

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?

Periop AC Management

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>

J. Am. Coll. Cardiol., September 23, 2008; 52: e1 - e142.

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.

Periop Bridging Anticoagulation

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 (?) ¹

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.

Case 1 (modified)

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.

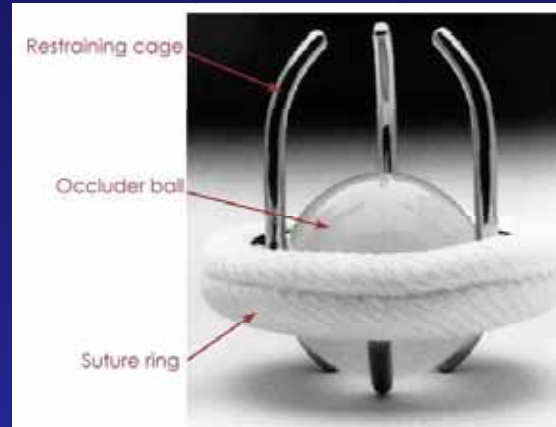
Bridge with low intensity heparin?

Low risk of clot:

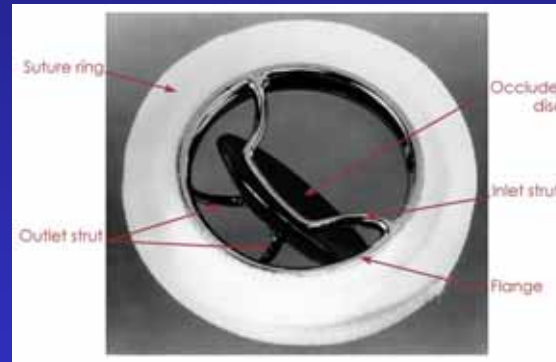
No bridge or low intensity heparin.

Mechanical Heart Valves

Caged Ball
(Starr-Edwards)



Tilting Disc
(Bjork-Shiley)



Bi-leaflet
(St Jude)



Mechanical Heart Valves

Table 1.—Thromboembolic Complications of Valvular Prostheses⁷¹⁻⁸⁰

Valve Position	Valve Type	Incidence of Thromboemboli per 100 Patient-Years			
		Emboli in Patients Receiving Anticoagulant Therapy		Valve Thrombosis	
		Fatal	Nonfatal	Anticoagulant Therapy	No Anticoagulant Therapy
Aortic	Ball	0.61	2.75	0.03	1.32
	Bjork-Shiley	0.65	1.64	0.33	3.14
	St Jude	0.00	0.70	0.00	1.64
Mitral	Ball	1.11	7.59	0.55	...
	Bjork-Shiley	0.80	3.69	0.70	5.74*
	St Jude	0.00	3.60	0.00	1.64

*Sutton and colleagues⁸⁰ 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.

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.

Mechanical Heart Valves

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

Risk Stratum	Mechanical Heart Valve	Indication for VKA Therapy	
		Atrial Fibrillation	VTE
High	Any mitral valve prosthesis Older (caged-ball or tilting disc) aortic valve prosthesis Recent (within 6 mo) stroke or transient ischemic attack	CHADS ₂ 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 (<i>eg</i> , 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	CHADS ₂ score of 3 or 4	VTE within the past 3 to 12 mo Nonsevere thrombophilic conditions (<i>eg</i> , 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	CHADS ₂ 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.

Mechanical Heart Valves

ACCP:

1. High Risk: Recommend therapeutic-dose heparin.
2. Intermediate Risk: Recommend therapeutic-dose heparin.
3. Low Risk: Recommend no bridging or low-dose heparin.

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ACC/AHA:

1. High Risk: Recommend therapeutic-dose heparin.
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

LMWH 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 LMWH over UFH.

¹Chest May 2004; 125:1642-1650

Bridging with LMWH

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.

Case 2

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)

Atrial Fibrillation

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

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

*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

CHADS₂ Score:

CHADS₂ :

C: CHF (1 pt)

H: HTN (1 pt)

A: Age > 75 (1 pt)

D: DM (1 pt)

S: Stroke, TIA

or TE event (2 pts)

Case 2 Patient:

0 pt

0 pt

0 pt

0 pt

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)

CHADS₂ Score:

0

1

2 or higher

Recommended AC:

Usually asa alone.

asa*

oral anticoagulation

*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

Mayo experience (afib)

		Heparin	
		(+)	(-)
History of TE	(+)	TE rate 1% BL rate 3% (n=87)	TE rate 0% BL rate 0% (n=43)
	(-)	TE rate 1% BL rate 3% (n=109)	TE rate 1% BL rate 3% (n=129)

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.

		Heparin	
		(+)	(-)
CHADS ₂	(≥3)	TE rate 1% BL rate 3% (n=80)	TE rate 0% BL rate 0% (n=51)
	(<3)	TE rate 1% BL rate 3% (n=116)	TE rate 1% BL rate 3% (n=121)

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: **c**ongestive heart failure, **h**ypertension (at least 160/90 mm Hg, past or present), **a**ge (>75 y), **d**iabetes, and **s**troke or transient ischemic attack (past or present).

Atrial Fibrillation

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

1. CHADS₂: ACCP:
0-1 No bridge or bridge with low dose LMWH
> or = 2 Rec bridging with therapeutic dose LMWH
Chest 2008 133;6:299S-339S

2. CHADS₂: Mayo:
0-3 No bridge except would bridge if hx/o stroke
> or = 4 Rec bridging (usually with therapeutic dose LMWH)
Mayo Clin Proc June 2008;83(6):639-645

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

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%)

Chest 2008 133;6:299S-339S

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

Chest 2008 133;6:299S-339S

Douketis Ann Intern Med 2007; 147:766-774

Douketis JAMA 1998; 279:458-462

Venous Thromboembolism

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.

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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

Risk Stratum	Indication for VKA Therapy		
	Mechanical Heart Valve	Atrial Fibrillation	VTE
High	Any mitral valve prosthesis Older (caged-ball or tilting disc) aortic valve prosthesis Recent (within 6 mo) stroke or transient ischemic attack	CHADS ₂ 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 (<i>eg</i> , 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	CHADS ₂ score of 3 or 4	VTE within the past 3 to 12 mo Nonsevere thrombophilic conditions (<i>eg</i> , 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	CHADS ₂ 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.

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?

ACCP Risk Assessment

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

Risk Stratum	Indication for VKA Therapy		
	Mechanical Heart Valve	Atrial Fibrillation	VTE
High	Any mitral valve prosthesis Older (caged-ball or tilting disc) aortic valve prosthesis Recent (within 6 mo) stroke or transient ischemic attack	CHADS ₂ 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 (<i>eg</i> , 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	CHADS ₂ score of 3 or 4	VTE within the past 3 to 12 mo Nonsevere thrombophilic conditions (<i>eg</i> , 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	CHADS ₂ 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.

ACCP Recommendations

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).