Measurement of prothrombin time in patients on oral anticoagulant therapy: effect of two different evacuated tubes

Sir,

The aim of oral anticoagulant therapy (OAT) is to prevent thrombus formation and/or extension without inducing complications. The aim of the laboratory is to measure the level of anticoagulation as reliably as possible.

The prothrombin time (PT) is used universally as the primary laboratory measurement of the control of OAT. There are still important factors that contribute to the imprecision of the PT test. Some of these are the concentration of sodium citrate and the type of the material used (glass or polyethylene tetraphthalate [PET]).[1-3] The aim of this study was to compare the analytical performances of the PT test in patients on OAT using two types of evacuated tubes. Not only was the material (glass or PET) compared, but also the *age-end of storage* effect following the manufacturers' instructions. The open study included all the PT determinations performed in our Laboratory for patients on OAT in the period July 1st-August 31st, 1997. Exclusion criteria were pregnancy, age below 15 years, anemia, problems in blood collection. Following blood collection, the tubes were gently inverted 5-6 time to allow complete anticoagulation of the blood. They were sent to the laboratory within the required time so that tests could start within two hours of the collection. Instruments, reagents and disposables are reported in Table 1. Only complete sets of data were recorded. The tests results used as a references were from samples collected in glass tubes. As the material may have an influence on test results, we decided not to use the INR for the comparisons; our control values were based on plasma collected into glass tubes. The statistical analyses included the comparison of the mean results by use of the coefficient of variation (CV) of the method, Student's paired t test, the regression line of the first kind and the coefficient of correlation (r^2). The study was performed in four phases:

1. Phase one, performed in July 1997, compared Glass Tubes BD Vacutainer® with PET Tube Terumo Venoject® II. The PT tests results are summarized in Table 2.
2. Phase two, performed in July 1997, compared Glass Tubes BD Vacutainer® with PET Tube Terumo Venoject® II at the end of their shelf-life (Exp. 8/97). The PT tests results are summarized in Table 3.

Table 1. Consumables and instruments used.

Equipment	*Cat. no.*	*Batch serial no.*	*Expiry date*	*Volume mL*
Tubes Becton Dickinson (BD) VS Vacutainer® 3.8% citrate, 13×75 mm				
Glass tubes (phase 1, 2, 1a and 2a)	367702	7P055	8/98	3.15
Tubes Terumo Venoject® II 3.8% citrate, 13×75 mm				
Venoject® II tubes (phase 1 and 1a)	VP050SBCS	97E26M2	10/98	4.5
Venoject® II tubes (phase 2 and 2a)	VP050SBCS	UD0441	8/97	4.5
Reagents				
PT (Innovin® DADE® - ISI = 0.96	B4212	TFS-527Z	1/98	(1)
Instruments				
Centrifuge: Heraeus	Megafuge	199822	(1)	(1)
Coagulometer: MLA	ELECTRA 1000C	S1095	(1)	(1)

Table 2. Phase one and phase one(a) PT test results.

	Phase one		***Phase one(a)***	
	Glass tubes BD Vacutainer®	Pet tubes Venoject® II	Glass tubes BD Vacutainer®	Pet tubes Venoject® II 30 days after
Patients	52		30	
Average(s)	29.48	33.15	31.14	34.18
Difference	–3.7		–3.03	
±2 CV units	27.53-31.42		29.03-33.13	
t test	< 0.05		< 0.05	
Regression line	y = 0.8× + 3		y = 1.13× – 1.06	
r^2	0.98		0.96	

Table 3. Phase two and phase two(a) PT test results.

	Phase two		*Phase two(a)*	
	Glass tubes BD Vacutainer®	Pet tubes Venoject® II exp 8/97	Glass tubes BD Vacutainer®	Pet tubes Venoject® II exp 8/97+30 days
Patients	52		18	
Average(s)	31.08	40.26	33.58	42.68
Difference	–9.2		–9.10	
±2 CV units	29.03-33.13		31.36-35.79	
t test	< 0.05		< 0.05	
Regression line	y = 0.65× + 5		y = 1.48× – 7.15	
r^2	0.91		0.99	

3. Phase one(a), performed in August 1997, compared Glass Tubes BD Vacutainer® with PET Tube Terumo Venoject® II expiring 10/98 but kept thirty days out of their pouch, which was the upper time limit recommended by the manufacturer. The PT tests results are summarized in Table 2.
4. Phase two(a), performed in August 1997, compared Glass Tubes BD Vacutainer® with PET Tube Terumo Venoject® II expiring in the same month and kept thirty days out of their pouch (since July). The PT tests results are summarized in Table 3.

In all the phases of the study the PET Tube Terumo Venoject® II gave longer values than Glass Tubes BD Vacutainer®, whatever the *age-end of storage* or storage condition. Our data showed that the difference was statistically significant and out of the 2CV limits (Tables 2 and 3). The difference was between 3 and 9 seconds which represents a difference of 10 to 30% from the glass tubes. Many variables have been reported to influence PT test results. Citrate concentration (3.2 vs 3.8%) has an impact which seems to be thromboplastin dependent.[2-5] Moreover both the temperature at which the sample is kept and the tube material influence the PT test.[6-8] In our study the main preanalytical variable was the tube material and its manufacturing process. Based on our data, further study is warranted because of the need for standardization in this field.

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Key words

Prothrombin time, oral anticoagulants, PET tubes, glass tubes

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Allogeneic peripheral blood stem cell transplantation in children with hematologic malignancies

Sir,

Over the past few years transplantation of allogeneic cytokine-mobilized peripheral blood stem cells (PBSCs) has increasingly been used instead of bone marrow to allow hemopoietic reconstitution after myeloablative therapy for hematologic malignancies.[1] Although available data do not indicate that a short course of granulocyte colony-stimulating factors (G-CSF) may cause untoward long-term effects, there is a theoretical concern about this issue. This fear has precluded routine use of PBSCs when the