Managing Anticoagulation to Avoid Postoperative Hemorrhage

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Disclosures

Timothy K. Liem, MD discloses the following:

• None

Potential Causes of our “Red Dot” in Perioperative Hemorrhage and Hematoma

• Capturing the wrong patients (coding and DRGs)
• We are not capturing patient co-morbidities accurately
• We over utilize prophylactic and therapeutic anticoagulation
  – Prophylaxis against VTE
  – Bridging anticoagulation
  – Aggressive postop therapeutic anticoagulation (eg. acute limb ischemia)

Study/ Year | Population | Intervention | VTE | Bleeding
---|---|---|---|---
Bergqvist, 1986 | Elective Gen Surg | LMWH 5,000 U 2 h preop + 5,000 U daily | | 4.3 %
LDUH | 5,000 U 2 h preop + 5,000 U q12 h | | 6.4 %
P = NS
P = .007
4.6 %

Turpie, 1986 | Elective THR | Enoxaparin 30 mg BID, starting 12-24 h postop | | 10.8%
P = .0002

Hull, 2000 | Elective THR | A) Preop dalteparin 2,500 U 2 h preop + 2,500 U postop >6 h
B) Postop dalteparin 2,500 U postop >6 h + 5,000 U daily
C) Warfarin INR 2.0-3.0 | A vs C
10.7 % v 24.0%
P<.01
B vs C
13.1 % v 24.0 %
P<.01
A vs B
2.2% vs 0.8%
A vs C
2.2% vs 0.4%

Colwell, 2006 | Elective THR or TKR | Delayed fondaparinux 2.5 mg morning postop + 2.5 mg daily | | 2.0 %
P=.89

Paikin, Chest 2015

UHC (Vizient) Quarterly QSMR Report - 2012

Potential Causes of our “Red Dot” in Perioperative Hemorrhage and Hematoma

• Capturing the wrong patients (coding and DRGs)
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• We over utilize prophylactic and therapeutic anticoagulation
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Our institution participates in Vizient (formerly UHC) as a PSO that provides performance feedback regarding certain patient outcomes. For several years, we had significant gaps in our outcomes with regard to postop hemorrhage and hematoma.
Perioperative Management of Anticoagulation: To Bridge or Not to Bridge

<table>
<thead>
<tr>
<th>Indication for Anticoagulation Therapy</th>
<th>Thrombosis Risk</th>
<th>Mechanical Heart Valve</th>
<th>Atrial Fibrillation</th>
<th>VTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Risk</td>
<td>&lt;10%/yr arterial TE</td>
<td>Any mechanical MVH</td>
<td>Dibek AVR - congenital - &gt;70% disco</td>
<td>Recent CVA or TIA, &gt;3 mos, Rheumatic valve</td>
</tr>
<tr>
<td></td>
<td>&gt;10%/mo VTE</td>
<td>Dibek AVR - &gt;70% disco</td>
<td>- Recent CVA or TIA, &gt;3 mos, Rheumatic valve</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>VTE &gt; 3 mos, Severe thrombophilia, Post CI, Post Si-KT, AF, Antiphospholipid Abs, Multiaffiliation</td>
<td></td>
</tr>
<tr>
<td>Moderate Risk</td>
<td>&gt;10%/yr arterial TE</td>
<td>Dibek AVR - 1st or prior CVA or TIA</td>
<td>CHADS2 score 2-4</td>
<td>VTE within 1-2 mos, Non-severe thrombophilia, TV Leaks, Protrombin mutation, Recent VTE, Active CA &gt; 6 mos</td>
</tr>
<tr>
<td></td>
<td>&gt;10%/mo VTE</td>
<td>Dibek AVR - 1st or prior CVA or TIA</td>
<td>CHADS2 score 0-1</td>
<td>VTE &gt; 12 mos, No other risk factors</td>
</tr>
</tbody>
</table>

- **Low Risk**
  - No holding DOAC on day of procedure
  - May administer LMWH VTE prophylaxis

- **Moderate Risk**
  - Hold DOAC on day of procedure
  - LMWH bridging suggested

- **High Risk**
  - LMWH bridging suggested
  - Do not interrupt AC therapy

Adapted from Douketis, Chest 2012

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Perioperative Management of Anticoagulation: To Bridge or Not to Bridge

<table>
<thead>
<tr>
<th>High Bleeding Risk Procedure</th>
<th>Low Bleeding Risk Procedure</th>
<th>Minimal Bleeding Risk Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Risk*</td>
<td>Low Risk</td>
<td>Minimal Risk</td>
</tr>
<tr>
<td>DOAC: Interrupt DOAC therapy</td>
<td>DOAC: Interrupt DOAC therapy</td>
<td>Low Risk</td>
</tr>
<tr>
<td>Bridging NOT suggested</td>
<td>Do not interrupt AC therapy</td>
<td>Low Risk</td>
</tr>
<tr>
<td>Warfarin: Interrupt VKA with LMWH bridging suggested</td>
<td>No bridging AC therapy**</td>
<td>Low Risk</td>
</tr>
<tr>
<td>Moderate Risk*</td>
<td>Low Risk</td>
<td>Minimal Risk</td>
</tr>
<tr>
<td>DOAC: Interrupt DOAC therapy</td>
<td>DOAC: Interrupt DOAC therapy</td>
<td>Low Risk</td>
</tr>
<tr>
<td>Bridging NOT suggested</td>
<td>Do not interrupt AC therapy</td>
<td>Low Risk</td>
</tr>
<tr>
<td>Warfarin: Consider interrupting VKA without bridging</td>
<td>No bridging AC therapy**</td>
<td>Low Risk</td>
</tr>
<tr>
<td>Low Risk</td>
<td>Low Risk</td>
<td>Minimal Risk</td>
</tr>
<tr>
<td>DOAC: Interrupt DOAC therapy</td>
<td>DOAC: Interrupt DOAC therapy</td>
<td>Low Risk</td>
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<tr>
<td>Bridging NOT suggested</td>
<td>Do not interrupt AC therapy</td>
<td>Low Risk</td>
</tr>
<tr>
<td>Warfarin: Interrupt VKA</td>
<td>No bridging AC therapy**</td>
<td>Low Risk</td>
</tr>
<tr>
<td>Bridging NOT necessary</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* May administer LMWH VTE prophylaxis

** Hold DOAC on day of procedure

Adapted from Spyropoulos, JTH 2016

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Initiation of Postoperative Anticoagulation in the Absence of Bridging

**Clinical Indication**
- Arterial thrombo-embolectomy s/p cardiogenic embolus
- LE bypass for acute limb ischemia
- Anti-thrombotic therapy to improve graft patency

**First 96 hours postop**
- IV heparin

**Subtherapeutic**

**Long-term oral anticoagulation**
- IV heparin "mini" dose
- LMWH prophylactic dose

Adapted from Spyropoulos, JTH 2016

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A Double Blind Randomized Control Trial of Perioperative Low Molecular Weight Heparin Bridging Therapy Versus Placebo Bridging Therapy for Patients Who Are at High Risk for Arterial Thromboembolism (PERIOP 2)

**In patients at high risk for arterial thromboembolism (MHV, CHADS2 5-6):**
- No bridging anticoagulation
- Adjusted bridging (Pv dose LMWH postop)

**Associated with low rates of periop major bleeding and thromboembolism**

**Procedure**
- Primary Amputation
- Revascularization for acute limb ischemia (ALI) 2008-2017

**Characteristics**
- **1167 (79.3)**
- **497 (76.5)**
- **670 (81.6)**

**Type of revascularization**
- **304 (20.7)**
- **153 (23.5)**
- **151 (18.4)**

**Outcome No Bridging (N=650)**
- **3 (1.96)**
- **11 (1.64)**
- **5 (0.75)**

**Outcome Bridging (N=821)**
- **172 (56.6)**
- **132 (43.4)**
- **86 (57.0)**

**Rescue Revascularization**
- **304 (20.7)**
- **153 (23.5)**
- **151 (18.4)**

**P-value**
- **0.16**

Adapted from Spyropoulos, JTH 2016

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Acute Limb Ischemia (ALI)

- Reviewed all patients who underwent surgical revascularization for acute limb ischemia (ALI) 2008-2017
- 124 limbs in 123 patients evaluating early postop anticoagulation

**Study population**
- **52 (41.9)**
- **96 (77.4)**
- **11 (8.9)**
- **2 (1.6)**

**Variables**
- **Rutherford Classification**
  - **172 (56.6)**
  - **132 (43.4)**
  - **86 (57.0)**

**Type of revascularization**
- **56 (41.9)**
- **96 (77.4)**
- **11 (8.9)**
- **2 (1.6)**

Adapted from Spyropoulos, JTH 2016
AK5 wanted more info regarding type of procedure, length of procedure, nature of ALI diagnosis
Adrienne Kahn, 10/31/2018

AK6 with respect to results/demographics
Adrienne Kahn, 10/31/2018
Postoperative Anticoagulation

First 96 Hours Post-Procedure

**THERAPEUTIC ANTICOAGULANT**
- Unfractionated Heparin (UH) titrated by aPTT/heparin levels
  - Mini-dose UH 500 Units/hr
  - LMWH prophylactic dosing
    - 30 mg SC QD
    - Unfractionated Heparin at prophylactic dosing
      - 5000 Units

**SUBTHERAPEUTIC ANTICOAGULANT**
- "Mini-dose" UH 500 Units/hr
- LMWH prophylactic dosing
  - 30 mg SC BID
  - 40 mg SC QD

First 96 Hours Post-Procedure

<table>
<thead>
<tr>
<th>Variable</th>
<th>Subtherapeutic</th>
<th>Therapeutic</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>3 (8.3)</td>
<td>8 (9.5)</td>
<td>0.84</td>
</tr>
<tr>
<td>Ischemic complications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recurrent limb ischemia</td>
<td>7 (19.4)</td>
<td>12 (14.3)</td>
<td>0.48</td>
</tr>
<tr>
<td>- MI, VTE, or stroke</td>
<td>1 (3)</td>
<td>5 (6)</td>
<td>0.51</td>
</tr>
<tr>
<td>- Major amputation</td>
<td>5 (15.2)</td>
<td>4 (4.9)</td>
<td>0.06</td>
</tr>
<tr>
<td>Bleeding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Major bleeding</td>
<td>5 (13.9)</td>
<td>15 (17.3)</td>
<td>0.59</td>
</tr>
<tr>
<td>- Minor bleeding</td>
<td>8 (23.5)</td>
<td>29 (37.2)</td>
<td>0.30</td>
</tr>
</tbody>
</table>

MI = Myocardial infarction, VTE = venous thromboembolism

"Mini-dose" heparin (500 U/hr) in the 1st several days after surgery for acute limb ischemia seems effective in preventing recurrent limb ischemia after revascularization (prior to transitioning to long-term anticoagulation).

 Strategies to Reduce Perioperative Hemorrhage

**VTE prophylaxis**
- Post-operative dosing is safe and effective, even when administered >6 h after surgery. We typically administer 12-24 h post-operatively.

**Perioperative bridging**
- VKA: Bridging anticoagulation (UH or LMWH) is not indicated in the majority of patients at low- and moderate-risk for thrombosis.
- VKA: Bridging may be appropriate in patients at high-risk for thrombosis (prosthetic heart valve, high risk a-fib, recent VTE). Prophylactic LMWH may be sufficient!
- DOACs: Bridging anticoagulation is NOT suggested for patients at low- moderate- or high-risk for thrombosis

Initiation of postoperative anticoagulation
- Avoid therapeutic dosing in the 1st 48-72 h.

UHC (Vizient) Quarterly QSMR Report - 2016

![UHC Vizient Quarterly QSMR Report - 2016](image-url)