**Review: heparin and mechanical pumping devices reduce deep venous thrombosis after surgery for hip fracture**


**QUESTION:** Do unfractionated heparin (UH), low molecular weight heparin (LMWH), or physical methods (compression stockings and calf or foot pumps) prevent deep venous thrombosis (DVT) and pulmonary embolism (PE) after surgery for hip fracture in elderly patients?

**Data sources**

Studies were identified by searching Medline (1966 to March 2002), CINAHL (1982 to February 2002), EMBASE/Excerpta Medica (1980 to March 2002), Current Contents (1993 Week 26 to 2002 Week 12), and the Cochrane Musculoskeletal Injuries Group specialised register (to March 2002); reviewing reference lists of identified trials and review articles; and contacting colleagues, trialists, and manufacturers. Randomised controlled trials (RCTs) in languages other than English were also included.

**Study selection**

Randomised or quasi-randomised clinical trials were included if they evaluated interventions to reduce DVT and PE in patients having surgery for proximal femoral fracture. Interventions included injectable anticoagulants (UH or LMWH) and physical agents (eg, compression stockings and arteriovenous foot pumps), which were compared with placebo, no treatment, or each other. Trials that focused exclusively on children or high energy fracture in young adults were excluded. Main outcomes included DVT, PE, and death.

**Data extraction**

2 reviewers independently extracted data on study methods, participants, interventions, and outcomes. Methodological quality of individual studies was assessed for 11 aspects of internal and external validity.

**Main results**

31 trials involving 2958 patients (predominantly elderly women) met the selection criteria. Mean score for methodological quality was 14 out of 33 (range 3–29). Heparin (UH or LMWH) reduced the incidence of any DVT, proximal DVT, and distal DVT compared with placebo or control (table). The heparin and control or placebo groups did not differ for PE or mortality. No trials evaluated compression stockings. Mechanical pumping devices reduced the incidence of DVT and PE compared with control (table), but not mortality. LMWH reduced any DVT compared with UH; however, analysis of the 3 studies with methodological scores ≥ 10 showed no such difference. UH and LMWH did not differ for PE or mortality. 2 studies each found no difference between heparin and mechanical methods for any outcome.

**Conclusions**

Unfractionated and low molecular weight heparins reduce deep venous thrombosis, but not pulmonary embolism or death, after surgery for hip fracture. Mechanical pumping devices such as arteriovenous foot pumps reduce deep venous thrombosis and pulmonary embolism.

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**Heparin (unfractionated or low molecular weight) and mechanical methods v control after hip fracture surgery in elderly patients**

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Number of studies (patients)</th>
<th>Weighted event rates</th>
<th>Heparin</th>
<th>Control</th>
<th>RRR (95% CI)</th>
<th>NNT (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any DVT</td>
<td>13 (990)</td>
<td>25%</td>
<td>42%</td>
<td>40%</td>
<td>0.29 (20 to 50)</td>
<td>6 (5 to 9)</td>
</tr>
<tr>
<td>Proximal DVT</td>
<td>7 (407)</td>
<td>8.6%</td>
<td>21%</td>
<td>55%</td>
<td>0.27 (27 to 72)</td>
<td>9 (6 to 17)</td>
</tr>
<tr>
<td>Distal DVT</td>
<td>6 (357)</td>
<td>25%</td>
<td>38%</td>
<td>35%</td>
<td>0.11 (15 to 53)</td>
<td>8 (5 to 25)</td>
</tr>
<tr>
<td><strong>Mechanical methods</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any DVT</td>
<td>5 (450)</td>
<td>6.7%</td>
<td>23%</td>
<td>69%</td>
<td>0.49 (49 to 81)</td>
<td>7 (5 to 10)</td>
</tr>
<tr>
<td>Proximal DVT</td>
<td>4 (414)</td>
<td>2.4%</td>
<td>12%</td>
<td>78%</td>
<td>0.47 (47 to 90)</td>
<td>10 (7 to 20)</td>
</tr>
<tr>
<td>Distal DVT</td>
<td>2 (103)</td>
<td>19%</td>
<td>42%</td>
<td>55%</td>
<td>0.15 (15 to 77)</td>
<td>5 (3 to 17)</td>
</tr>
<tr>
<td>PE</td>
<td>5 (487)</td>
<td>2.4%</td>
<td>6%</td>
<td>60%</td>
<td>1.04 (4 to 3)</td>
<td>25 (1 to 13)</td>
</tr>
</tbody>
</table>

*Abbreviations defined in glossary: experimental event rates, RRR, NNT, and CI calculated from data in article. Follow up ranged from 4 days to 6 months. Meta-analyses were done using a fixed effects model.*

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**Commentary**

The development of either DVT or PE is a life threatening emergency, and people who have had hip surgery are at high risk of developing these conditions. Questions about the efficacy of DVT and PE prophylaxis continue to challenge healthcare providers. Handoll et al reviewed 31 experimental or quasi-experimental trials that examined the effectiveness of UH, LMWH, and mechanical devices for DVT and PE prevention.

Strengths of this review include the quantitative assessment of methodological quality for each of the 31 studies. Unfortunately, many of the studies lacked the methodological rigour necessary to provide a definitive evaluation of the effectiveness of heparin and mechanical devices for DVT and PE prophylaxis.

Meta-analysis showed that heparin (UH or LMWH) reduced the relative risk of DVT by 60% compared with placebo. However, important issues such as the effect of variations in the type (UH or LMWH), dosage, or timing of heparin remain unresolved. Mechanical pumping devices reduced the relative risk of DVT by 60% compared with no treatment; however, this finding should be viewed with caution because of methodological flaws in the 5 individual studies included in this analysis.

The review by Handoll et al supports the current practice of giving UH or LMWH to reduce DVT after hip surgery. Further studies are needed to determine whether a difference exists between UH and LMWH. Use of mechanical devices when anticoagulation is contraindicated may be beneficial. Nurses should remain vigilant when assessing patients after hip surgery and continue to monitor for signs of DVT, PE, or complications of prophylaxis such as bleeding or skin breakdown.

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