Is Dilute Russell’s Viper Venom Time a Useful Assay To Monitor Patients Treated By Rivaroxaban Or Dabigatran Etexilate?
Douxfils, Jonathan; Tamigniau, Anne; Chatelain, Bernard; Devalet, Bérangère; Wallemacq, Pierre; Hjemdahl, Paul; Rönquist-Nii, Yuko; Dogne, Jean-Michel; Mullier, François

Publication date: 2013

Document Version
Peer reviewed version

Link to publication
Citation for published version (HARVARD):
Douxfils, J, Tamigniau, A, Chatelain, B, Devalet, B, Wallemacq, P, Hjemdahl, P, Rönquist-Nii, Y, Dogne, J-M & Mullier, F 2013, 'Is Dilute Russell’s Viper Venom Time a Useful Assay To Monitor Patients Treated By Rivaroxaban Or Dabigatran Etexilate?', New Orleans, United States, 7/12/13 - 10/12/13,

General rights
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

• Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
• You may not further distribute the material or use it for any profit-making activity or commercial gain
• You may freely distribute the URL identifying the publication in the public portal ?

Take down policy
If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.
**Background**

Direct oral anticoagulants (DOACs) include anti-Ilara agent (dabigatran etexilate) and anti-Xa agents (rivaroxaban, apixaban and edoxaban). DOACs do not require monitoring nor frequent dose adjustment. However, searching for the optimal response at the individual patient level may be useful in some situations. Activated partial thromboplastin time, Hemoclot Thrombin Inhibitor® (HTI) and ecarin clotting time have been proposed to monitor dabigatran whereas anti-Xa chromogenic assays are preferable to monitor anti-Xa agents\(^1\&2\). However, there is still a need for a global test easily implementable and widely available that may be used for all DOACs. Recent studies showed that the dilute Russell Viper Venom Time (DRVV-T) could be used for the monitoring of DOACs but these results have not been performed on clinical samples\(^3\).

**Objectives**

To analyse and compare the results obtained with STA®-DRVV Screen and STA®-DRVV Confirm with the plasma drug levels measured by LC-MS/MS.

**Methods**

60 plasmas from patients treated with rivaroxaban and 48 plasmas from patients treated with dabigatran etexilate were included in the study. Plasma concentrations were measured by LC-MS/MS. STA®-DRVV Screen and Confirm (Diagnostica Stago®) were performed on the 108 plasma samples. All methodologies were performed according to the recommendations of the manufacturer.

**Results**

The dabigatran plasma concentration ranged from 0 to 413ng/mL and the rivaroxaban plasma concentration ranged from 0 to 426ng/mL.

**Correlation between STA®-DRVV Screen and LC-MS/MS measurements**

Calibrated STA®-DRVV Screen and dabigatran or rivaroxaban plasma concentrations correlate well (Figures 1 C). The Spearman correlation is 0.84 (95% CI: 0.72 – 0.91; p<0.0001) and 0.88 (95% CI: 0.82 – 0.93) for dabigatran and rivaroxaban, respectively. When expressed in seconds or as ratios the relation is not linear and is best fit by a second order relation (Figures 1 A & B). Results of the Bland-Altman analysis reveal a mean difference of -37ng/mL and -21ng/mL for dabigatran and rivaroxaban, respectively, with large confidence interval. This implies that STA®-DRVV Screen tends to overestimate the concentration of dabigatran and rivaroxaban in plasma samples. Therefore STA®-DRVV Screen should not be used to estimate plasma concentrations of both dabigatran and rivaroxaban. However, specific cut-off associated with supra-therapeutic concentrations at Crouch (i.e. 200ng/mL which represent the 90\(^{th}\) percentile of plasma concentrations at Crouch) could be defined. Thus, a ratio of 2.5 or 3.0 could exclude plasma concentration above 200ng/mL for dabigatran and rivaroxaban, respectively.

**Correlation between STA®-DRVV Confirm and LC-MS/MS measurements**

Calibrated STA®-DRVV Confirm and dabigatran or rivaroxaban plasma concentrations correlate well (Figures 2 C). The Spearman correlation is 0.94 (95% CI: 0.89 – 0.97; p<0.0001) and 0.89 (95% CI: 0.82 – 0.94; p<0.0001) for dabigatran and rivaroxaban, respectively. When expressed in seconds or as ratios the relation is not linear and is best fit by a second order relation (Figures 2 A & B). Results of the Bland-Altman analysis reveal a mean difference of -40ng/mL and -16ng/mL with large confidence interval for dabigatran and rivaroxaban, respectively. Results are expressed in seconds (A), as ratio (B) or in ng/mL (C). Graphic of the Bland-Altman analysis (D) comparing the two methods for results expressed in ng/mL is also provided. For the Bland Altman analysis the difference is calculated as follow: [difference (A-B) vs. average] where A is the result of the LC-MS/MS and B the result of calibrated STA®-DRVV Screen.

**Discussion**

The dabigatran plasma concentration ranged from 0 to 413ng/mL and the rivaroxaban plasma concentration ranged from 0 to 426ng/mL.

**Conclusions**

- The DRVV cannot be used to accurately estimate dabigatran and rivaroxaban plasma concentrations.
- Specific cut-off could however be proposed to rule out excessive concentrations (i.e. concentrations > 200ng/mL at Crouch).
- However, these cut-offs are specific for dabigatran and rivaroxaban due to difference in sensitivities and also depend on the quantity of phospholipid in the test.