

Perioperative Management of Anticoagulation for Mechanical Heart Valve Replacements in Adults

In patients with a mechanical heart valve replacement the temporary interruption of anticoagulation before an invasive procedure or non-cardiac surgery will increase the thromboembolic risk.

However, early reintroduction of anticoagulation post op may result in bleeding and subsequent delay in re-anticoagulation, thereby also increasing the thromboembolic risk. The perioperative management of anticoagulation in these patients therefore requires meticulous attention to detail.

Surgery is best avoided in the 3 months after valve replacement (for mechanical and biological replacements) and after valve repair.

Individual thromboembolic risk will depend on a number of factors:

- Type of valve replacement (e.g. old generation ball and cage Starr Edwards prosthesis versus the more modern bileaflet valve e.g. Carbomedics)
- Position of the valve replacement (mitral versus aortic)
- Number of valve replacements
- Previous thromboembolic events
- Co-existent atrial fibrillation
- Left atrial size
- Left ventricular function

A median target INR rather than a range of INR is preferred to avoid accepting an INR at the extreme of the range.

In general, target INRs are as follows:

Aortic valve replacement (AVR) target INR 2.5

Mitral valve replacement (MVR) target INR 3.5

Both AVR and MVR target INR 3.5

Some patients with a mechanical valve replacement (typically younger patients at low bleeding risk) may take low dose aspirin (75mg) in addition to warfarin. If this is the case, aspirin can be discontinued for surgery.

Patients with a mechanical valve replacement who need to stop their warfarin for surgery will require bridging with heparin, providing there is no contraindication e.g. previous heparin induced thrombocytopenia (HIT), heparin allergy. Low molecular weight heparin (LMWH) should be used with caution in patients with significant renal impairment.

Pre Admission Management

Patients should take their usual warfarin on day 6 before surgery and thereafter cease taking warfarin.

Patients should check their INR in the morning of day 4 and, if necessary, day 3 before surgery in preparation for bridging with heparin. The timing of heparin will be dictated by the patient's target

INR and additional thromboembolic risk factors. Once the INR falls below the target, the patient is commenced on heparin. Subcutaneous (sc) LMWH Enoxaparin is preferred to iv unfractionated heparin (UFH) providing creatinine clearance ≥ 30 ml/min and means the majority of patients with a mechanical valve replacement need not be admitted until the day of surgery, providing there are no contraindications and there is no concern about compliance with injecting.

Bridging with sc Low Molecular Weight Heparin (LWMH)

Use weight adjusted Enoxaparin twice daily

- Patients weighing ≤ 150 Kg use Enoxaparin 1mg/Kg bd *as above*
- There are minimal safety data for patients weighing >150 Kg and the dose of LMWH should be discussed with a Consultant Haematologist for this patient group.

Bridging with iv Unfractionated Heparin (UFH)

- All patients undergoing intracranial surgery
- Patients weighing ≥ 150 Kg pre and post op
- Patients creatinine clearance <30 ml/min pre and post op
- Mitral valve replacements – evening before surgery and immediately post op (see below and Figure 2)
- High risk aortic valve replacements – post op on day of surgery (see below and Figure 2 High Risk)

Aim for APTTR 2-2.5 for patients on iv unfractionated heparin

When to commence Heparin Bridging Depending on Valve Replacement Type and INR

- Aortic valve replacement and no additional valvular or thromboembolic risk factors (Figure 1 Low Risk)
 - Bridge with LMWH once INR ≤ 2.0
- Older generation AVR (ball and cage) or additional valvular or thromboembolic risk factors (figure 2)
 - Bridge once INR < 2.5
- All Mitral valve replacements (Figure 2 High Risk)
 - Bridge once INR < 3.0

When to commence Heparin Depending on Type of Surgery and Type of Valve Replacement

1. High Risk Intracranial surgery (any type of mechanical valve replacement)
 - Last dose Enoxaparin 08.00 day 2 prior to surgery
 - Admit patient day 2 prior to surgery for conversion to iv heparin at 18.00
 - Stop iv heparin 6 hours before surgery
2. Mitral valve replacement
 - Last dose Enoxaparin 08.00 day 1 prior to admission for surgery *as above*
 - Admit patient day 1 prior to surgery for conversion to iv unfractionated heparin at 18.00
 - Stop iv heparin 6 hours before surgery

3. All other patients can be admitted on the day of surgery
 - Last dose Enoxaparin 08.00 day 1 prior to admission for surgery *as above*

Day of Surgery

All patients with a mechanical valve replacement must be first on the theatre list (no exceptions)

Post op Management

Day of surgery

1. High risk intracranial surgery
 - No anticoagulation
 - Mechanical thromboprophylaxis only
2. Mitral valve replacements and high risk aortic valve replacements (e.g. previous valvular thromboembolic event on warfarin, old generation valve, high gradient)
 - Start unfractionated iv unfractionated heparin within 6 hours of surgery providing there is no concern about immediate post op bleeding (senior surgical review is necessary if there is a concern)
 - Do not give a bolus of heparin
 - Re-start usual dose warfarin (do not load the patient) in addition to the iv heparin regime on the evening of surgery providing there are no concerns about active bleeding and there is no epidural/regional catheter in place
3. All other (low risk) aortic valve replacement patients
 - Give a single dose Enoxaparin 40mg sc on the evening of surgery (or other prophylactic LMWH)
 - Re-start usual dose warfarin (do not load the patient) on the evening of surgery providing there are no concerns about active bleeding and there is no epidural/regional catheter in place

Day 1 post surgery (see Figures 1 and 2)

1. High risk Intracranial surgery
 - Start unfractionated iv heparin
 - Consider giving usual dose warfarin (discuss with surgeon / anaesthetist)
2. Ongoing bleeding concerns (senior surgical review)
 - Continue iv unfractionated heparin
3. Mitral valve replacements and high risk aortic valve replacement patients (e.g. previous valvular thromboembolic event on warfarin, old generation valve, high gradient)
 - Continue unfractionated iv unfractionated heparin
 - Give usual dose warfarin 18.00 in addition to the iv heparin regime providing there are no concerns about active bleeding and there is no epidural/regional catheter in place
4. All other (low risk) aortic valve replacement patients

- Give Enoxaparin 40mg sc 18.00 (or other prophylactic LMWH)
- Continue to give the patient's usual warfarin dose in the evening

Day 2 post surgery (see figures 1 and 2)

1. High risk Intracranial surgery
 - Continue unfractionated iv heparin
 - Consider giving usual dose warfarin (discuss with surgeon / anaesthetist)
2. Ongoing bleeding concerns (senior surgical review)
 - Continue iv unfractionated heparin
3. Mitral valve replacements and high risk aortic valve replacement patients (e.g. previous valvular thromboembolic event on warfarin, old generation valve, high gradient)
 - Change iv heparin to LMWH 1mg/Kg Enoxaparin s/c bd
 - Give usual dose warfarin 18.00 providing there are no concerns about active bleeding and there is no epidural/regional catheter in place
4. All other (low risk) aortic valve replacement patients
 - Start 1mg/Kg Enoxaparin sc 18.00
 - Continue to give the patient's usual warfarin dose in the evening

Discontinue heparin once INR is therapeutic for that patient typically

- AVR (low risk) INR \geq 2.0
- AVR (high risk) INR 2.5
- MVR INR \geq 3.0

Arrange an anticoagulation appointment for INR check within 72 hours of discharge if the INR has not reached target before discharge. If this cannot be achieved, bring the patient back to the ward for a check.

Figure 1

[Bridging for LOW RISK mechanical heart valves prior to elective surgery](#)

Figure 2

[Bridging for HIGH RISK mechanical heart valves prior to elective surgery](#)

References

Baumgartner H, Falk V, Bax JJ. ESC/EACTS Guidelines for the management valvular heart disease. Eur Heart J 2017; 38: 2739-2791

Nishimura RA, Otto CM, Bonow RO et al. AHA/ACC guidelines for the management of patients with valvular heart disease. Journal Am Coll Cardiol 2014; 63: 2440-2483

Nishimura RA Otto CM, Bonow RO et al. AHA/ACC 2017 Focused update of 2014 AHA/ACC guideline for the management of patients with valvular heart disease. Circulation 2017; 135: 1159-1195

Little SH et al. Antiplatelet and anticoagulation for patients with prosthetic heart valves. Cochrane database of systematic reviews 2003; issue 4

Salen DN, O'Gara PT, Madias C et al. Valvular and structural heart disease. Am Coll Chest Physicians 2008

Dentali F et al. Combined aspirin-oral anticoagulant therapy compared with oral anticoagulant therapy alone among patients at risk for cerebrovascular disease. A meta-analysis of randomised trial. J Am Coll Cardiol 2010; 167 (2): 117-211

Carnicelli A. Anticoagulation for valvular heart disease. Journal Am Coll Cardiol 2015

Perioperative Management of Anticoagulation for Mechanical Heart valve Replacements for Non-cardiac Surgery working group

Dr Rachael James Consultant Cardiologist (Lead)

Dr Julie George Consultant Anaesthetist and Pre-op Physician

Dr Brigitta Marson Consultant Haematologist

Clare Proudfoot Specialist Pharmacist

October 2020