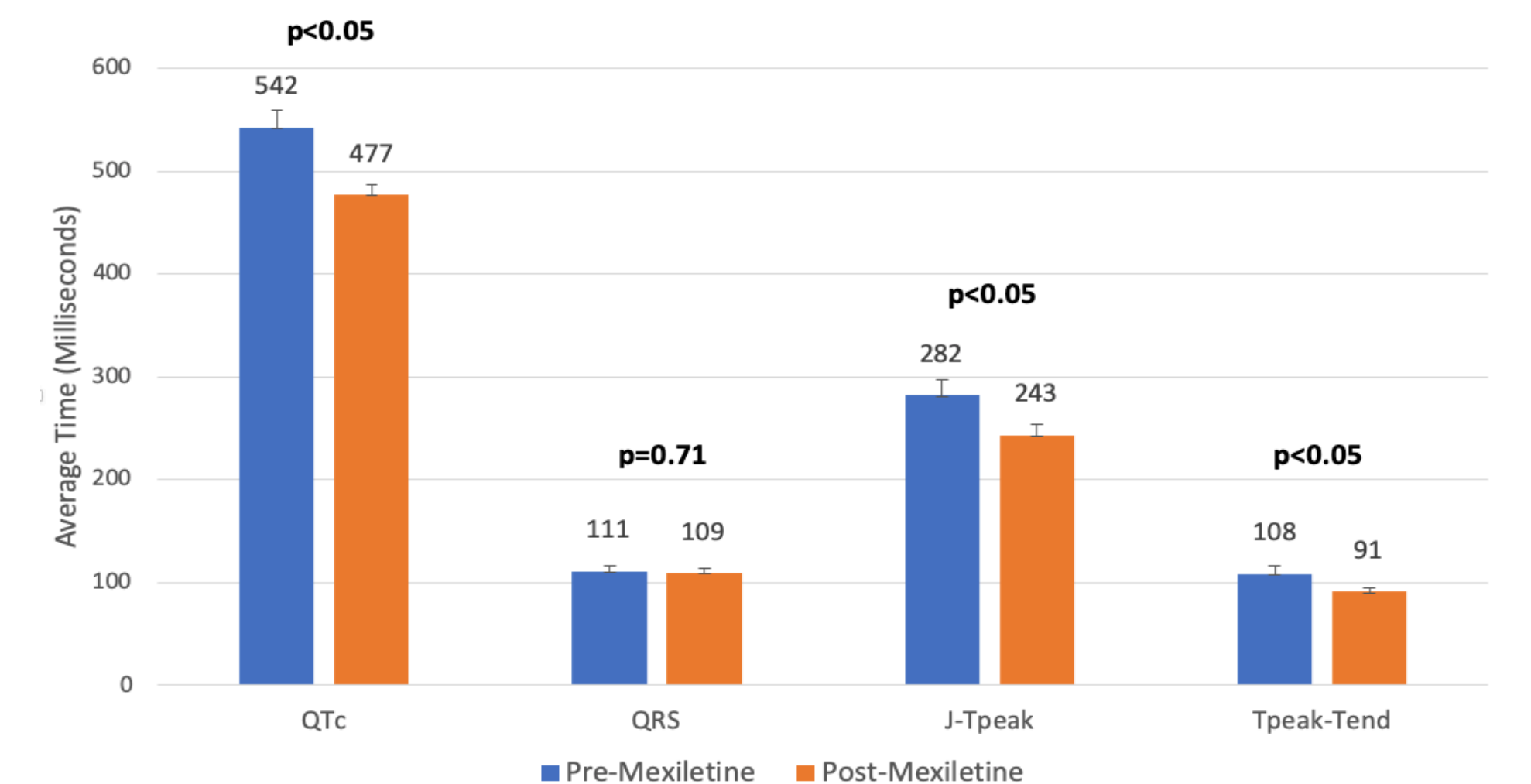
**Figure 1.** Mexiletine blocks sodium currents, decreasing slope of phase 0 and shortening phase 3 of cardiac action potential.

## ETIOLOGIES OF QT PROLONGATION



**Figure 2.** Etiologies of QT Prolongation.

## PRE AND POST-MEXILETINE PARAMETERS



## REFERENCES

1. Johannesen L, Vicente J, Mason JW, et al. Late Sodium Current Block for Drug-Induced Long QT Syndrome: Results from a Prospective Clinical Trial. Clin. Pharmacol. Ther. 2016;99:214–223.
2. Badri M, Patel A, Patel C, et al. Mexiletine prevents recurrent torsades de pointes in acquired long QT syndrome refractory to conventional measures. JACC Clin. Electrophysiol. 2015;1:315–322.
3. Frommeyer G, Garthmann J, Ellermann C, et al. Broad antiarrhythmic effect of mexiletine in different arrhythmia models. Europace 2018;20:1375–1381.
4. Al-Khatib SM, Stevenson WG, Ackerman MJ, et al. 2017 AHA/ACC/HRS Guideline for Management of Patients With Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Hea. J. Am. Coll. Cardiol. 2018;72:e91–e220.
5. Liu G, Xue X, Gao C, et al. Synergistic effect of dofetilide and mexiletine on prevention of atrial fibrillation. J. Am. Heart Assoc. 2017;6:1–10.