Perioperative Anticoagulation Management

Tony Ochoa, MD, FACC
Interrupting Anticoagulation: To Bridge or Not?

- Peri-operative is most common reason
- Injury/Acute internal bleeding (not discussed)
- Atrial fibrillation
- Mechanical Valves
- LV thrombus, PFO
- Venous Thromboembolism
- Warfarin vs. Novel Anticoagulants
Systematic Approach

• Estimate thromboembolic risk
• Estimate bleeding risk
• Determine timing of anticoagulant interruption
• Determine whether to use a bridging agent
## Determining Thromboembolic Risk: High Risk Patients

<table>
<thead>
<tr>
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<th>Mechanical Heart Valves</th>
<th>Atrial Fibrillation</th>
<th>VTE</th>
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</thead>
</table>
| **High Risk** | - Any MV prosthesis  
- Any tilting disc or cage ball aortic prosthesis  
- Recent CVA/TIA <6mo | - CHADS$_2$ ≥5  
- Recent CVA/TIA <3mo  
- Rheumatic valvular heart disease  
- Hx cardiac thrombus/embolism | - Severe thrombophilia  
- Recent VTE <3mo |
| **Moderate Risk** | Bileaflet AV prosthesis and any of these:  
Afib, prior CVA/TIA, HTN, DM, CHF, age>75 | CHADS$_2$ 3-4  
Or reversal of OAC performed* | Hx VTE 3-12mo  
- Recurrent VTE  
- Heterozygote Factor V Leiden  
- Active cancer (tx<6mo) |
<p>| <strong>Low Risk</strong> | Bileaflet AV prosthesis w/o afib and no other risk factors | CHADS$_2$ 0-2 | Hx VTE &gt;12mo and no other risk factors |</p>
<table>
<thead>
<tr>
<th>High bleeding risk (2-day risk 2-4%)</th>
<th>Low bleeding risk (2-day risk &lt;2%)</th>
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<tbody>
<tr>
<td>AAA repair, vascular surgery</td>
<td>Abdominal hernia repair</td>
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<tr>
<td>Bilateral knee replacement</td>
<td>Abdominal hysterectomy</td>
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<tr>
<td>Endoscopic FNA</td>
<td>Axillary node dissection</td>
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<tr>
<td>Renal biopsy</td>
<td>Bronchoscopy ± biopsy</td>
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<tr>
<td>Laminectomy</td>
<td>Ophthalmologic</td>
</tr>
<tr>
<td>Neurosurgical and Urologic</td>
<td>Carpal tunnel repair</td>
</tr>
<tr>
<td>breast cancer</td>
<td>Cholecystectomy</td>
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<tr>
<td>GI: Polypectomy, variceal treatment, pneumatic dilation, sphincterotomy</td>
<td>D&amp;C</td>
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<tr>
<td>Coronary angiography</td>
<td>Cutaneous biopsies (skin, LN, thyroid, breast, bladder, prostate)</td>
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<tr>
<td>Multiple tooth extraction</td>
<td>GI endoscopy ± biopsy</td>
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<tr>
<td>Neuraxial Anesthesia</td>
<td>Knee/hip replacement</td>
</tr>
<tr>
<td></td>
<td>Cardiac device implantation, EP testing/ablation</td>
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<td></td>
<td>Single tooth extraction</td>
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</table>
Deciding Whether to Interrupt Anticoagulation

- Low bleeding Risk -> Continue
- Low thrombotic Risk -> Interrupt (no bridging)
- High bleeding risk + Moderate/High thrombotic risk -> Interrupt and bridge
- Pre +/- Post-op Bridging
  - NVAF w/ High bleed risk: pre-op bridging only
  - High thrombotic risk: pre and post-op bridging
  - VTE >1mo: post-op bridging only
Efficacy of Bridging

- Meta-analysis of 34 studies*
- No difference in rate of thromboembolism
- Bridging increased major bleeding rate 3 fold
- Full dose heparin vs. prophylactic or intermediate dose heparin -> no difference
  - full dose increased overall bleeding
- Heterogeneous, mostly observational (1 RCT), biased data
- BRIDGE and PERIOP trials in progress

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Bridging Agents

- **UFH**: rapid offset, cheaper, IV (inpt)
  - preferred by ACC/AHA and ESC

- **LMWH** (avoid if CRI/dialysis)
  - now endorsed by ACCP, ECP

- **DTI** (HIT) – very limited data; IV

- **NovAC’s** – no data!
  - use only if plan to transition from VKA post op (NVAF/DVT)
Timing: Pre-Op Bridging

• Stop warfarin 5 days prior to procedure
• Low risk: check INR day before, if INR>1.5 consider Vit. K 1-2mg and recheck next day (goal INR<1.4)
• Moderate/High thrombotic risk: initiate UFH/LMWH starting 3 days prior to surgery (or when INR< 2); stop LMWH 24hrs before and UHF 3-5hrs pre-op
Timing: Post-Op Bridging

• Both UFH and LMWH have rapid onset (1 hour)
• Minor procedures (e.g. lap-hernia repair) - start LMWH or UFH 24hrs post-op
• Major procedures: start 48-72hrs post-op
• Resume warfarin same day as start bridging anticoagulation
Novel Oral Anticoagulants

- Approved for NVAF and DVT/PE
- Dabigatran (Pradaxa) – direct thrombin inhibitor
- Rivaroxiban (Xarelto) – FXa inhibitor
- Apixaban (Eliquis) – FXa inhibitor
- All have rapid onset and offset of AC effect vs. warfarin
- No effective reversal for any
- No bridging is generally needed/advised
Measuring NOVAC Effect

• PT/INR does not accurately measure AC effect for these agents
• Pradaxa: use aPTT and TT (ECT*)
• Xarelto: Fxa*, PT (not accurate)
• Eliquis: Fxa*, PT (not accurate)
Peri-Op NOVAC Use:
Manufacturer’s guidelines

• Pradaxa: stop 1-2 days (GFR>50) or 3-5 days before (GFR= 30-50)
• Xarelto: stop at least 24hrs prior
• Eliquis: low bleeding risk- stop at least 24hrs prior; mod/high bleeding risk- stop at least 48 hrs prior
• If use bridging-> wait to start UFH/LMWH 12hours after last dose (GFR>30)
Use of NOVAC’s: Mechanical Valves

- Pradaxa vs. warfarin
- ReAlign study
- Terminated early
- More bleeding (27% vs. 12%)
- More thrombosis (8% vs. 0%)
  - CVA 5%, ‘asx valve thrombosis 3%
Case 1

- 76yo WF, on Pradaxa for NVAF (flutter)
- CHADS$_2$ = 2 (age>75, CHF)
- GRF= 46cc/kg/min
- Hx NICM (TMC), SSS s/p pacemaker
- Last echo 4/14: LVEF 25->50% w/ OMT; LAE (5cm), 2+MR
- PM check: A-Flutter, rate controlled
- Plans to have cataract removal (bilateral)
Case 1

- Surgery scheduled next week for left eye followed by right eye 1 week later
- Interrupt her NOVAC?
- Bleeding risk = low (ophthalmologic)
- Ophthalmologist calls to tell you they are uncomfortable with continuation of NOVAC
- Thrombotic risk = low
- Pradaxa held 3 days before left cataract removal and resumed 24 hours after
Case 1

- Pradaxa held again 3 days before right cataract and resumed 24hrs after
- 24 hrs after resuming Pradaxa she develops a left facial droop and aphasia
- Neuro symptoms improve (<24 hrs)
- Pradaxa continued
Case 1

• Rebound thrombosis may be higher with NOVAC’s
• Avoid tandem procedures- delay second procedure at least 3-4 weeks if possible
  - if not-> use bridging AC between
• ? continuing NOVAC after CVA
  - really due to ineffective AC?
  - risk of hemorrhagic transformation (no reversal)
Summary

• Interrupting AC always poses some risk of thrombosis
• Assess bleeding risk of proposed procedure
• Assess risk for thrombosis off AC
• Minimize period off of AC
• Bridge those at moderate/high thrombosis risk (pre-op, post-op, both)
References/Sources

• 2006 ACC/AHA Guidelines (focused update 2008)
• 2012 ESC Guidelines
• 2012 ACCP (9th) Guidelines
• Up to Date©