To Bridge or Not to Bridge

Periop Anticoagulation Management

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Financial Disclosure Information

Nothing to report
Periop AC Management

Chronically anti-coagulated patient

+ procedure

Bridge with heparin or not bridge with heparin?
On what are our guidelines based?
- Observational data
- No randomized controlled trials
- Expert opinions

Therefore:
- We need to individualize therapy.
- We need to use our judgment.
- We need to take into account guidelines.
Resources

ACCP Guidelines: Perioperative Management of Antithrombotic Therapy
http://www.chestjournal.org/content/133/6_suppl/299S.abstract?etoc
Chest June 2008 133;6:299S-339S

ACC/AHA Guidelines: Management of Patients with Valvular Heart Disease
(2008 update)
http://content.onlinejacc.org/cgi/reprint/52/13/e1
Indications to Chronically Anticoagulate

- Mechanical Heart Valves
- Atrial Fibrillation
- Thromboembolic disease (DVT/PE)
Case 1

Patient with mechanical heart valve who will be undergoing a procedure.

1. Proceed directly to surgery.
2. Hold warfarin for 5 days and no bridge.
3. Bridge with IV unfractionated heparin (UFH).
4. Bridge with LMWH.
5. Need more information.
First Question:

Do you need to stop the anticoagulation therapy for this procedure?
Periop Bridging Anticoagulation

Don’t necessarily need to stop AC for all procedures:

- Cataracts
- Dermatology procedures
- Dental procedures
- Diagnostic endoscopies (?)
- Arthrocentesis (?)

Need to balance risk of bleeding with risk of clot. If in doubt, ask the person doing the procedure.

¹Arthritis Rheum. 1998; 41:736-739
Case 1 (modified)

Patient with bi-leaflet aortic mechanical valve who will be undergoing an open AAA repair.

1. Proceed directly to surgery.
2. Hold warfarin for 5 days and no bridge.
3. Bridge with UFH.
4. Bridge with LMWH.
5. Need more information.
Patient with bi-leaflet aortic mechanical valve who will be undergoing an open AAA repair.

1. Bleeding risk of procedure?
   - High risk of bleeding so need to stop warfarin.

2. Risk of clot?
   - Need to assess the risk of the valve.
Rule of Thumb

Assuming high risk of bleeding from procedure so will need to stop warfarin:

High risk of clot:
  Bridge with therapeutic dose of heparin.

Intermediate risk of clot:
  Bridge with therapeutic dose of heparin.
  Bridge with low intensity heparin?

Low risk of clot:
  No bridge or low intensity heparin.
Mechanical Heart Valves

Caged Ball
(Starr-Edwards)

Tilting Disc
(Bjork-Shiley)

Bi-leaflet
(St Jude)
# Mechanical Heart Valves

**Table 1. — Thromboembolic Complications of Valvular Prostheses**

<table>
<thead>
<tr>
<th>Valve Position</th>
<th>Valve Type</th>
<th>Emboli in Patients Receiving Anticoagulant Therapy</th>
<th>Valve Thrombosis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Fatal</td>
<td>Nonfatal</td>
</tr>
<tr>
<td>Aortic</td>
<td>Ball</td>
<td>0.61</td>
<td>2.75</td>
</tr>
<tr>
<td></td>
<td>Bjork-Shiley</td>
<td>0.65</td>
<td>1.64</td>
</tr>
<tr>
<td></td>
<td>St Jude</td>
<td>0.00</td>
<td>0.70</td>
</tr>
<tr>
<td>Mitral</td>
<td>Ball</td>
<td>1.11</td>
<td>7.59</td>
</tr>
<tr>
<td></td>
<td>Bjork-Shiley</td>
<td>0.80</td>
<td>3.69</td>
</tr>
<tr>
<td></td>
<td>St Jude</td>
<td>0.00</td>
<td>3.60</td>
</tr>
</tbody>
</table>

*Sutton and colleagues reported this rate in patients treated with dipyridamole. While we could not find any adequate series describing the rate of thrombosis for Bjork-Shiley valves in the mitral position in patients not receiving anticoagulant therapy, Sutton et al reiterated Björk's contention that the frequency of thromboembolism in patients treated with dipyridamole was the same as that in patients receiving no treatment at all.*

_Eckman JAMA 1990;263:1513_
Mechanical Heart Valves

High risk for arterial thromboembolism:
1. Mitral valve prosthesis
2. Older generation AoVR (ball in cage, tilting disc)
3. Recent CVA/TIA (within 6 months)
4. Multiple mechanical valves.

Moderate risk for arterial thromboembolism:
1. Atrial fibrillation
2. Prior CVA/TIA
3. Other risk factors (HTN, CHF, DM, age >75)

Low risk for arterial thromboembolism:
1. Bileaflet AoVR without other risk factors.

Chest June 2008 133:6:305S
# Mechanical Heart Valves

## Table 2—Suggested Patient Risk Stratification for Perioperative Arterial or Venous Thromboembolism

<table>
<thead>
<tr>
<th>Risk Stratum</th>
<th>Mechanical Heart Valve</th>
<th>Indication for VKA Therapy</th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| High         | Any mitral valve prosthesis  
Older (caged-ball or tilting disc) aortic valve prosthesis  
Recent (within 6 mo) stroke or transient ischemic attack | CHADS2 score of 5 or 6  
Recent (within 3 mo) stroke or transient ischemic attack,  
Rheumatic valvular heart disease | Recent (within 3 mo) VTE  
Severe thrombophilia (eg, deficiency of protein C, protein S or antithrombin, antiphospholipid antibodies, or multiple abnormalities) |
| Moderate     | Bileaflet aortic valve prosthesis and one of the following: atrial fibrillation, prior stroke or transient ischemic attack, hypertension, diabetes, congestive heart failure, age > 75 yr | CHADS2 score of 3 or 4 | VTE within the past 3 to 12 mo  
Nonsevere thrombophilic conditions (eg, heterozygous factor V Leiden mutation, heterozygous factor II mutation)  
Recurrent VTE  
Active cancer (treated within 6 mo or palliative) |
| Low          | Bileaflet aortic valve prosthesis without atrial fibrillation and no other risk factors for stroke | CHADS2 score of 0 to 2 (and no prior stroke or transient ischemic attack) | Single VTE occurred > 12 mo ago and no other risk factors |

*CHADS2 = Congestive heart failure-Hypertension-Age-Diabetes-Stroke.
Mayo experience (MHV)

Study:
- Looked at 556 MHV patients who underwent 580 procedures.
- Majority of valves were bi-leaflet valves.
- Followed for three months post op.
- 375 patients with single MHV in aortic position.

Results
- Overall risk of clot is low: 0.9% after three months.
- No patient developed prosthetic valve thrombosis.
- 25% of pts with single AoVR did not receive any heparin.
- None of these 25% developed any thromboembolism.

ACCP:
3. Low Risk: Recommend no bridging or low-dose heparin.

Chest 2008 133;6:299S-339S

ACC/AHA:
2. Intermediate Risk: not addressed.
3. Low Risk: “Heparin is usually unnecessary.”

J Am Coll Cardiol. 2008 52:e1
Case 1 (modified again)

Patient with bi-leaflet aortic mechanical valve in 76 yo patient with HTN and DM who will be undergoing an open AAA repair.

1. Proceed directly to surgery.
2. Hold warfarin for 5 days and no bridge.
3. Bridge with UFH.
4. Bridge with LMWH.
5. Need more information.
UFH vs LMWH

LWMH advantages:
• LMWH is considered to be “safe” for bridging but has not been studied head to head with UFH.
2. LMWH is cheaper than UFH assuming LMWH is given on an outpatient basis vs inpatient with UFH.¹

However:
1. Bridging or even anticoagulating patients with mechanical heart valves with LMWH is not a labeled indication.
2. ACC/AHA recommends UFH over LMWH while ACCP recommends LMHW over UFH.

¹Chest May 2004; 125:1642-1650
PRE-OP:
1. Start holding warfarin 5 (to 6) days ahead of time.
2. Start LMWH when INR is < 2.0.
3. Last dose of LMWH: 50% dose 24 hours ahead

POST-OP:
Start warfarin day after surgery (or later depending on surgery).

Low Bleeding Risk
- Restart therapeutic dose LMWH 24 hours post op

High Bleeding Risk:
- Restart LMWH 48-72 hours post op
- Consider low dose LMWH
- Consider no LMWH at all.
Mechanical Heart Valves

**Bottom Line:**

- Bridge all patients with mechanical heart valves with the exception of those with isolated bi-leaflet aortic valves and no risk factors.
- Generally recommend LMWH for bridging if you do decide to bridge.
- Have to take into account post op bleeding risk and adjust post op heparin accordingly.
62 yo patient, status past TIA 2 years ago, with chronic non-valvular atrial fibrillation. No history of CHF, HTN, or DM. Chronically anticoagulated with warfarin. Is going to undergo radical prostatectomy.

1. Proceed directly to surgery.
2. Hold warfarin and no bridge with heparin.
3. Bridge with UFH.
4. Bridge with LMWH.
5. Need more information.
Atrial Fibrillation

CHADS₂ Score (nonvalvular afib):

CHF (1 pt)
HTN (1 pt)
Age > 75 (1 pt)
DM (1 pt)
Stroke, TIA or systemic TE event (2 pts)

JAMA 2001; 285: 2864
# Atrial Fibrillation

## Table 2. Risk of Stroke in National Registry of Atrial Fibrillation (NRAF) Participants, Stratified by CHADS2 Score*

<table>
<thead>
<tr>
<th>CHADS2 Score</th>
<th>No. of Patients (n = 1733)</th>
<th>No. of Strokes (n = 94)</th>
<th>NRAF Crude Stroke Rate per 100 Patient-Years</th>
<th>NRAF Adjusted Stroke Rate, (95% CI)†</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>120</td>
<td>2</td>
<td>1.2</td>
<td>1.9 (1.2-3.0)</td>
</tr>
<tr>
<td>1</td>
<td>463</td>
<td>17</td>
<td>2.8</td>
<td>2.8 (2.0-3.8)</td>
</tr>
<tr>
<td>2</td>
<td>523</td>
<td>23</td>
<td>3.6</td>
<td>4.0 (3.1-5.1)</td>
</tr>
<tr>
<td>3</td>
<td>337</td>
<td>25</td>
<td>6.4</td>
<td>5.9 (4.6-7.3)</td>
</tr>
<tr>
<td>4</td>
<td>220</td>
<td>19</td>
<td>8.0</td>
<td>8.5 (6.3-11.1)</td>
</tr>
<tr>
<td>5</td>
<td>65</td>
<td>6</td>
<td>7.7</td>
<td>12.5 (8.2-17.5)</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>2</td>
<td>44.0</td>
<td>18.2 (10.5-27.4)</td>
</tr>
</tbody>
</table>

*CHADS2 score is calculated by adding 1 point for each of the following conditions: recent congestive heart failure, hypertension, age at least 75 years, or diabetes mellitus and adding 2 points for having had a prior stroke or transient ischemic attack. CI indicates confidence interval.

†The adjusted stroke rate is the expected stroke rate per 100 patient-years from the exponential survival model, assuming that aspirin was not taken.
Atrial Fibrillation

CHADS$_2$ Score:

CHADS$_2$ : Case 2 Patient:
C: CHF (1 pt) 0 pt
H: HTN (1 pt) 0 pt
A: Age > 75 (1 pt) 0 pt
D: DM (1 pt) 0 pt
S: Stroke, TIA or TE event (2 pts) 2 pts

Total Score: 2 pts
Atrial Fibrillation

Our patient’s score is 2. What do we do? First, let’s look at who should be anticoagulated long term:

ACC/AHA (2006)

<table>
<thead>
<tr>
<th>CHADS₂ Score</th>
<th>Recommended AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Usually asa alone.</td>
</tr>
<tr>
<td>1</td>
<td>asa*</td>
</tr>
<tr>
<td>2 or higher</td>
<td>oral anticoagulation</td>
</tr>
</tbody>
</table>

*Exceptions to score of 1: Rec AC if reason score is 1: age 75 or older, or 65 and older and CHF, or EF < 35%, or 65 to 74 with DM or CAD

*Circulation August 15, 2006:e292*
FIGURE 1. Distribution of 3-month thromboembolism (TE) and major bleeding (BL) rates by bridging heparin therapy and prior TE. History of TE included stroke, transient ischemic attack, thromboembolic complications of various location including left atrial thrombus.

FIGURE 2. Distribution of 3-month thromboembolism (TE) and major bleeding (BL) rates by bridging heparin therapy and CHADS2 score. CHADS2 index is named for the components of the score: congestive heart failure, hypertension (at least 160/90 mm Hg, past or present), age (>75 y), diabetes, and stroke or transient ischemic attack (past or present).
### Atrial Fibrillation

Our patient’s score is 2 due to stroke. What do we do?

<table>
<thead>
<tr>
<th>1. CHADS₂</th>
<th>ACCP:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>No bridge or bridge with low dose LWMH</td>
</tr>
<tr>
<td>&gt; or = 2</td>
<td>Rec bridging with therapeutic dose LMWH</td>
</tr>
</tbody>
</table>

*Ches 2008 133;6:299S-339S*

<table>
<thead>
<tr>
<th>2. CHADS₂</th>
<th>Mayo:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3</td>
<td>No bridge except would bridge if hx/o stroke</td>
</tr>
<tr>
<td>&gt; or = 4</td>
<td>Rec bridging (usually with therapeutic dose LMWH)</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>3. ACC/AHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>“High Risk” (hx/o stroke/TE): Rec bridging with heparin</td>
</tr>
<tr>
<td>Otherwise, “AC may be interrupted for up to a week without substituting heparin.”</td>
</tr>
</tbody>
</table>

*Circulation August 15, 2006: e298*
Case 3

70 yo man with history of unprovoked DVT 9 months ago on warfarin. No history of thrombophilic conditions, no cancer. Undergoing prostatectomy.

1. Proceed directly to surgery.
2. Hold warfarin and no bridge with heparin.
3. Bridge with UFH.
4. Bridge with LMWH.
5. Need more information.
Venous Thromboembolism

Some differences between patients with VTE and afib/mechanical heart valves (MHVs):

**Afib/MHV:**
Risk of arterial TE/Stroke:
If occurs, high risk of neurological compromise/death (70%)

Kaplan Neurology 2005; 56:368-375
Longstreth Neurology 2001; 65:835-842

**Venous TE:**
Risk of recurrent venous TE (DVT/PE):
Fatal in 4-9% and less morbidity

Douketis JAMA 1998; 279:458-462
Some differences between patients with VTE and afib/mechanical heart valves (MHVs):

**Afib/MHV:**
Low dose heparin has not been well studied and hasn’t been proven to decrease arterial TE.

Chest 2008 133;6:299S-339S

**Venous TE:**
Low dose heparin has been shown to decrease post-op DVTs (non-bridging trials). Perhaps consider more strongly in intermediate risk patients compared with afib/MHV.

Chest 2008 133;6:299S-339S
Geerts Chest 2004; 126 (suppl):338S-400S
### Venous Thromboembolism

#### Table 2—Suggested Patient Risk Stratification for Perioperative Arterial or Venous Thromboembolism

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<th>Atrial Fibrillation</th>
<th>VTE</th>
</tr>
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<tr>
<td>High</td>
<td>Any mitral valve prosthesis</td>
<td>CHADS&lt;sub&gt;2&lt;/sub&gt; score of 5 or 6</td>
<td>Recent (within 3 mo) VTE</td>
</tr>
<tr>
<td></td>
<td>Older (caged-ball or tilting disc) aortic valve prosthesis</td>
<td>Recent (within 3 mo) stroke or transient ischemic attack, severe thrombophilia (e.g., deficiency of protein C, protein S or antithrombin, antiphospholipid antibodies, or multiple abnormalities)</td>
<td></td>
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<td></td>
<td>Recent (within 6 mo) stroke or transient ischemic attack</td>
<td>Rheumatic valvular heart disease</td>
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<tr>
<td>Moderate</td>
<td>Bileaflet aortic valve prosthesis and one of the following: atrial fibrillation, prior stroke or transient ischemic attack, hypertension, diabetes, congestive heart failure, age &gt; 75 yr</td>
<td>CHADS&lt;sub&gt;2&lt;/sub&gt; score of 3 or 4</td>
<td>VTE within the past 3 to 12 mo</td>
</tr>
<tr>
<td></td>
<td>Recurrent VTE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>Bileaflet aortic valve prosthesis without atrial fibrillation and no other risk factors for stroke</td>
<td>CHADS&lt;sub&gt;2&lt;/sub&gt; score of 0 to 2 (and no prior stroke or transient ischemic attack)</td>
<td>Active cancer (treated within 6 mo or palliative)</td>
</tr>
</tbody>
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*CHADS<sub>2</sub> = Congestive heart failure-Hypertension-Age-Diabetes-Stroke.*
Case 3

70 yo man with history of unprovoked DVT 9 months ago on warfarin. No history of thrombophilic conditions, no cancer. Undergoing prostatectomy.

Risk: Intermediate

Bridging? Perhaps low dose heparin?
Rule of Thumb

Assuming high risk of bleeding from procedure so will need to stop warfarin:

High risk of clot:
  Bridge with therapeutic dose of heparin.

Intermediate risk of clot:
  Bridge with therapeutic dose of heparin.
  Bridge with low intensity heparin?

Low risk of clot:
  No bridge or low intensity heparin.

Questions?

Discussion?
## Table 2—Suggested Patient Risk Stratification for Perioperative Arterial or Venous Thromboembolism

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<td>Recent (within 3 mo) stroke or transient ischemic attack, Rheumatic valvular heart disease</td>
<td>Severe thrombophilia (eg, deficiency of protein C, protein S or antithrombin, antiphospholipid antibodies, or multiple abnormalities)</td>
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<td>Bileaflet aortic valve prosthesis and one of the following: atrial fibrillation, prior stroke or transient ischemic attack, hypertension, diabetes, congestive heart failure, age &gt; 75 yr</td>
<td>CHADS₂ score of 3 or 4</td>
<td>VTE within the past 3 to 12 mo Nonsevere thrombophilic conditions (eg, heterozygous factor V Leiden mutation, heterozygous factor II mutation) Recurrent VTE Active cancer (treated within 6 mo or palliative)</td>
</tr>
<tr>
<td>Low</td>
<td>Bileaflet aortic valve prosthesis without atrial fibrillation and no other risk factors for stroke</td>
<td>CHADS₂ score of 0 to 2 (and no prior stroke or transient ischemic attack)</td>
<td>Single VTE occurred &gt; 12 mo ago and no other risk factors</td>
</tr>
</tbody>
</table>

*CHADS₂ = Congestive heart failure-Hypertension-Age-Diabetes-Stroke.
2.4. In patients with a mechanical heart valve or atrial fibrillation or VTE at high risk (Table 2) for thromboembolism, we recommend bridging anticoagulation with therapeutic-dose SC LMWH or IV UFH over no bridging during temporary interruption of VKA therapy (Grade 1C); we suggest therapeutic-dose SC LMWH over IV UFH (Grade 2C). In patients with a mechanical heart valve or atrial fibrillation or VTE at moderate risk (Table 2) for thromboembolism, we suggest bridging anticoagulation with therapeutic-dose SC LMWH, therapeutic-dose IV UFH, or low-dose SC LMWH over no bridging during temporary interruption of VKA therapy (Grade 2C); we suggest therapeutic-dose SC LMWH over other management options (Grade 2C). In patients with a mechanical heart valve or atrial fibrillation or VTE at low risk (Table 2) for thromboembolism, we suggest low-dose SC LMWH or no bridging over bridging with therapeutic-dose SC LMWH or IV UFH (Grade 2C).