Emergency reversal of heparin overdose in a neurosurgical patient guided by thromboelastography

Editor—Reversing heparin-induced anticoagulation quickly and effectively can be challenging in bleeding patients undergoing emergency surgery. The required dose of protamine to neutralize unfractionated heparin (UFH) is difficult to predict and use of standard coagulation tests such as activated partial thromboplastin time (aPTT) to assess the effectiveness of reversal may delay surgery, compromising patient safety.\textsuperscript{1,3} Herein, we present a case in which thromboelastography (TEG)\textsuperscript{4–6} was used to quickly restore normal coagulation immediately before an emergency procedure for intracranial haemorrhage in a context of heparin overdose.

A 51-yr-old woman without any medical history except obesity [body mass index (BMI) = 38 kg m\textsuperscript{-2}] was admitted for elective removal of an intracranial hemangiopericytoma. On the postoperative day 2, the patient exhibited chest pain, dyspnoea, and mild hypoxaemia related to subsegmental pulmonary embolism on a computed tomography (CT) scan. A resident in neurosurgery prescribed i.v. continuous UFH at a dose of 50 000 U per 24 h after a bolus dose of 50 U kg\textsuperscript{-1}. After 12 h of infusion, the patient presented with bleeding from different puncture sites and heparin infusion was stopped. A blood sample was obtained for standard coagulation tests immediately after heparin discontinuation and just before incision, a repeat TEG trace along with aPTT and TT measurements (T\textsubscript{3}) were performed (Table 1). TEG showed a reappearance of the heparin effect, evidenced as a prolonged r time > 11 min. Protamine administration was repeated (50 mg), complete heparin reversal was confirmed by normalization of TEG trace (T\textsubscript{4}) and surgery could start. All routine laboratory-based coagulation tests (aPTT, TT, and anti-Xa assays) from T\textsubscript{0} to T\textsubscript{4} (Table 1) were obtained at least 1 h after each corresponding blood sampling. The surgery went well, the patient was extubated a few hours after surgery and physical examination showed partial resolution of hemiplegia. The day after this second surgical procedure, complete normalization of coagulation tests was observed (T\textsubscript{5}, Table 1). In order to confirm heparin indication, both a chest CT scan and a lower extremity Doppler examination were performed and revealed no venous thromboembolism. Prophylactic anticoagulation with subcutaneous enoxaparin (40 mg) was reintroduced 2 days after surgery without any bleeding and the patient was discharged from the hospital 2 months after admission.

To our knowledge, this is the first report of an emergency reversal of heparin in a bleeding neurosurgical patient guided by TEG. Thus, point-of-care TEG represents a very useful tool to guide heparin reversal in all types of emergency surgical procedures, not only in cardiac or liver elective surgery.

<table>
<thead>
<tr>
<th>Time</th>
<th>Situation</th>
<th>aPTT (s)</th>
<th>Heparin level (U ml\textsuperscript{-1})\textsuperscript{*}</th>
<th>TT (s)</th>
<th>r (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T\textsubscript{0}</td>
<td>H\textsubscript{0}</td>
<td>Neurosurgery ward</td>
<td>&gt;120</td>
<td>4.5</td>
<td>&gt;120</td>
</tr>
<tr>
<td>T\textsubscript{1}</td>
<td>H\textsubscript{1} ICU</td>
<td>&gt;120</td>
<td>2.8</td>
<td>&gt;120</td>
<td>&gt;240</td>
</tr>
<tr>
<td>T\textsubscript{2}</td>
<td>H\textsubscript{2} ICU</td>
<td>36</td>
<td>0.3</td>
<td>24</td>
<td>7</td>
</tr>
<tr>
<td>T\textsubscript{3}</td>
<td>H\textsubscript{3} OT</td>
<td>42</td>
<td>0.3</td>
<td>55</td>
<td>11</td>
</tr>
<tr>
<td>T\textsubscript{4}</td>
<td>H\textsubscript{4} OT</td>
<td>42</td>
<td>0.2</td>
<td>20</td>
<td>8</td>
</tr>
<tr>
<td>T\textsubscript{5}</td>
<td>H\textsubscript{24} ICU</td>
<td>33</td>
<td>&lt;0.1</td>
<td>18</td>
<td>–</td>
</tr>
</tbody>
</table>

*heparin level was (reaction) time measured by TEG.

Declaration of interest

None declared.

S. Figueiredo*  
B. Vigué  
D. Benhamou  
J. Duranteau  
Le Kremlin-Bicêtre, France  
\textsuperscript{*}E-mail: samy.figueiredo@bct.aphp.fr
International practices of organ donation: an alternative view of Australian experiences

Editor—I write with reference to the article ‘International Practices of Organ Donation’ by Rudge and colleagues, 1 published in the Journal recently.

In part the article refers to a ‘grassroots movement’ with prominent community figures and a government-sponsored taskforce (National Clinical Taskforce on Organ and Tissue Donation) advocating for change in Australia. Although not named by the authors, the community organization referred to is ShareLife Australia. As the chairman of ShareLife Australia I wish to challenge a number of statements appearing in the article. In particular, I would challenge the concept that the National Reform Agenda, formulated to increase organ donation in Australia, was an amalgam of a community practice guidelines. Chest 2012; 141: e245–435


doi:10.1093/bja/aet245

The media release from the Prime Minister (PM) in July 2008 clearly referred to ShareLife Australia’s input in addition to others, but did not attribute the input of the government-funded Taskforce, which was headed by co-author Chapman, as claimed in this article. Given the reference to our organization’s pivotal role in securing the PM’s attention to this public health emergency, I wish to provide my reflection of the organ and tissue donation system in Australia and further to clarify the position of the ShareLife Australia Board, given that this article may be misinterpreted as conveying ShareLife’s endorsement of the progress of the national reform agenda.

The plan announced by the PM was not an amalgamation of the ShareLife plan and the Taskforce as stated by Rudge and colleagues. It is true that parts of the National Reform Agenda related to organ allocation and practice were suggested by the Taskforce; however, all of the first six measures outlined in Table 2 by Rudge and colleagues were put forward by ShareLife. The only one of these shared by the 51 recommendations of the Taskforce was Item 1—the setting up of a national authority.

Sharelife’s recommendations only concerned aspects of increasing organ donation rates not the broad practice agenda. The Taskforce did recommend the development of clinical triggers to identify potential organ donors but gave no specifics about how this was to be done. Furthermore, the Taskforce continued to recommend donor registries as a key to increasing organ donation—a strategy that has never been shown to work. We anticipated that implementation of the proper reform agenda would lift organ donation rates to the numbers achieved in the top 10 countries (i.e. 25–35 donors per million population). The Taskforce, on the other hand, noted, Australia would benefit from setting a performance goal of 15 organ donors per million population (page 147). This seemed to be the maximum that the Taskforce could envisage. It seems from co-author Chapman’s recent remarks that this was a misjudgement. ‘The Task Force looked at the implementation of the Spanish model as being beyond that which the government would accept. The Taskforce was wrong on that, ShareLife was right on that, they said this is the answer, invest at that level and government took that decision’. Chapman: ABC Radio, Health Report, May 2010.

The assessment of the Taskforce was that Australia’s low organ donation rate was contributed to by plummeting deaths from road trauma and strokes. It has been clearly shown by Bendorf and colleagues that Australia was neither unique nor exemplary in the ‘plummeting’ death rates from these two causes but other countries maintained high deceased organ donor rates. Reductions in these two causes of death do not provide an adequate explanation for the low organ donor rates. Such thinking was common in the Taskforce report. Hence, the decision by the Federal Government to limit the influence of the Taskforce report on designing the reform agenda.

Rudge and colleagues also claimed that Australia’s results are already substantial and the donation rate has climbed 30% in the past year to the highest rate ever. While there was an increase in 2010, after a decrease in the prior year, the pace of growth has stalled and reforms have been very slow to be implemented. Indeed in 2011 there was only a 9% increase upon 2010 and in 2012 there was only a 5% increase upon 2011. Furthermore, 80% of the increase since 2008 has been in DCD rather than DBD. Australia’s current organ donation rate places it 22nd in the world compared with 28th before the attempted implementation of the National Reform Agenda in 2008. Two media articles and Parliament scrutiny give an indication of the public appraisal of the national reform agenda over the last 12 months.

I certainly hope that the reform agenda as originally outlined can be implemented and in the near future Australia’s rate of deceased organ donation will be in the world-leading category that will match our transplant outcomes. It seems other countries (Portugal and Croatia are examples) are able to do this. Why not Australia?