
Risk Factors Spinal Bleeding (Spinal Hematoma):
- Traumatic needle or catheter placement
- Type of procedure: Epidural greater than (>) spinal
- Pre-existing vascular abnormalities
- Neoplastic disease
- Bleeding disorders
- Drugs: Antiplatelet agents – ASA (acetylsalicylic acid), NSAIDS (non-steroidal anti-inflammatory drugs)
  - Anticoagulants - Standard heparin, LMWH (low molecular weight heparin)
  - Thrombolytic agents – urokinase, dextran

<table>
<thead>
<tr>
<th>AGENT</th>
<th>Effect on Coagulation Variables</th>
<th>Time to Peak Effect</th>
<th>Time to Normal Hemostasis after Discontinuation</th>
<th>Regional Anesthesia</th>
<th>Catheter removal</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV heparin (SH)</td>
<td>↑PT</td>
<td>Minutes</td>
<td>4 - 6</td>
<td>Coagulations status must be normal (only check PTT if &lt; 4 - 6 hours since last dose, or if additional concerns)</td>
<td>4 - 6 hours after last heparin dose Wait 1 hour to give 1st dose after catheter removal</td>
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<tr>
<td>SC heparin (SH)</td>
<td>↑PT</td>
<td>40 - 50 minutes</td>
<td>4 - 6 hours</td>
<td>If on standard dose (5000-7500 units every 12 hours) no need to measure PTT if elapsed time 4 – 6 hours post-dose in the absence of specific woman’s concerns Not contraindicated NB: ↑ risk if also on anti-platelet drugs</td>
<td>4 - 6 hours after last heparin dose or 1 hour prior to next dose</td>
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<tr>
<td>LMWH</td>
<td>Anti-Xa activity (measurement of anti-Xa levels not recommended because not predictive of risk of bleeding)</td>
<td>2 - 4 hours</td>
<td>12 + hours</td>
<td>NB: Avoid neuraxial techniques when LMWH is given 2 hours preop because needle placement would occur during peak anticoagulant activity; Wait 10 – 12 hours after low dose Wait 24 hours after high dose</td>
<td>Low dose: 10 - 12 hours after last dose; High dose: 24 hours after last dose Wait ≥ 2 hours to give 1st dose after catheter removal; If needle or catheter placement was difficult (traumatic), wait 24 hours to give 1st dose; Overall, probably safest to wait 24 hours to give 1st dose.</td>
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<tr>
<td>Oral anti-coagulant (Coumadin, warfarin)</td>
<td>↑PT ↑ INR</td>
<td>4 - 6 days</td>
<td>4 - 6 days</td>
<td>Normal coagulation required (INR)</td>
<td>Remove catheter within 24 hours of restart of Coumadin</td>
</tr>
<tr>
<td>Antiplatelet agents Aspirin Other NSAIDS</td>
<td>-- --</td>
<td>Hours</td>
<td>5 - 8 days</td>
<td>Not contraindicated</td>
<td>Without ↑ risk</td>
</tr>
</tbody>
</table>

Key:
↑ = increased
↑↑↑ = greatly increased
< = less than
≥ = greater than or equal to
INR = International Normalized Ratio
PT = Prothrombin Time
PTT = Partial Thromboplastin Time
sc = subcutaneous
UNFRACTIONATED HEPARIN (UFH)
Prophylactic heparin (SH) doses:
- Usually 5000 - 7500 units subcutaneously (sc), twice daily (bid); decrease to 5000 units bid in anticipation of labour/delivery;
- PTT usually normal; only check prior to epidural insertion if less than 4 hours since dose unless there is a specific patient concern about possible prolongation of heparin effect. Peak effect is 2 hours post-dose.

Therapeutic heparin (SH) doses:
- Goal: PTT duration = 2 ½ times greater than (>) normal;
- Usually decrease dose until PTT is normal prior to labour/delivery if hoping to use regional anesthesia;
- May elect to continue throughout labour/delivery in some women at high risk for thromboembolic disease (regional anesthesia contraindicated).

LOW MOLECULAR WEIGHT HEPARIN (LMWH) - Management Approach:
- Woman on LMWH can be assumed to have altered coagulation
- Anti-platelet medications administered with LMWH may increase the risk of hematoma. Avoid NSAIDS
- Ideally, best to switch and stabilize with standard heparin prior to labour/delivery (so that can assess coagulation with PTT)
- If LMWH prophylaxis is electively continued up to and/or during labour/delivery or if labour begins before planned conversion to standard heparin as been achieved:

1. Timing of Needle Placement:

<table>
<thead>
<tr>
<th>Regimen</th>
<th>Example</th>
<th>Delay Minimum of</th>
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</thead>
<tbody>
<tr>
<td>Low Dose regimen</td>
<td>Enoxaparin 40 milligrams or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fragmin 5000 - 7500 units</td>
<td>12 hours after last dose</td>
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<tr>
<td></td>
<td>once daily</td>
<td></td>
</tr>
<tr>
<td>High dose regimen</td>
<td>Enoxaparin 30 milligrams or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fragmin 15000/ 200 Units/</td>
<td>24 hours after last dose</td>
</tr>
<tr>
<td></td>
<td>kilogram every 12 hours</td>
<td></td>
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</tbody>
</table>

Note: Avoid neuraxial techniques when LMWH is given 2 hours preop because needle placement would occur during peak anticoagulant activity.

2. Safest neuraxial technique: single dose spinal anesthetic may be the safest - decreased (↓) trauma.

3. Presence of blood during needle and catheter placement (traumatic needle or catheter placement. May increase (↑) risk of hematoma:
   - Delay initiation of subsequent LMWH therapy for 24 hours;
   - 1st dose should be ≥ 24 hours post-procedure in presence of adequate hemostasis (indwelling catheter must be removed prior to 1st dose)

4. Postoperative LMWH (Timing LMWH doses after epidural catheter removal)
Women with postoperative initiation of LMWH thromboprophylaxis may safely undergo single-injection and continuous catheter techniques. Management is based on total daily dose, timing of the first postoperative dose and dosing schedule.
- Twice daily dosing. This dosage regimen may be associated with an increased risk of spinal hematoma. The first dose of LMWH should be administered no earlier than 24 hours postoperatively, regardless of anesthetic technique, and only in the presence of adequate (surgical) hemostasis. Indwelling catheters should be removed prior to initiation of LMWH thromboprophylaxis. If a continuous technique is selected, the epidural catheter may be left indwelling overnight and removed the following day, with the first dose of LMWH administered at least two hours after catheter removal.
- **Single daily dosing.** This dosing regimen approximates the European application. The first postoperative LMWH dose should be administered 6 - 8 hours postoperatively. The second postoperative dose should occur no sooner than 24 hours after the first dose. Indwelling neuraxial catheters may be safely maintained. However, the catheter should be removed a minimum of 10 - 12 hours after the last dose of LMWH. Subsequent LMWH dosing should occur a minimum of 2 hours after catheter removal.

**REMEMBER:**
1) Therapeutic anticoagulation (SH or LMWH) is an **absolute contraindication** to regional anesthesia:
   - Use alternative labour analgesia methods - e.g. Entonox, TENS, IV PCA fentanyl.
   - Assess airway carefully to be prepared in the event of an emergency C-Section requiring General Anesthetic.
   - If a difficult intubation is anticipated, take appropriate precautions to be prepared as necessary. Plan for awake intubation as needed (prn). Communicate airway concerns to obstetrician, hematologist, and woman and plan strategies for labour/delivery together.
2) No intramuscular (IM) injections
3) No NSAIDS; Anti-platelet medications given concomitantly with SH or LMWH, ↑ increases the risk of hematoma

See Reference

**Anesthetic Management of the Woman Receiving Low Molecular Weight Heparin**
Anesthesiologists in North America can draw on the extensive European experience to develop practice guidelines for the management of patients undergoing spinal and epidural blocks while receiving perioperative LMWH. All consensus statements contained herein respect the labelled dosing regimens of LMWH as established by the US Food and Drug Administration. Although it is impossible to devise recommendations that will completely eliminate the risk of spinal hematoma, previous consensus recommendations have appeared to improve outcome. Concern remains for higher dose applications, where sustained therapeutic levels of anticoagulation are present.

1) Monitoring of the anti-Xa level is not recommended. The anti-Xa level is not predictive of the risk of bleeding and is, therefore, not helpful in the management of women undergoing neuraxial blocks.
2) Antiplatelet or oral anticoagulant medications administered in combination with LMWH may increase the risk of spinal hematoma. Concomitant administration of medications affecting hemostasis, such as antiplatelet drugs, standard heparin, or dextran represents an additional risk of hemorrhagic complications perioperatively, including spinal hematoma. Education of the entire woman’s care team is necessary to avoid potentiation of the anticoagulant effects.
3) The presence of blood during needle and catheter placement does not necessitate postponement of surgery. However, initiation of LMWH therapy in this setting should be delayed for 24 hours postoperatively. Traumatic needle or catheter placement may signify an increased risk of spinal hematoma, and it is recommended that this consideration be discussed with the surgeon.
4) Preoperative LMWH
   - Women on preoperative LMWH thromboprophylaxis can be assumed to have altered coagulation. In these women, needle placement should occur at least 10 to 12 hours after the LMWH dose.
   - Women receiving higher (treatment) doses of LMWH, such as enoxaparin1 milligrams/ kilogram (mg/kg) every 12 hours, enoxaparin 1.5 mg/kg daily, dalteparin 120 U (Units)/kg every 12 hours, dalteparin 200 U/kg daily, or tinzaparin 175 U/kg daily will require delays of at least 24 hours to assure normal hemostasis at the time of needle insertion.
   - Neuraxial techniques should be avoided in women administered a dose of LMWH 2 hours preoperatively (general surgery patients), because needle placement would occur during peak anticoagulant activity.
5) Postoperative LMWH: Women with postoperative initiation of LMWH thromboprophylaxis may safely undergo single-injection and continuous catheter techniques. Management is based on total daily dose, timing of the first postoperative dose, and dosing schedule.

**DOCUMENTATION**

- Anesthesia Consultation
- BCW Anesthesia Record
- Physician’s Orders

**REFERENCES**


BC Women’s Department of Anesthesia (2009).