Contamination of coagulation tests with heparin from blood gas samples

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We investigated the possibility that samples of blood could be contaminated by heparinized blood gas syringes, giving spurious results in coagulation tests. We collected coagulation test samples before (n=5) and after (n=13) blood gas sampling from a venous cannula in a volunteer. The results of activated partial thromboplastin time (APTT) tests were compared between control samples and samples taken before and after blood gas sampling. The median APTT after blood gas sampling was 71 s, significantly higher than before (median 34 s, P<0.05). We conclude that heparin from blood gas sampling syringes can contaminate coagulation tests. Heparinized samples for blood gas analysis should be obtained after coagulation test samples have been obtained.

Keywords: blood, coagulation tests; blood, blood gases; blood, anticoagulants, heparin

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Blood samples are often taken from indwelling catheters during anaesthesia and in intensive care. Contamination of coagulation tests with heparin left in such catheters is well known.¹² Heparin-free flush solution is now used routinely to stop this source of contamination. When we obtained some apparently spurious coagulation test results, we thought that heparin from blood gas syringes could contaminate the samples taken for activated partial thromboplastin time (APTT) measurement and investigated this possibility in a volunteer.

Methods and results

After the hospital ethics committee had given permission for the study, a 16-gauge i.v. cannula (Insys; Becton Dickinson) was inserted into the median cubital vein of one of the investigators (J.M.B.). A three-way tap (Connecta Plus 3; Becton Dickinson) was connected to the cannula via a 60 cm arterial pressure tube (Arterial Pressure Tubing; Abbott Ireland). A series of samples was obtained from the three-way tap. Group A (n=5) was the control group, in which coagulation samples were obtained using a fresh sampling connector (Venoject Luer adapter) after 2.5 ml of blood had been discarded. Blood gas samples were obtained using 3 ml Preset syringes (Becton Dickinson, Product No. 365313) filled to the self-venting mark (0.6 ml). Group B (n=13) was the test group, in which the coagulation samples were obtained immediately after blood gas sampling (without flushing or discarding). Coagulation test tubes (3.5 ml 9 NC; Greiner Labortechnik) containing 3.2% sodium citrate were used for coagulation tests. The blood samples were obtained with the Vacutainer system (Venoject Luer adapter, Terumo). The coagulation analysis was performed with ACL Futura Plus Instrumentation Laboratory analysers (Beckman Coulter Australia, Australia). The normal range for the APTT for our laboratory is 25–38 s.

The Mann–Whitney U test was used to compare the results using the PEPI statistical package (Abramson and Gahlinger). An arbitrary value of 300 s was allocated if the values were greater than 300 s.

Table 1 shows the results of the coagulation tests. APTT values after blood gas sampling (group B) were significantly longer (median 71.3 s) than control values (group A) (median 33.9 s; P<0.05).

Comment

We found that heparin from blood gas syringes can contaminate coagulation test samples. The arbitrary use of
300 s for APTT values >300 would tend to reduce any difference between groups. In clinical practice, the degree of contamination will depend on several factors. The amount of heparin in blood gas syringes varies (>80 units with Becton Dickinson 3 ml Preset syringes), and this and the volume of blood drawn into the syringe will determine the heparin concentration in the syringe. The amount of blood remaining in the hub of the three-way tap after blood gas sampling will vary with blood viscosity and depend on how the syringe is removed. We found contamination, but a larger study would be needed to estimate the magnitude of the error. Samples for coagulation tests should be taken before samples are taken with syringes containing anticoagulant.

References

1 Haynes SR, Allardyce W, Cowan B, Tansey P. Accuracy of coagulation studies performed on blood samples obtained from arterial cannulae [see comments]. Br J Anaesth 1992; 69: 599–601


Table 1 APTT results for control (A) and test (B) groups

<table>
<thead>
<tr>
<th></th>
<th>Group A (n=5)</th>
<th>Group B (n=13)</th>
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<tbody>
<tr>
<td>Median APTT (s)</td>
<td>33.9</td>
<td>71.3</td>
</tr>
<tr>
<td>Range (s)</td>
<td>32.9 to 35.4</td>
<td>32.7 to &gt;300</td>
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<tr>
<td>Interquartile range (s)</td>
<td>33.9 to 34.6</td>
<td>55.3 to 106.4</td>
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