serum, have shown either significant (I) or no (3) interference. In contrast, our study applied the dilution technique for detecting interfering substances in patients' sera.

We conclude that the Instar N-tact PTH kit is prone to significant negative interference by C-terminal and mid-molecule fragments in assays of PTH in serum from renal dialysis patients and should not be used in this diagnostic setting.

References

Intra-Individual Variation of the Electrophoretic Serum Protein Fractions, L. Juan-Pereira and X. Fuentes-Arderiu (Servei de Bioquímica Clínic, Hospital de Bellvitge "Princeps d'Espanya," Feixa Llarga s/n, 08907 L'Hospitalet del Llobregat, Barcelona, Spain)

We assessed the biological variation of the serum protein fractions, to obtain the analytical goals for the imprecision (CV_D) (1), the indices of individuality (P) between the individual (CV_I) and the inter-individual (CV_C) variations (2), and the critical differences for two serial results to be significantly (P <0.05) different (3) for each of the serum protein fractions.

We studied 20 healthy volunteers (six men and 14 women, ages 24-70 years), blood being sampled once a month for a year. The serum protein fractions were determined by electrophoresis on cellulose acetate (Cellogel); Chemetron International Sales Headquarters, Milan, Italy), followed by staining with Amido Black (Merck, Darmstadt, F.R.G.). The stained and cleared cellulose acetate strips were then scanned at 525 nm in a densitometer (Super Cellomatic; Atom S.A., Barcelona, Spain). The samples were analyzed on the same day of sampling and the between-day imprecision (CV_A) was assessed by replicate analyses of 20 aliquots from a pool of sera stored at -20°C.

The results, expressed in SI units:

<table>
<thead>
<tr>
<th>Protein</th>
<th>Mean</th>
<th>CV_A, %</th>
<th>CV_I, %</th>
<th>CV_C, %</th>
<th>CV_D, %</th>
<th>r</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albumin</td>
<td>0.58</td>
<td>6.1</td>
<td>4.1</td>
<td>5.1</td>
<td>2.0</td>
<td>1.4</td>
<td>0.12</td>
</tr>
<tr>
<td>α1-Globulin</td>
<td>0.03</td>
<td>13.4</td>
<td>10.0</td>
<td>22.6</td>
<td>5.0</td>
<td>1.1</td>
<td>0.02</td>
</tr>
<tr>
<td>α2-Globulin</td>
<td>0.09</td>
<td>7.5</td>
<td>10.4</td>
<td>12.7</td>
<td>5.2</td>
<td>1.0</td>
<td>0.03</td>
</tr>
<tr>
<td>β-Globulin</td>
<td>0.13</td>
<td>5.1</td>
<td>9.6</td>
<td>9.2</td>
<td>4.8</td>
<td>1.4</td>
<td>0.04</td>
</tr>
<tr>
<td>γ-Globulin</td>
<td>0.16</td>
<td>9.5</td>
<td>11.2</td>
<td>12.3</td>
<td>5.6</td>
<td>1.3</td>
<td>0.06</td>
</tr>
</tbody>
</table>

The biological variation of these electrophoretic fractions of serum has not been reported before. We derived the state of the art for the imprecision, calculating the 0.25 fractile of approximately 20 laboratories participating in a European quality-control scheme (Merck+Dade AG, Düdingen, Switzerland): albumin 2.6%, α1-globulin 11.1%, α2-globulin 8.1%, β-globulin 6.0%, and γ-globulin 6.0%. We did this to compare these data with the goals for the imprecision arising from biological variation. In any case, the impreci-

sion we attained was less than the state of the art. It seems difficult to improve the precision, owing to the intrinsic characteristics of the technical procedure itself (4).

The biological variation of the serum protein fractions measured by more up-to-date methods should be studied. In this way, objective criteria would be available for the selection of an alternative to electrophoresis on cellulose acetate.

The indices of individuality for albumin and β-globulin are 1.4 (see the above tabulation), indicating that conventional population-based reference values are of clinical utility. For the other analytes the r is <1.4, so it seems to be more useful to apply the individual reference values.

Assuming the homoscedasticity of the serum proteins, it is possible to apply the critical differences between two serial results to see if they are significantly (P <0.05) different. The critical differences have been reported before (5), but only the analytical variability was considered; the contribution of the biological component to the total variation of the serum proteins was not considered.

References

Impact of Acute Phase on Concentrations of Tissue Plasminogen Activator and Plasminogen Activator Inhibitor in Plasma after Deep-Vein Thrombosis or Open-Heart Surgery, Jan-Håkan Jansson, Bo Norberg, and Torbjörn K. Nilsson (Dept. of Internal Medicine, Skellefteå Hospital and Umeå University Hospital, and Dept. of Clin. Chem., University Hospital, S-90185 Umeå, Sweden)

The clinical application of the fibrinolytic indicators in investigation and treatment of thromboembolic diseases might be confounded because tissue plasminogen activator (tPA) and plasminogen activator inhibitor (PAI-1) behave like acute-phase reactants, e.g., in the postoperative period (I, 2) and during endotoxin infusion (3). Our aim in this study was to define an appropriate time lapse after which measurement of these analytes would accurately reflect the individual's constitutional level of them.

Of all 258 patients attending the outpatient clinic of the Department of Internal Medicine, Umeå, for oral anticoagulant treatment, we selected for the present study 18 subjects who were started on treatment with warfarin in the acute phase after deep-vein thrombosis (n = 9) or

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open-heart surgery (n = 9). Blood samples were drawn in the morning, into siliconized Venoject tubes containing sodium citrate, centrifuged, and the plasma obtained was stored in aliquots at -70°C until analyzed. tPA-concentrations were measured with an enzyme-linked immunosorbent assay as recently described (4). PAI-1 was measured by incubating the sample with purified single-chain tPA and assaying the remaining tPA with a chromogenic substrate assay based on fibrin stimulation of the tPA-mediated conversion of plasminogen to plasmin (5).

Repeated sampling of tPA and PAI-1 showed a considerable intra-individual variation during the first month after surgery or onset of DVT, and an even more conspicuous inter-individual dispersion of values (Figure 1). In particular, PAI-1 activities showed more variation than tPA concentrations.

The pattern of tPA and PAI-1 dynamics was the same in both groups, with both analytes being increased for two to four weeks after the acute incident (deep-vein thrombosis or open-heart surgery). The probands returned to their individual baseline values for tPA and PAI-1 within four weeks.

In conclusion, investigation of the fibrinolytic system should be postponed for at least one month after an acute episode, given the acute-phase reaction pattern of tPA and PAI-1.

References

Three Nonisotopic Methods for Human Chorionic Gonadotropin Evaluated, Giuseppe Banfi, Erminia Casari, Michelangelo Murone, and Pier Angelo Bonini (Istituto Scientifico S. Raffaele, Laboratorio Analisi, Via Olgettina 60, 20132 Milano, Italy)

We evaluated three nonisotopic methods for human chorionic gonadotropin (hCG) in serum: Delfia (immunofluorimetry) from Pharmacia, Amerlite (chemilumimetry) from Amersham, and Enzymun test on ES 600 (immunoenzymatic assay) from Boehringer Mannheim, in comparison with an immunoradiometric assay (IRMA) from Becton Dickinson. The ES 600 and Delfia are calibrated in terms of the 1st International Reference Preparation; the Amerlite is standardized against the 2nd International Standard.

Precision was best for the fully automated method (ES 600) (Figure 1). Linearity ranges claimed by the manufacturers were confirmed for ES 600 and Amerlite (628 and 200 int. units/L, respectively), but the broadest range was presented by Delfia, up to 6000 int. units/L (manufacturer's claim: 10 000 int. units/L), requiring fewer dilution steps for samples with high hCG concentrations.

Comparison tests performed on 150 sera with a very wide range of hCG concentrations were satisfactory (Delfia vs.

Fig. 1. Results of precision test: 10 replicates of three pools were analyzed for within-run precision, whereas on 10 different days three replicates were used for between-run precision.

The mean values of the three pools assayed by Amerlite were 43.45, 298.5, 19 584 int. units/L; with the ES 600, 50.17, 281.9, 19 100 int. units/L; with Delfia, 42.16, 232.8, 19 165 int. units/L; and with IRMA, 57.7, 327.8, 19 208 int. units/L.