Review: Heparin reduces central venous and pulmonary artery catheter clots


Question
In patients who have central venous and pulmonary artery catheters, what effect does heparin have on thrombus formation and risk for infection?

Data sources
Studies were identified by searching MEDLINE (1966 to November 1996) and EMBASE (1988 to 1996), scanning bibliographies of relevant studies, searching conference proceedings and references in package inserts of catheter kits, and contacting companies that manufacture heparin-bonded catheters.

Study selection
Studies were selected if they were randomized controlled trials of prophylactic heparin given to adults or children who had central venous or pulmonary artery catheters. Studies were excluded if >40% of patients were excluded from the data analysis after randomization.

Data extraction
Data on the number of catheters and patients, duration of catheter patency, catheter thrombus, catheter-related vessel thrombosis, catheter colonization, and catheter-related sepsis or bacteremia were extracted by 2 investigators who used consensus to resolve disagreements. 2 investigators independently assessed the study methods for random allocation, blinding, and follow-up.

Main results
Relative risks were calculated by using a random effects model, and catheters were the unit of analysis. 14 randomized controlled trials (12 of central venous catheters and 2 of pulmonary artery catheters) met the inclusion criteria. In patients who had central venous catheters, heparin led to a reduction in catheter-related vessel thrombosis and bacterial colonization and showed a trend for reducing catheter-related bacteremia and catheter thrombus (Table). Heparin was given in parenteral nutrition solution (5 studies), by intermittent line or subcutaneous injection (4 studies), and by heparin bonding (3 studies). In patients who had pulmonary artery catheters, heparin bonding reduced the risk for catheter thrombus within the first 24 hours of catheter placement (Table).

Conclusions
For patients who have central venous catheters, heparin reduces catheter-related vessel thrombosis and bacterial colonization. It also reduces the risk for catheter thrombus within the first 24 hours of catheter placement in patients who have pulmonary artery catheters.

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Prophylactic heparin used with central venous and pulmonary artery catheters*

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Number of studies</th>
<th>Weighted RRR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central venous catheter thrombus or fibrin sheath</td>
<td>4</td>
<td>34%</td>
<td>-5 to 78</td>
</tr>
<tr>
<td>Central venous catheter–related vessel thrombosis</td>
<td>7</td>
<td>57%</td>
<td>22 to 77</td>
</tr>
<tr>
<td>Central venous catheter colonization</td>
<td>3</td>
<td>82%</td>
<td>40 to 94</td>
</tr>
<tr>
<td>Central venous catheter–related bacteremia</td>
<td>4</td>
<td>74%</td>
<td>-3 to 93</td>
</tr>
<tr>
<td>Pulmonary artery catheter thrombus within 24 h</td>
<td>2</td>
<td>92%</td>
<td>63 to 98</td>
</tr>
</tbody>
</table>

*Abbreviations defined in Glossary.

Thus, many patients with central venous catheters routinely receive heparin prophylaxis, even if the heparin is directed against preventing venous thrombosis more generally.

The most important side effects of heparin are heparin-induced thrombocytopenia (HIT) and the heparin-induced thrombocytopenia and thrombosis syndrome (HITTS). These are uncommon but potentially devastating complications that can lead to loss of life or limb. Available information suggests that the incidence of catheter-related thrombosis is higher than that of HIT or HITTS (1, 2). In addition, HIT can be detected by monitoring the platelet count during heparin use, and it is usually curtailed by stopping heparin. Serial monitoring of the platelet count is therefore important when this drug is used.

The routine use of prophylactic heparin in seriously ill patients is often problematic because thrombocytopenia often develops during critical illness for many reasons unrelated to heparin. The difficulty in excluding HIT as the cause often forces termination of the drug in this setting, even though most cases of thrombocytopenia are caused by other factors.

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References