Accuracy Performance Verification of the microINR® System

Introduction

The present study attempts to verify the accuracy performance of the microINR system through a study across three sites. The study follows guidelines provided in ISO17593: 2007 standard "Clinical laboratory testing and in vitro medical devices – requirements for in vitro monitoring systems for self-testing of oral anticoagulation therapy"[1].

The innovative microINR system (iLine Microsystems, Spain) has been designed to exploit the advantages of both microfluidics and the Lab-on-a-Chip (LOC) technological concepts under the company´s proprietary core technology. Following the activation of the coagulation cascade by a microdispensed amount of recombinant tissue factor reagent, INR determination is carried out through capillary blood flow monitoring along microfluidic channels through an embedded Machine Vision System (MVS). When clotting, blood undergoes a sudden viscosity increase and thus a sudden flow rate decay, which is detected, measured as prothrombin time and converted into INR using lot-specific calibration parameters microprinted on the chip surface.

The aim of this study was to evaluate the performance, in terms of accuracy, of the microINR system.

Method

292 subjects from three different populations, two in Spain and one in the U.S.A, were recruited and compared to the same laboratory reference system. The whole range measurable of the microINR system was covered with subjects from all three sites.

For the purposes of this study, patients on anti-vitamin K therapy (222) and normal donors (70) underwent INR testing through both finger stick capillary testing by microINR and venous blood testing by the reference system, the ACL® ELITE PRO with the HemosILRecombiPlasTin2G reagent.

Three sites participated in the study:

1. Primary Care Centre Portugalete-Errepelega Portugalete, Spain
2. Primary Care Centre Kabiezes. Santurtzi, Spain
3. Fogarty Clinical Research and El Camino Hospital. Mountain View, CA, United States of America.

Laboratory reference system location: Basurto Hospital and FIDEC (Fundación para la Investigación y Docencia de Enfermedades Cardiovasculares, Trombosis y Arterioesclerosis). Bilbao, Spain.

Results

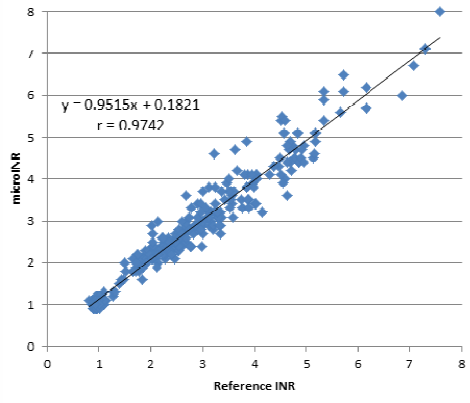

Figure 1. Linear regression plot, INR results from microINR system vs. INR results from the reference system (ACL ELITE PRO with Recombiplastin 2G reagent).

Accuracy was evaluated by comparing results on the microINR to reference results on the ACL Elite Pro method from citrated venous blood processed to plasma.

Linear regression analysis between the results of the microINR system and the reference system showed strong correlation. The correlation coefficient was 0.974, very satisfactory in comparison with other anticoagulation point-of-care systems that showed a weaker correlation: the 0.951 with the INRatio reported by Taborski[2] or the 0.854 in a study reported by McBane et al. with the Protime 3 against a MDA180 using Innovin thromboplastin[3]. The microINR system correlation coefficient is equivalent or superior to the ones reported for the Coaguchek XS system (0.97 [4], 0.95 [5], 0.96 [6], 0.93 [7]).

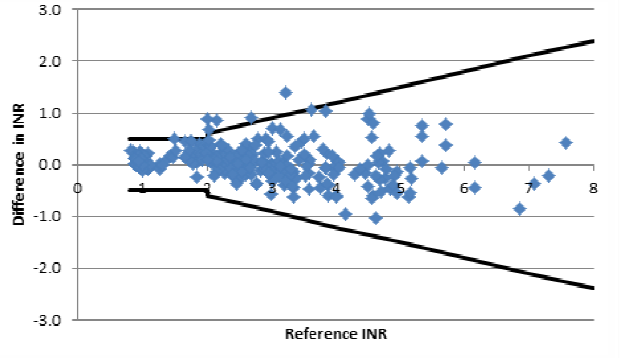

Figure 2. Bland-Altman plot showing differences between microINR and reference system (ACL ELITE PRO with Recombiplastin 2G reagent) results.

INR interval	N	Within 0.3 INR	Within 0.5 INR	Average INR difference
<2	99	92.9%	**99.0%**	0.11

INR interval	N	Within 10%	Within 20%	Within 30%	Average INR difference
2.0-4.5	153	69.9%	92.8%	**96.7%**	**0.05**
> 4.5	40	62.5%	95.0%	100%	-0.07

Table 1. System accuracy results for each INR interval.

Accuracy results are well within the ISO17593: 2007 acceptable criteria[1], as 96.7% of the differences between results from microINR and results from the reference measurement system are within the ±30% limits for the INR range 2.0-4.5, and 99% within ±0.5 INR for the INR range below 2.0. Furthermore, 92.8% of the differences were within the more restricted ±20% limits, and 92.9% within ±0.3 INR for the INR range below 2.0.

Conclusion

The microINR system is fully complying with the ISO 17593:2007 requirements and these results confirm the suitability of the system for managing patients receiving warfarin.

References

1. *ISO 17593:2007 - Clinical laboratory testing and in vitro medical devices - Requirements for in vitro monitoring systems for self-testing of oral anticoagulation therapy.* 2007.
2. Taborski, U., S.L. Braun, and H. Voller, *Analytical performance of the new coagulation monitoring system INRatio for the determination of INR compared with the coagulation monitor Coaguchek S and an established laboratory method.* J Thromb Thrombolysis, 2004. **18**(2): p. 103-7.
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