Mapping the antiplatelet effects of clopidogrel and aspirin by modified thromboelastography

Sir,
We read with interest a report by Glenn et al.,\[1\] in which the authors assessed platelet function by platelet function analyzer (PFA) and standard thromboelastography (TEG) in a patient requiring epidural catheter removal as the patient had received an oral dose of clopidogrel and aspirin 72 hours earlier. As the results of both the tests were normal, removal of epidural catheter was allowed and authors concluded that ‘PFA and TEG offer potentially reliable guidance for epidural catheter removal in patient who had received double antiplatelet therapy’ (last paragraph pg 101).

However, we have some reservations if such conclusions can be drawn from their findings as antiplatelet response of
aspirin and clopidogrel varies widely from one individual to another; with some having no response while some having bleeding. Moreover, although PFA is a good screening tool for assessing platelet function, it is not recommended for monitoring of clopidogrel efficacy. Also the ‘standard TEG’ used in the study is not sensitive to aspirin and clopidogrel drugs and thus it can remain normal despite adequate platelet inhibition by aspirin and clopidogrel. While the modification of TEG, i.e., TEG-based platelet mapping (TEG®-PlateletMapping™; Haemoscope, Niles, IL, USA) can quantify the contribution of fibrin, adenosine diphosphate (ADP) receptor and thromboxane A2 (TxA2) receptor in clot strength. Hence it can assess the effect of individual antiplatelet agents namely, aspirin and clopidogrel, via inhibition of TxA2 and ADP receptors, respectively. At our center we are using TEG-platelet mapping to quantify the effect of antiplatelet drugs in patients including those undergoing percutaneous cardiac intervention [Figure 1]. As illustrated in Figure 1 apart from MA-thrombin (maximum possible clot strength), it also measures MA-fibrin (clot strength by fibrin alone), MA-ADP (clot strength under ADP receptor inhibition by clopidogrel), MA-AA (clot strength under TxA2 receptor inhibition by aspirin) and thereafter the percentage (%) platelet inhibition is calculated. Thus platelet mapping measures platelet inhibition along with total platelet function as a reference point thereby assessing effect of antiplatelet agents more objectively.

Hence, use of TEG-platelet mapping would have been more appropriate to quantify the platelet inhibition by antiplatelet drugs more objectively and would have helped authors in taking evidence based decision to discontinue or continue antiplatelet therapy both before surgery and also postoperatively to ascertain the optimum timing for catheter removal. Also decision to stop antiplatelet agents in a case with recent stenting before surgery should be based on a quantitative assessment of platelet function by a method which can assess platelet inhibition with combined drug therapy. Though, authors used two different point of care tests namely, TEG and PFA to ascertain hemostatic function in their patient however, both of these tests have their own limitations and TEG-platelet mapping alone would have been more appropriate in this setting. This is more so because TEG-platelet mapping assay could have been performed on the TEG analyzer using platelet-mapping kits.

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Data acquisition from S/5 GE Datex anesthesia monitor using VSCapture: An open source.NET/Mono tool

Sir,

Modern anesthesia monitors that are commonly used in operating rooms such as GE Datex S/5 (System 5) series monitor (GE Datex Ohmeda, Helsinki, Finland) allows external data logging through its RS 232 (Recommended standard 232) serial communications port on the monitor. A large set of physiological data can be captured in real time such as invasive or non-invasive arterial blood pressure, ECG, ST segment data, oxygen saturation, end-tidal carbon dioxide, anesthetic agent identification and concentration, temperature, entropy, BIS, EEG. Logging of this data is important for documentation and research purposes.

Capturing these vital signs can allow for statistical analysis, development of models of anesthetic maintenance and recovery, hemodynamic-respiratory interactions. Automated data capture and record-keeping accurately stores events that maybe otherwise omitted in manual data logging. These data capture components maybe used to develop anaesthesia information management systems that help in quality assurance.

The RS 232 communication port maybe identified through its standard male 9 pin D-shaped connector on the backend of the GE Datex S/5 monitor. The user may refer to the user manual for confirmation. Physiological data is sent from the monitor on request through this port, at a time interval of 5 seconds or greater, by a valid binary data-frame request constructed by client software with checksum verification of both sent and received bytes. These frames are transmitted in 8-bit binary format using hardware handshaking.

We describe an open source tool VSCapture developed in C# programming language on the .NET/Mono platform that allows the tool to run on Windows, Macintosh OS X, Linux Ubuntu operating systems. Unlike commercial solutions that cost several thousands of dollars and maybe available only for limited operating systems, this tool can be freely downloaded and installed from its project page https://sourceforge.net/projects/vscapture/. The program requires the .NET 4 runtime that maybe downloaded and installed on Windows operating system from the Microsoft download page http://www.microsoft.com/en-us/download/details.aspx?id=17718. Running the program on Linux or Macintosh OS X requires a Mono version of VSCapture that can be installed from the project website, also required is a Mono runtime from http://www.go-mono.com/mono-downloads/download.html (Xamarin Inc, USA). The capture of data is based on an event-triggering programming paradigm at the serial port.

Hardware requirements for interfacing a PC with the anaesthesia monitor, includes a serial port and a standard null modem serial cable. Most modern laptop computers do not have this RS 232 serial port. However, inexpensive converter cables that plug into the Universal Serial Bus (USB) port of the laptop and provide a serial port conversion are commercially available, such as Future Technology Devices International (FTDI limited, UK) or PL2303 (Prolific Technology Inc., Taiwan) chip-based USB-serial cables.

In addition, an inexpensive standard null modem serial 9 pin D-shaped female-female cable is required to connect the serial port of the PC to the serial port of the monitor. After the software is opened, the cables can be connected, the user is then prompted to select the port to which the cable has been assigned. In Windows operating system, looking up the hardware Device Manager can reveal the COM port number. In Linux and Macintosh OS X operating systems, the name can be obtained from the list of available ports shown by the software such as /dev/ttyUSB0 or driver specific names. The next step involves entering a 5 second or greater data transmission interval in the software. Subsequently, data is captured to the console screen in real-time and in a larger subset to a CSV (comma separated value) file called Figure 1: