SAS Journal of Medicine
Abbreviated Key Title: SAS J Med
ISSN 2454-5112
Journal homepage: https://saspublishers.com

OPEN ACCESS

Cardiology

The Prognostic Role of Corrected QT Interval with Quantitative Cardiac Troponin Levels in NTSEMI

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DOI: 10.36347/sasjm.2022.v08i10.002 | **Received:** 19.08.2022 | **Accepted:** 24.09.2022 | **Published:** 04.10.2022

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Abstract **Original Research Article**

Presence of different risk groups in non-ST-elevation acute coronary syndrome (NSTE-ACS), indicate the need for new tools to perform early diagnosis and prognostic stratification in order to indicate the appropriate startegy. In this sense, it has been shown that the corrected QT interval prolongation is an independent risk marker in NSTE-ACS with or without acute ischemic changes. However, there is scarce information about its relationship with other variables of known prognostic value, such as cardiac troponins.

Keywords: acute coronary syndrome, (NSTE-ACS), QT Interval, NTSEMI.

INTRODUCTION

Non-ST-elevation Myocardial Infarction (NSTEMI) subgroup of acute coronary syndrome has wide variability in patient prognosis. Risk stratification in NSTEMI is essential for deciding about early management. Corrected QT interval estimation is one tool that has utility in bedside risk stratification. Whether it differentiates NSTEMI patients into different risk groups is the contention of this study.

OBJECTIVE

To prove that prolonged corrected QT interval is an independent predictor of higher MACE in NSTEMI patients and to assess correlation between maximum corrected QT interval (QTc) and cardiac Troponin (cTn) levels.

METHODS

Retrospective cohort encompassing 183 NSTEMI patients. cTn level and QTc was measured at 0, 24 and 48 hours post-admission in cardiology department, Arrazi hospital, Mohamed VI university hospital center, between January 2018 and August 2021. Patients were followed for 30 days post-discharge for incidence of major adverse cardiac events (MACE) defined as composite of cardiac death, non-fatal MI and urgent revascularization. Regression analysis was performed to identify independent predictors of MACE.

RESULTS

We found a strong positive linear correlation between maximum QTc interval and cTn level with a correlation. Median hs-Tn was measured 453 ng/mL. Multivariate analysis revealed that after adjusting for different prognostic variables, TIMI score>2 and QTc>480ms, were the only independent predictors of MACE.

The cut-off value of 480 ms had a sensitivity of 63% and specificity of 58% for predicting MACE ($p< 0.01$).The incidence of MACE was 25.1% in QTc > 480 ms vs. only 17% in QTc ≤ 480 ms ($p = 0.002$). More than two-thirds of total MACE (74%) occurred in QTc > 480 ms group.

Multivariate analysis was done to find independent predictors of MACE in this population. TIMI score > 4 was the strongest independent predictor for MACE, followed by QTc > 468 ms ($p=0.018$) after adjusting for other variables. Age, sex, diabetes, Troponin level, SBP < 90 mmHg, Killip class > 1, LVEF < 35%, and MV-CAD were not event predictors.

Even in patients with an equivocal ECG on presentation, multivariate analysis revealed TIMI score > 4 ($p< 0.001$) was the strongest independent predictor for MACE followed by QTc > 480 ms ($p = 0.03$). Rest of the variables were not independent event predictors.

Table 1. Baseline characteristics of study population

Characteristic	Total n=183
Age in years, mean (SD)	
• Age < 45 years, n (%)	23 (12.5)
• Age 46-70 years, n (%)	126 (68.85)
• Age > 70 years, n (%)	37 (20)
Male gender, n (%)	116 (63.4)
Risk factors for CAD	
• Smoker, n (%)	119 (65)
• Hypertension, n (%)	87 (47.54)
• Dyslipidemia, n (%)	69 (48.63)
• Diabetes Mellitus, n (%)	61 (33.33)
• Family history of CAD, n (%)	6 (3.27)
Past history of CAD, n (%)	11 (6)

DISCUSSION

QT interval prolongation has been historically reported to be associated with increased risk of sudden death, cardiovascular morbidity/mortality in unselected populations in general and ACS population in particular [1].

Our study also showed that mean QTc interval was higher in patients with older age, diabetes, and dyslipidemia. More importantly, mean QTc was significantly higher in patients with higher Killip class on presentation, lower LV ejection fraction, and presence of multivessel CAD. These associations along with significant correlation with troponin levels indicate that QTc is not only a marker of electrical dispersion, but it relates well to the overall cardiac function and ischemic damage, and is consequentially found higher in patients with larger ischemic and damaged myocardium – the two most powerful predictors of poor outcome in ACS.

Our findings concur with prior studies in NSTEACS population. According to Gadaleta *et al*., after adjustment for other variables, the QTc interval was found to be the only independent risk variable to predict MACE (P=0.001). What is noteworthy is that the TIMI risk score and troponin T levels were excluded from the multivariate analysis [2]. Susana *et al*., reported that the correlation between QTc-max with cardiac troponin T resulted in a correlation coefficient of 0.38 (p< 0.001). On multivariate analysis, QTc > 0.458 sec was an independent predictor of MACE risk in NSTEACS population (p=0.002) [3].

In 2000, Döven *et al*., correlated QT dispersión (QTd) with cTnT levels in NSTE-ACS patients. They found that QTd was greater in cases with elevated cTnT and postulated QTd as a non-invasive marker of myocardial injury and a useful variable to select high risk patients [4].

Jimenez-Candil *et al*., reported that risk of MACE was higher when prolonged QTc (> 450 ms) was present in patients with Troponin > 0.1 ug/l (72% vs 35%; p<0.001) vs. negative troponin release (70% vs 15%; p<0.001). Correlation with absolute troponin value was not reported [5].

Rajvanshi *et al*., found a strong positive linear correlation between maximum QTc interval and cTnI level with a correlation coefficient of 0.637 (p<0.001). Cut-off value of QTc>468ms predicted poor prognosis in form of MACE with 72% sensitivity and 61% specificity. Multivariate analysis revealed that after adjusting for different prognostic variables, TIMI score>2 and QTc>468ms, were the only independent predictors of MACE [6].

Rushkin *et al*., observed the highest transient QTc prolongation in non-Q wave AMI compared to UA patients, and concluded that the analysis of this variable could help to the early differentiation of UA from non-Q wave AMI, suggesting that QTc prolongation would not only be related to ischemia but also with the degree of necrosis [7].

CONCLUSION

QTc-maximal interval has a positive linear correlation with cTn level. Prolonged QTc has utility as an independent high risk predictor in NSTEMI population.

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