

Laboratory Assessments of Therapeutic Platelet Inhibition in Endovascular Neurosurgery: Comparing Results of the VerifyNow® P2Y12 Assay to Platelet Mapping Thromboelastography

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Introduction

Inhibition of platelet aggregation is vital to preventing thromboembolic complications related to stent placement in endovascular neurosurgery, but excessive inhibition potentiates hemorrhagic complications. Recent evidence suggests an ideal inhibition range of 70-150 P2Y12 response units (PRU) as measured on the VerifyNow® assay, which relies on photometric measurements of platelet aggregation. Thromboelastography (TEG) with platelet mapping (TEG-PM) is an alternative assay that directly measures clot formation and mechanical strength. We compare results of PRU to TEG-PM.

Methods

Adult patients with simultaneous or near-simultaneous PRU and TEG-PM results who underwent cervical carotid artery stenting, intracranial stent-assisted aneurysm coiling, or flow diversion at our institution between August 2015 and November 2016 were identified. PRU results were compared to the TEG maximal amplitude attributable to ADP activity (MA (ADP)) as measured by TEG-PM. Platelet inhibition was considered therapeutic for MA (ADP) values <50 mm or PRU <194. Pearson correlation coefficient was calculated, and sensitivity and specificity of PRU were calculated assuming that the results of TEG-PM reflected the true degree of platelet inhibition.

Results

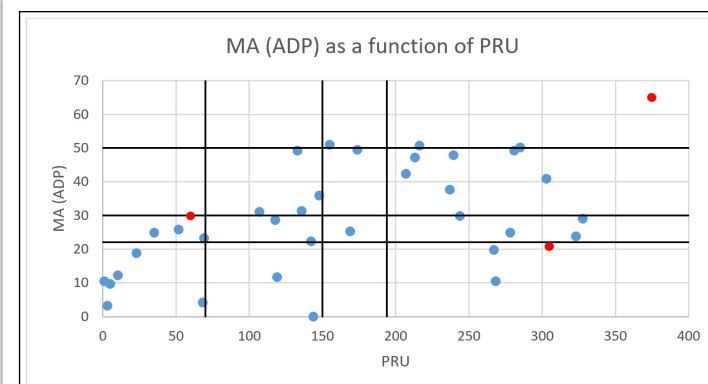
23 patients were identified with a total of 37 matched sets of TEG-PM and PRU. Three of these pairs were excluded due to anemia outside of the PRU manufacturer's recommended range. The Pearson coefficient for these values was 0.50 ($p=0.0026$.) The prevalence of clopidogrel non-responders determined by TEG-PM (9%) matched reported rates (5-12%); PRU demonstrated much higher prevalence (39%.) For detecting a therapeutic level of platelet inhibition, PRU demonstrated sensitivity of 0.59, specificity of 0.50, positive predictive value of 0.95, and negative predictive value of 0.07. Ideal inhibition was concordant in only 25% of observations in which at least one of the results was ideal.

References

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3. Slavik L, Ulehlova J, Krcova V, Hlusi A, Indrakova J, Hutyra M, Galuszka J, Indrak K. Detection of clopidogrel resistance using ADP induced aggregometry with specific inhibitor PGE1. *Clinical laboratory* 2014; 60(9): 1475-1480

Conclusions

Agreement between TEG-PM and PRU regarding degree of platelet inhibition is poor. PRU may overestimate clopidogrel resistance, as 93% of patients with a PRU >194 demonstrate adequate ADP inhibition on TEG-PM.



MA (ADP) results compared to PRU. NB: Red data points excluded from analysis due to anemia

PRU	TEG-PM		Total
	Inhibited	Un-inhibited	
Inhibited	19	1	20
Un-inhibited	13	1	14
Total	32	2	34

Sensitivity	0.59
Specificity	0.50
PPV	0.95
NPV	0.07

Predictive statistics based on the assumption that TEG-PM results reflect the true degree of platelet inhibition. PPV: Positive predictive value, NPV: Negative predictive value

Learning Objectives

By the conclusion of this session, participants should be able to:

- 1) describe the methodological differences between TEG with platelet mapping and the VerifyNow assay, and
- 2) Describe the limitations of VerifyNow results with respect to endovascular stenting for neurosurgical procedures.