The impact of thromboelastography (TEG) on the decision making process of anaesthetists in a non-cardiac surgical setting

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Thromboelastography (TEG)
Interpretation of a TEG result
TEG vs Standard blood tests
TEG at Manchester Royal Infirmary (MRI)

- 2 TEG machines
  - Cardiac theatres
    - Staff by operating department practitioners (ODPs)
  - Critical care lab
    - Staff by critical care technicians
- Clinical staff
  - Online lectures, courses and training days
- Quality control
- Quality assurance
## Methods – Sampling group

<table>
<thead>
<tr>
<th>Department/ward</th>
<th>Number of times</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchester heart centre</td>
<td>201</td>
</tr>
<tr>
<td>Critical care/HDU</td>
<td>71</td>
</tr>
<tr>
<td>Obstetrics</td>
<td>54</td>
</tr>
<tr>
<td>General surgery and vascular ward</td>
<td>23</td>
</tr>
<tr>
<td>Elective treatment centre short stay</td>
<td>15</td>
</tr>
<tr>
<td>Renal</td>
<td>11</td>
</tr>
<tr>
<td>Vascular and orthopaedic ward</td>
<td>9</td>
</tr>
<tr>
<td>Emergency department</td>
<td>4</td>
</tr>
<tr>
<td>Emergency surgery trauma unit</td>
<td>4</td>
</tr>
<tr>
<td>Haematology</td>
<td>3</td>
</tr>
<tr>
<td>Gynaecology</td>
<td>3</td>
</tr>
<tr>
<td>GI</td>
<td>2</td>
</tr>
<tr>
<td>Elective treatment centre day case</td>
<td>2</td>
</tr>
<tr>
<td>Urology ward</td>
<td>2</td>
</tr>
<tr>
<td>Acute medical unit</td>
<td>2</td>
</tr>
</tbody>
</table>
Methods – Data collection

- Data collection
  - Audit proforma
  - Clinical work station (CWS)
    - Standard coagulation tests
    - Cross matching, LFTs, U&Es
    - Sample processing times
  - Focus group discussion (only anaesthetists)
    - 2 obstetric consultants, 1 cardiac consultant and 1 SpR
- Three types of trust haemostasis protocol
  - General surgical
  - Obstetrics
  - Cardiac
Methods - Trust haemostasis protocol for general surgical patients

Algorithm for the management of haemostasis and TEG® analysis in bleeding general surgical patients

- TEG®
  - Reaction Time (R-Time*)
    - >15min (plain cup*)
      - 15ml/kg FFP (usually 4 units) + check fibrinogen
  - Maximum Amplitude (MA)
    - MA 40-47
      - 1 bag platelets + check fibrinogen
    - MA < 40
      - 2 bags platelets + check fibrinogen
  - Clot Lysis (LY30)
    - LY30 > 7.5% CI < 1.0
      - Primary fibrinolysis
        - If not already given consider tranexamic acid (30mg/kg IV)
    - LY30 > 7.5% CI >3.0
      - Secondary fibrinolysis
        - Seek advice from on-call Haemostasis Consultant
Methods - Trust haemostasis protocol for obstetric patients

- **TEG®**
  - **Reaction Time (R-Time*)**
    - >10min (plain cup*)
      - 15ml/kg FFP (usually 4 units) + check fibrinogen
  - **Maximum Amplitude (MA)**
    - MA 50-57
      - 1 bag platelets + check fibrinogen
    - MA < 50
      - 2 bags platelets + check fibrinogen
  - **Clot Lysis (LY30)**
    - LY30 > 7.5% CI < 1.0
      - Primary fibrinolysis
        - If not already given consider tranexamic acid (30mg/kg IV)
    - LY30 > 7.5% CI >3.0
      - Secondary fibrinolysis
        - Seek advice from on-call Haemostasis Consultant
## Methods – Standards of the audit

<table>
<thead>
<tr>
<th>Standards</th>
<th>Inclusion criteria</th>
<th>Target standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Is the correct patient name and number inputted in to the TEG?</td>
<td>Include all the selected TEG results</td>
<td>95%</td>
</tr>
<tr>
<td>2. The proportion of TEGs that did not contain any errors</td>
<td>Include all TEG results even the TEGs that had an error but was corrected.</td>
<td>95%</td>
</tr>
</tbody>
</table>
Methods – Standards of the audit

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<tr>
<td>3. Did the second step of the trust haemostasis protocol where the other investigations such as FBC, U&amp;Es, PT, aPTT, fibrinogen and cross match were performed along with TEG?</td>
<td>Only if the reason for the TEG was because of haemorrhage Blood components cross matched at the beginning of the surgery is sufficient to full fill the criteria</td>
<td>85%</td>
</tr>
<tr>
<td>4. Once a TEG was done, was the blood components given according to the management protocol for haemostasis</td>
<td>Include all the selected TEG results</td>
<td>80%</td>
</tr>
</tbody>
</table>
Methods – Time to taken to obtain a result for R time versus the standard coagulation tests

<table>
<thead>
<tr>
<th>Inclusion criteria</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Any preoperative, midoperative and postoperative TEG along with their respective standard coagulation test regardless of when they were taken</td>
<td>Duplicate times of completion</td>
</tr>
<tr>
<td></td>
<td>If there was any errors in the results</td>
</tr>
</tbody>
</table>
Results and discussion – Category of patient

- Audit period – 36 days
- 21 patients and 26 TEGs
Results and discussion – Reason for test

- Major surgery
- Trauma
- Low platelet count
- Immuno compromise
- Clopidogrel medication

![Bar chart showing reasons for TEG tests](chart.png)
Results and discussion – The proportion of baseline, midoperative and postoperative TEGs
Results and discussion – Decision whether to give blood products based on TEG/clinical/lab

![Bar chart showing decision categories: TEG, Clinical, Lab, TEG & clinical, TEG & lab, Lab & clinical, All three. The chart shows the number of TEGs for each category.]
Results and discussion - A summary of the action taken after taking into consideration the TEG/clinical/lab

- FFP
- Platelets
- Others
- None

Proportion of TEGs
Results and discussion – Time to taken to obtain a result for R time versus standard coagulation test

<table>
<thead>
<tr>
<th>Test</th>
<th>Time taken for</th>
<th>Minimum value/mins</th>
<th>Maximum value/mins</th>
<th>Average/mins</th>
<th>Median/mins</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEG</td>
<td>R time</td>
<td>2.1</td>
<td>19</td>
<td>7.1</td>
<td>7.4</td>
</tr>
<tr>
<td>Standard coagulation Tests</td>
<td>To process sample in the lab</td>
<td>23.0</td>
<td>115.0</td>
<td>53.9</td>
<td>48.0</td>
</tr>
</tbody>
</table>
## Results and discussion – Standards of the audit

<table>
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<th>Level of standard achieved</th>
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<tbody>
<tr>
<td>1. Is the correct patient name and hospital number inputted in to the TEG?</td>
<td>Include all the selected TEG results</td>
<td>95%</td>
<td>85%</td>
</tr>
<tr>
<td>2. The proportion of TEGs that did not contain any errors</td>
<td>Include all TEG results even the TEGs that had an error but was corrected.</td>
<td>95%</td>
<td>88%</td>
</tr>
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# Results and discussion – Standards of the audit

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<tr>
<td>3. Did the second step of the trust haemostasis protocol where the other investigations such as FBC, U&amp;Es, PT, aPTT, fibrinogen and cross match were performed along with TEG?</td>
<td>Only if the reason for the TEG was because of haemorrhage Blood products cross matched at the beginning of the surgery is sufficient to full fill the criteria</td>
<td>85%</td>
<td>9%</td>
</tr>
<tr>
<td>4. Once a TEG was done, was the blood products given according to the trust management protocol for haemostasis</td>
<td>Include all the selected TEG results</td>
<td>80%</td>
<td>73%</td>
</tr>
</tbody>
</table>
Results and discussion: Focus group

- Positives/benefits
- Drawbacks/barriers
Limitations

- Prospective audit but the information is collected retrospectively (within 3-4 days) from the anaesthetists
- Some of the surgical patients will be transferred to the intensive care unit or the high dependency unit (HDU) and if a TEG was ordered from there, it would technically come under the sample group of this audit
- This audit is biased in assuming that the majority of the decisions to give blood components is based on the TEG as this audit is specifically targeting this group
Conclusion

• The TEG is used predominantly in vascular and obstetrics surgery
• It is mainly requested to assess the risk of haemorrhage or the reason for the haemorrhage
• The TEG played a central role in the decision making process of the anaesthetist in the administration of blood component
• A faster result can be obtained using the TEG compared to standard coagulation tests.
Action plan

- To create a training programme that includes
  - Highlighting the importance of recording correct patient information
  - Minimising technical/human errors when running a TEG
  - Addressing deficits in the clinical knowledge of the TEG
  - Recording TEG results and subsequent management in the patient notes/electronically like any other tests
  - Raising awareness of the haemostasis protocol
  - Raising awareness of further additions to the TEG repertoire:
    - Platelet mapping
    - Functional fibrinogen
Thank you