Risk factors for symptomatic venous thromboembolism in patients with hip fractures

Iain McNamara
Aman Sharma
Teresa Prevost
Martyn Parker

Peterborough Hospital, UK
University of Cambridge, UK
Background

• Venous thromboembolism (VTE)
  – Up to 50% hip fractures
  – Significant cause of morbidity and mortality

• Highest risk groups
  – Need to be identified
Aims

• Report incidence of VTE
• Examine preadmission risk factors
• Examine surgical risk factors
• Evaluate time course
• Change practice
Patients and methods

• Duration

• All had subcutaneous heparin for 2 weeks from admission

• Pre fall data
  – Residence
  – Mobility score (0-9; 9 - full mobility)
  – Mental test score (0-10)
  – Smoking status
Patients and methods

• Post fall data
  – Admission Hb
  – Length of time from fall to surgery
  – Length of time from admission to surgery
  – Type of fracture

• Operation data
  – Type of procedure
  – Type of anaesthesia
  – Duration
Patients and methods

• Post op data
  – Time to presentation

• Diagnosis of symptomatic VTE
  – DVT
    • Diagnosed on USS, venography
  – PE
    • Diagnosed on CTPA, nuclear medicine
Analysis

- Baseline characteristics VTE to no VTE compared

- Category of VTE
  - Subdivided into DVT and PE
  - Compared with no VTE group

- Significant risk factors for VTE
  - Logistic regression, Multivariate analysis
    Significance p<0.05
Results

• 5300 patients
• Average age 80 (47-103)
• 22% male
• 117 thromboembolic events (2.2%)
  – 79 DVT (1.5%)
  – 38 PE (0.7%)
Occurrence of VTE following hip fracture

The graph shows the number of incidents of DVT, PE, and Total VTE over time following a hip fracture. The x-axis represents the time following the fracture (Weeks), while the y-axis shows the number of incidents. The chart indicates a significant increase in VTE incidents in the first few weeks post-fracture, with a gradual decrease over time.
Admission summary
No VTE v.s. VTE

• No difference
  – Gender (p=0.26)
  – Age (p=0.72)
  – Smoking (p=0.66)
  – Pathological fracture (p=1)

  – Time from fracture to admission (p=0.8)
  – Time to surgery (p=0.47)
Admission summary
No VTE v.s. VTE

• Significant difference
  – Better Mobility
    • VTE ($p=0.01$), DVT ($p=0.008$), PE (0.63)
  – Residence
    • VTE (0.002), DVT ($p=0.008$), PE (p=0.42)
  – Better Mental test score
    • VTE ($p=0.005$), DVT ($p=0.004$), (p=0.45)
Admission summary
No VTE v.s. VTE

• Significant difference
  – Higher Admission Hb
    • VTE ($p=0.03$), DVT ($p=0.18$), PE ($p=0.06$)

  – Extra capsular fracture
    • VTE ($p=0.008$), DVT ($p=0.002$), PE (0.8)
Operative details

• No difference
  – ASA grade (p=0.37)
  – Type of anaesthesia (p=0.12)

• Difference
  – Procedure performed
  – DHS and IM nail
    • VTE (p=0.03), DVT (p=0.01), PE (p=0.83)
## Logistic regression

<table>
<thead>
<tr>
<th></th>
<th>No VTE</th>
<th>Any VTE</th>
<th>Odds ratio (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>4062 (97.6%)</td>
<td>97 (2.3%)</td>
<td>1.00</td>
<td>0.090</td>
</tr>
<tr>
<td>Male</td>
<td>1121 (98.2%)</td>
<td>20 (1.8%)</td>
<td>0.64 (0.38, 1.07)</td>
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</tr>
<tr>
<td><strong>Mean age</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>79.84 (sd=11.1)</td>
<td>79.47 (sd=11.6)</td>
<td>1.00 (0.98, 1.02)</td>
<td>0.91</td>
</tr>
<tr>
<td><strong>Residence on admission</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>home</td>
<td>3715 (97.4%)</td>
<td>99 (2.6%)</td>
<td>2.24 (1.32, 3.82)</td>
<td>0.003</td>
</tr>
<tr>
<td>Institution</td>
<td>1468 (98.8%)</td>
<td>18 (1.2%)</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td><strong>Mean admission Hb</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>124.1 (sd=17.0)</td>
<td>127.6 (sd=17.9)</td>
<td>1.01 (1.00, 1.03)</td>
<td>0.013</td>
</tr>
<tr>
<td><strong>Type of fracture</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intracapsular</td>
<td>2917 (98.3%)</td>
<td>50 (1.7%)</td>
<td>1.00</td>
<td>0.001</td>
</tr>
<tr>
<td>Intertroch</td>
<td>2032 (97.0%)</td>
<td>63 (3.0%)</td>
<td>2.15 (1.46, 3.17)</td>
<td></td>
</tr>
<tr>
<td>Subtroch</td>
<td>180 (97.8%)</td>
<td>4 (2.2%)</td>
<td>1.51 (0.53, 4.30)</td>
<td></td>
</tr>
</tbody>
</table>
Discussion

• Hip fracture patients – high risk VTE group
• Symptomatic VTE Incidence - 2.2%
• Comparable to literature - heparin
  – Todd (6%)
  – Errikson (2.7%)
  – Rosensher (1.3%)
Discussion

• We identified risk factors:
  – Residence
    • Own home Odds Ratio (OR) = 2.24
  – Admission Hb
    • High Hb OR = 1.01
  – Fracture type
    • Intertrochanteric OR = 2.15
    • Subtrochanteric OR = 1.51
Explanation

• Causes unclear

  – ?patients living alone – lower mortality or report symptoms

  – Previously no risk of type of fracture identified
    • ?bleeding
Summary

• Symptomatic VTE is low

• High risk groups can be identified

• Should extended prophylaxis be offered to high risk groups?
Extended prophylaxis

• Reviews of RCT
  – extended prophylaxis LMWH reduce VTE by half
    Eikelboom et al Lancet. 2001 Jul 7;358(9275):9-15

• Reduce our incidence to 1%
  – NNT for this approx. 100

• ?cost effectiveness in hip fracture patients

• If only offered to high risk groups
  – NNT for this approx. 33
### Admission characteristics

<table>
<thead>
<tr>
<th></th>
<th>No VTE</th>
<th>Any VTE</th>
<th>DVT</th>
<th>PE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admission mobility score</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>8-9</td>
<td>1466 (28%)</td>
<td>47 (3.2%)</td>
<td>34 (2.3%)</td>
<td>13 (0.9%)</td>
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<tr>
<td>4-7</td>
<td>1834 (35%)</td>
<td>38 (2.1%)</td>
<td>27 (1.5%)</td>
<td>11 (0.6%)</td>
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<td>0-3</td>
<td>1881 (36%)</td>
<td>32 (1.7%)</td>
<td>18 (1.0%)</td>
<td>14 (0.7%)</td>
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<tr>
<td>p-value</td>
<td>0.01</td>
<td>0.008</td>
<td>0.63</td>
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<tr>
<td>Residence on admission</td>
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<tr>
<td>home</td>
<td>3715 (72%)</td>
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<tr>
<td>Institution</td>
<td>1468 (28%)</td>
<td>18 (1.2%)</td>
<td>12 (0.8%)</td>
<td>6 (0.4%)</td>
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<td>Mental test score</td>
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<td>0-5</td>
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<td>11 (0.7%)</td>
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<td>6-10</td>
<td>3255 (69%)</td>
<td>85 (2.6%)</td>
<td>60 (1.8%)</td>
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<td>0.004</td>
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<td>No VTE</td>
<td>Any VTE</td>
<td>DVT</td>
<td>PE</td>
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<td><strong>Mean admission Hb</strong></td>
<td>124.1</td>
<td>127.6</td>
<td>126.7</td>
<td>129.4</td>
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<td>p-value</td>
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<td><strong>Type of fracture</strong></td>
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<td>17 (0.8%)</td>
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<tr>
<td>Subtroch</td>
<td>180 (4%)</td>
<td>4 (2.2%)</td>
<td>3 (1.7%)</td>
<td>1 (0.6%)</td>
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<tr>
<td>p-value</td>
<td>0.008</td>
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<td>0.80</td>
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<td><strong>Median hours fracture to surgery</strong></td>
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<td>25</td>
<td>25</td>
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<tr>
<td>p-value</td>
<td>0.8</td>
<td>0.99</td>
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<tr>
<td><strong>Median hours admission to surgery</strong></td>
<td>21</td>
<td>22</td>
<td>22</td>
<td>20</td>
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<tr>
<td>p-value</td>
<td>0.47</td>
<td>0.38</td>
<td>0.99</td>
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## Operative details

<table>
<thead>
<tr>
<th>Type of operation</th>
<th>No VTE</th>
<th>Any VTE</th>
<th>DVT</th>
<th>PE</th>
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<tbody>
<tr>
<td>Hemi-arthroplasty</td>
<td>1645 (32%)</td>
<td>28 (24%)</td>
<td>19 (24%)</td>
<td>9 (24%)</td>
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<tr>
<td>Sliding hip screw</td>
<td>1863 (36%)</td>
<td>56 (48%)</td>
<td>40 (51%)</td>
<td>16 (42%)</td>
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<tr>
<td>I.M. nail</td>
<td>327 (6%)</td>
<td>11 (9%)</td>
<td>9 (11%)</td>
<td>2 (5%)</td>
</tr>
<tr>
<td>Multiple screws</td>
<td>1262 (24%)</td>
<td>21 (18%)</td>
<td>11 (14%)</td>
<td>10 (26%)</td>
</tr>
<tr>
<td>Conservative</td>
<td>86 (2%)</td>
<td>1 (1%)</td>
<td>0 (0%)</td>
<td>1 (3%)</td>
</tr>
</tbody>
</table>

*p-value*  
- 0.03  
- 0.01  
- 0.83