CLINICAL KNOWLEDGE UPDATE

Perioperative management of anticoagulants and antiplatelets in Spine Surgery

Executive Summary

- The aim of this document is to provide guidance on the management of anticoagulants (ACT) and antiplatelets (APT) in patients undergoing spine surgery.
- **This guidance does not replace local policy.**
- **This guidance does not replace a patient specific management plan following discussion with involved clinicians, taking into account specific risks and the surgical procedure itself.**
- The risk of bleeding in spine surgery includes neuro-compressive haematoma, excessive blood loss and soft tissue complications including infection.
- The risk of stopping ACT / APT includes thromboembolic risk, ischaemic events, stent occlusion and valve thrombosis.
- Evidence is low for stopping or continuing NSAIDS. When NSAIDS are to be stopped they should be stopped according to the individual drug half-life.
- Evidence suggests that continuation of aspirin may not lead to significant problems particularly in low / intermediate risk procedures. When aspirin is to be stopped, 7 days minimum preoperative cessation is satisfactory.
- Evidence suggests that continuation of clopidogrel, Plavix may lead to problems. These agents should be stopped a minimum of 5-7 days preoperatively.
- Evidence suggests that continuation of NOACS can lead to problems. These agents should be stopped a minimum of 5 half-lives preoperatively (24 -72 hours).
- Evidence suggests that continuation of warfarin can lead to problems. Warfarin should be stopped a minimum of 5 days preop until INR < 1.5.
- Evidence suggests that continuation of heparin and fractionated heparin can lead to problems. These agents should be stopped minimum 6-24 hours preoperatively depending on the agent.
- Evidence suggests that bridging therapy is not needed universally and should only be used in patients with high risk of thromboembolic events.
- Plan for recommencing ACT / APT agents will be dependent on the agent, the underlying surgical bleed risk and the patient's risk of stopping the agent.
- Inform patients about the risk of continuation or cessation of ACT / APT (in addition to other complications) during the consent process.
- Preparation for cases with a high risk of stopping ACT / APT should include individualised discussion with the appropriate treating clinicians to ascertain the risks and benefits of delaying surgery or ACT / APT cessation.
- All patients undergoing spine surgery should be screened for ACT / APT use and a clear visible plan documented for the perioperative period.
- All personnel involved in managing the patient should be aware of the decision making to reduce the risk of variance from the preoperative plan and prevent adverse consequences.
- The plan for recommencement of ACT / APT should be clearly outlined in the postoperative notes.
- Reversal in emergency scenarios should be performed with haematology advice.

Contents

Who does this update affect?

Patient group
This guidance affects all patients undergoing spine surgery on ACT or APT agents.

Clinical staff
Spine surgeons and surgical team, preassessment teams, spine practitioners, theatre and recovery personnel, anaesthetic teams, nursing and pharmacy teams.

Managerial staff
Responsible ward managers, matrons, clinical leads / directors in spine surgery and RSN.

What is the update trying to achieve?

The guidance is trying to reduce the risks associated with managing ACT / APT in the perioperative phase of spine surgery.

Spine surgery whilst on ACT / APT agents carries a risk of neuro-compressive haematoma, excessive blood loss and soft tissue complications including infection.

The risk of stopping ACT / APT includes thromboembolic risk, ischaemic events, stent occlusion and valve thrombosis.

Recognising the use of anticoagulants and antiplatelets

Any patients undergoing elective or non-elective spine surgery should be screened for the use of ACT / APT.

At the time of writing in the UK, these drugs are used to reduce the risk of venous and arterial thromboembolic events, protect stents and mechanical valves from thrombosis.

Ideally patients should be screened for the use of ACT / APT at the time of listing for any spine intervention so that the appropriate enquiries with respect to cessation can be made and a perioperative plan established. Any preassessment pathway for spine surgery should ensure screening questions for ACT / APT are asked and that this triggers a perioperative plan to be detailed.

The patient and admitting team should be made aware of the perioperative plan to ensure complications related to ACT / APT use and cessation are minimised.

Most cases can revert to a default plan, although more complex cases should have an individualised MDT discussion with the appropriate medical specialty to ensure the optimal perioperative plan.

Abbreviations used

ACT – anticoagulant
APT - antiplatelet
EBL – estimated blood loss
POD – post operative drainage
POBL – perioperative blood loss
SEH – spinal epidural haematoma
TE – thromboembolic
ACS – acute coronary syndrome
CrCl – creatinine clearance
VTE – venous thromboembolism

Considerations

Considerations in managing ACT / APT perioperatively include:

1. Risk of stopping ACT / APT (thromboembolic events)

- The risk of having a thromboembolic event resulting in a stroke, stent occlusion, valve thrombosis or other consequence needs to be considered
- Risk calculators such as the CHA_2DS_2-VASc score can be used to assess the risk of stroke and stopping medication (low level of evidence for perioperative use)
- The acuity of a recent event or intervention (e.g. stroke or percutaneous coronary intervention) needs to be considered. In general the risk of another event is felt to be higher within the first 3 - 6 months
- Patients with high risk of having a thromboembolic event from stopping ACT / APT must be considered for deferring surgery when possible OR an individualised plan outlined after multidisciplinary discussion

Table 1 **Risk of stopping ACT / APT**

High	Low
Mechanical heart valve (target INR 3.0-4.5)	Aortic bi-leaflet valve (target INR 2.0-3.0) with no other thromboembolic risk factors
Percutaneous coronary angioplasty < 2 weeks	Primary prevention antiplatelet therapy
Myocardial infarction / ACS < 6 weeks	Myocardial infarction / ACS > 6 months
Bare metal stent < 6 weeks	Bare metal stent > 6 weeks
Drug eluting stent < 12 months	AF with CHA_2DS_2-VASc score ≤4 and no stroke or TIA in last 3 months
Stroke < 3 months	Unprovoked VTE > 3 months
Stroke with high CHA_2DS_2-VASc score (≥5)	
VTE < 3 months	
VTE that occurred on ACT	
High risk pro-thrombotic conditions such as anti-phospholipid syndrome and thrombophilia	
Patients on dual ACT or APT	
Any condition requiring warfarin with a target INR range above 2.0-3.0	

2. Risk of bleeding and consequences

- Spinal surgery is generally considered a high risk category in terms of the consequence of bleeding perioperatively when considering stopping ACT / APT
- Epidural haematoma is a serious concern with excessive bleeding and can result in disastrous neurological deficits. Any canal invasive procedure result in a higher risk of this happening
- Perioperative bleeding can result in physiological instability and the need for transfusions which are not without risk
- Soft tissue haematomas can result in postoperative infection as well as discomfort
- Some spine surgical interventions could be considered lower risk than others (expert opinion)
- Patients who have a high risk of bleeding (uncontrolled hypertension, age > 65 y, liver disease, renal disease, >8 alcohol drinks per week), prior major bleeding or predisposition to bleeding will need to be considered high risk. Consider using the HEMSTOP questionnaire to evaluate bleeding predisposition.

Table 2 **Risk of bleeding and consequences in spine surgery**

Procedure	**Risk of spinal epidural haematoma^**	**Risk of increased perioperative blood loss^**
Any surgery involving the spinal canal and contents	High	Low if purely decompressive procedure < 3 levels Intermediate if purely decompressive procedure > 3 levels Intermediate if + spinal instrumentation High if + complex reconstruction
Complex reconstruction (including osteotomies)	High	High
Bony stabilisation > 3 levels (no canal opening procedure)	Low	High
Bony stabilisation < 3 levels (no canal opening procedure)	Low	Intermediate
Epidural /nerve root blocks or intradural infiltration / injection (SEH)	Intermediate	Low
MBB / facet injections	Low	Low

^Patients who have a high risk of bleeding (uncontrolled hypertension, age > 65 y, liver disease, renal disease, >8 alcohol drinks per week, prior major bleeding or predisposition to bleeding will need to be considered high risk

3. Need for bridging therapy
    - Although evidence is mixed, the use of bridging therapy may be considered particularly for warfarin
    - This involves replacing ACT / APT with treatment dose low molecular weight heparin (LMWH) or unfractionated heparin (UFH) to reduce thromboembolic risk in the perioperative period
    - Patients with a recent thromboembolic event, recent stent or mechanical valve may be candidates for bridging therapy
    - Patients with higher risk scores may be candidates for bridging therapy
    - Several studies have actually shown no clear benefit of bridging compared to placebo and higher bleeding risk

4. When to recommence treatment
    - The operative procedure, intraoperative bleeding and postoperative drain output all need to be considered
    - The risk of omitting ACT / APT will influence the timing of re-establishing ACT / APT therapy as well as pharmacological considerations

Anticoagulant / antiplatelet recommendations for Elective Surgery

The following recommendation is based on the available evidence and guidance at the time of writing. Individualised multidisciplinary risk assessment and perioperative management plan is advised for complex cases or patients at high risk of thromboembolic events (TE) from stopping ACT / APT or high surgical risk from continuing. Discussion with the key prescribing clinician is valuable in devising a patient specific plan.

Although it is recognised that spine surgery can be time sensitive even in elective practice (e.g. cervical myelopathy), consideration should be given to deferring surgery for patients at high risk of thromboembolic events due to recent interventions or events where that risk can be reduced by waiting (see table 1).

The recommendations relate only to the risk of TE and consequences of bleeding. No other benefits or disadvantages of the drug have been considered.

The evidence cited is on the basis of spine specific literature review or evidenced benefit of continuation of drugs for thromboembolic risk.

NSAIDS	High risk of TE	Low risk of TE	Surgical risk^	Discontinuation pre-op (minimum)	Recommence post-op
Diclofenac	Can stop	Can stop	Stop to reduce POBL in high risk (Evidence very low)	I day	24-48 hours
Ibuprofen **Ketorolac**	Can stop	Can stop	Stop to reduce POBL in high risk (Evidence very low)	I day	24-48 hours
Etodolac **Indomethacin**	Can stop	Can stop	Stop to reduce POBL in high risk (Evidence very low)	2 days	24-48 hours
Meloxicam **Naproxen**	Can stop	Can stop	Stop to reduce POBL in high risk (Evidence very low)	4 days	24-48 hours
Nabumetone	Can stop	Can stop	Stop to reduce POBL in high risk (Evidence very low)	6 days	24-48 hours
Piroxicam **Oxaprozosin**	Can stop	Can stop	Stop to reduce POBL in high risk (Evidence very low)	10 days	24-48 hours

^Patients who have a high risk of bleeding (uncontrolled hypertension, age > 65 y, liver disease, renal disease, >8 alcohol drinks per week, prior major bleeding or predisposition to bleeding will need to be considered high risk

Antiplatelets	High risk of TE	Low risk of TE	Surgical risk^	Discontinuation pre-op (minimum)	Recommence post-op
Aspirin	Do not stop Consider deferring surgery Discuss with prescribing clinician for individualised plan	Can stop	Stop in high surgical risk low TE risk Do not stop if high TE risk. There is supportive evidence to operate and inject on low dose aspirin (<1g) but if concerns - defer surgery or discuss with prescribing clinician for individualised plan (Evidence to continue moderate-high; evidence to stop low)	7 days	24-48 hours
ADP receptor blockers **Clopidogrel Ticagrelor**	Do not stop Consider deferring surgery Consider Aspirin cover	Can stop	Stop where possible for all categories except low for both SEH and POBL For high TE risk defer surgery or use Aspirin cover if no option to defer (< 12 months drug eluting stents discuss with cardiology) If surgery cannot be deferred and ADP blocker cannot be stopped consider MDT decision and short acting IV agents as bridging therapy (tirofiban or eptifibatide) For low TE risk ADP blocker can stop. (Evidence moderate-high)	5 days (up to 7 days in some studies)	48 hours
ADP receptor blocker **Prasugrel**	Do not stop Consider deferring surgery Consider Aspirin cover	Can stop	Stop where possible for all categories except low for both SEH and POBL For high TE defer surgery or use Aspirin if no option to defer (< 6-12 months drug eluting stents dw cardiology) If surgery cannot be deferred and ADP blocker cannot be stopped consider MDT decision and short acting IV agents as bridging therapy (tirofiban or eptifibatide) For low TE risk ADP blocker can stop (Evidence moderate-high)	7-10 days	48 hours

^Patients who have a high risk of bleeding (uncontrolled hypertension, age > 65 y, liver disease, renal disease, >8 alcohol drinks per week, prior major bleeding or predisposition to bleeding will need to be considered high risk

Vit K antagonists	High risk of TE	Low risk of TE	Surgical risk^	Discontinuation pre-op (minimum)	Recommence post-op
Warfarin	Stop Warfarin 5 days preop and use bridging therapy with treatment dose LMWH 72 hrs before surgery Stop bridging 24 hours preoperatively Aim for INR <1.5 on day of surgery	Stop Warfarin 5 days preop No bridging required Aim for INR <1.5 on day of surgery	Stop Warfarin 5 days preop Check INR <1.5 before day of surgery If INR ≥ 1.5 on day before surgery use Vitamin K 1-2 mg orally and recheck INR (Evidence – high)	5 days Bridging therapy with treatment dose LMWH for high TE risk For high TE and high surgical risk consider intermediate dose LMWH e.g. dalteparin 5000 u bd Stop bridging 24 hours preop No bridging therapy required for low risk TE Check INR <1.5 before day of surgery If INR ≥ 1.5 on day before surgery use Vitamin K 1-2 mg orally and recheck INR	Start prophylactic LMWH dose 24 hours postop and then treatment dose LMWH 48 hrs post op if high surgical risk and high TE risk Start treatment dose LMWH 24 hrs postop for low surgical risk high TE risk For low TE risk start prophylactic dose LMWH 24-48 hrs postop Usual dose Warfarin to restart 24 hrs postop (unless POBL concerns) and continue bridging / prophylaxis until INR therapeutic.

Heparin	High risk of TE	Low risk of TE	Surgical risk^	Discontinuation pre-op (minimum)	Recommence post-op
Unfractionated Heparin (UFH)	Can stop if surgery cannot be delayed	Can stop	Stop agents preoperatively (Evidence – high)	4-6 hours	24 hours if low surgical risk 48 hours for high surgical risk
LMWH – therapeutic doses	Can stop if surgery cannot be delayed For VTE < 30 days consider IVC filter	Can stop	Stop agents preoperatively (Evidence – moderate)	24 hours For od regimen omit dose 24 hours preoperatively For bd regimen omit dose 12 hours preoperatively	24 hours if low surgical risk 48 hours for high surgical risk
LMWH – prophylactic doses	Can stop if surgery cannot be delayed	Can stop	Stop agents preoperatively (Evidence - moderate)	12 hours	24 hours if low surgical risk 48 hours for high surgical risk

^Patients who have a high risk of bleeding (uncontrolled hypertension, age > 65 y, liver disease, renal disease, >8 alcohol drinks per week, prior major bleeding or predisposition to bleeding will need to be considered high risk

DOAC / NOAC	High risk of TE	Low risk of TE	Surgical risk^	Discontinuation pre-op (minimum)	Recommence post-op
Apixaban **Rivaroxaban** **Edoxaban**	Can stop	Can stop	Stop agents preoperatively No bridging therapy required (Evidence – high)	If CrCl ≥30ml/min 36 hrs preop (omit for 1 day preop) if low surgical risk If CrCL <30ml/min 60 hrs preop (omit for 2 days preop) if low surgical risk If CrCl ≥30ml/min 60 hours preop (omit for 2 days preop) if intermediate / high surgical risk If CrCL <30ml/min 84 hrs preop (omit for 3 days preop) if intermediate / high surgical risk	If high risk TE start prophylactic dose LMWH 24-48 hrs post op until NOAC restarted Restart NOAC 24 hrs postop if low surgical risk and 48 hrs if high surgical risk
Dabigatran	Can stop	Can stop	Stop agents preoperatively No bridging therapy required (Evidence – high)	If CrCl ≥50ml/min 36 hrs preop (omit for 1 day preop) if low surgical risk If CrCL <50ml/min 60 hrs preop (omit for 2 days preop) if low surgical risk If CrCl ≥50ml/min 60 hours preop (omit for 2 days preop) if intermediate / high surgical risk If CrCL <50ml/min 108 hrs preop (omit for 4 days preop) if intermediate / high surgical risk	If high risk TE start prophylactic dose LMWH 24-48 hrs post op until NOAC restarted Restart NOAC 24 hrs postop if low surgical risk and 48 hrs if high surgical risk

^Patients who have a high risk of bleeding (uncontrolled hypertension, age > 65 y, liver disease, renal disease, >8 alcohol drinks per week, prior major bleeding or predisposition to bleeding will need to be considered high risk

Table 3 **Summary of recommendations for discontinuation in elective surgery**

		High stop risk	Low stop risk
NSAIDS	High surgical risk	Omit 1 – 10 days preop	Omit 1 – 10 days preop
	Low surgical risk	Do not stop	Do not stop
Aspirin	High surgical risk	Do not stop – if concerns defer surgery or discuss with prescribing physician	Omit 7 days preop
	Low surgical risk	Do not stop	Do not stop
Clopidogrel **Ticagrelor**	High surgical risk	Defer surgery OR use aspirin cover	Omit 5-7 days
	Low surgical risk	Defer surgery OR use aspirin cover	Omit 5-7 days
Prasugrel	High surgical risk	Defer surgery OR use aspirin cover	Omit 7-10 days
	Low surgical risk	Defer surgery OR use aspirin cover	Omit 7-10 days
Warfarin	High surgical risk	Omit 5 days preop and bridge with LMWH	Omit 5 days preop
	Low surgical risk	Omit 5 days preop and bridge with LMWH	Omit 5 days preop
UFH	High surgical risk	Omit 6 hours	Omit 6 hours
	Low surgical risk	Omit 6 hours	Omit 6 hours
LMWH therapeutic	High surgical risk	Omit 24 hours (consider IVC filter)	Omit 24 hours
	Low surgical risk	Omit 24 hours (consider IVC filter)	Omit 24 hours
LMWH prophylactic	High surgical risk	Omit 12 hours	Omit 12 hours
	Low surgical risk	Omit 12 hours	Omit 12 hours
Apixaban **Rivaroxaban** **Edoxaban**	High surgical risk	Omit 2 days if CrCl ≥ 30 no bridging Omit 3 days if CrCl < 30 no bridging	Omit 2 days if CrCl ≥ 30 Omit 3 days if CrCl < 30
	Low surgical risk	Omit 1 day if CrCl ≥ 30 no bridging Omit 2 days if CrCl < 30 no bridging	Omit 1 day if CrCl ≥ 30 Omit 2 days if CrCl < 30
Dabigatran	High surgical risk	Omit 2 days if CrCl ≥ 50 no bridging Omit 4 days if CrCl < 50 no bridging	Omit 2 days if CrCl ≥ 50 Omit 4 days if CrCl < 50
	Low surgical risk	Omit 1 day if CrCl ≥ 50 no bridging Omit 2 days if CrCl < 50 no bridging	Omit 1 day if CrCl ≥ 50 Omit 2 days if CrCl < 50

Anticoagulant / antiplatelet recommendations for Emergency Surgery

Where surgery can be safely delayed, this is the recommended action to reduce the bleeding risk. The following recommendations are for scenarios whereby surgery cannot be delayed.

Reversal in emergency scenarios should be performed with haematology advice.

Agent	Reversal
NSAIDs	None advised – continue with procedure
Aspirin	Continue without reversal and use 1 g tranexamic acid intraoperatively If risk of bleeding concerns are high, then use 2 pools of donor platelet transfusion at least 2 hours after last dose
Clopidogrel	2 pools of donor platelet transfusion at least 12-24 hours after the last dose 1g Tranexamic acid intraoperatively (repeat if necessary)
Warfarin	5mg Vit K intravenously if 6-8 hours delay is acceptable If no delay possible also infuse 25–50 u/kg of four-factor prothrombin complex concentrate (PCC) OR fresh frozen plasma (10-20 ml/kg) (This does increase thrombotic state)
Dabigatran	1g Tranexamic acid intraoperatively (repeat if necessary) 5g IV infusion of idarucizumab followed by another 5g if required (evidence is low) PCC use for dabigatran is controversial
Rivaroxaban, apixaban, edoxaban	1g Tranexamic acid intraoperatively (repeat if necessary) PCC use is controversial but can be considered if bleeding risk is high The evidence for use of Andexanet alfa as a specific reversal agent is also unclear. NICE currently do not recommend its use as a reversal (If last dose > 12 hours and normal renal function there is limited value in a prothrombotic reversal agent)
UFH and LMWH	For UFH stopping the agent may be sufficient Protamine can be used for both UFH and LMWH If last dose UFH > 4hrs nothing further may be required If last dose UFH ≤ 4 hours then use protamine 1mg per 100u heparin slowly (especially if subcut regimen UFH; IV regimen stopped > 2 hrs may not need protamine) If last dose LMWH ≥ 12 hours (and CrCl normal) nothing further may be required If last dose LMWH 8-12 hours consider protamine 0.5mg per 100 u heparin slowly If last dose LMWH < 8 hours give protamine 1mg per 100u heparin slowly

Disclaimer

The advice in this guidance is correct at the time of writing. Always consult with the appropriate clinician involved in the prescribing of the ACT / APT to confirm that the agent can be stopped safely for surgery. If the risk of TE events is high, deferring surgery until the drug can be stopped is recommended where this is safe and reasonable to do so. Multidisciplinary discussions will aid safe decision making. This guidance is not meant to be comprehensive nor a tool for management decisions on specific patients.

Reversal in emergency situations should always take place with haematology involvement and guidance.

This guidance does not replace established local policy. It is not intended to be medical advice or a substitute for the medical advice, diagnosis, or treatment of a health care provider based on the health care provider's examination and assessment of a patient's specific and unique circumstances. Patients must speak with a health care provider for complete information about their health, medical questions, and treatment options, including any risks or benefits regarding use of medications. This information does not endorse any treatments or medications as safe, effective, or approved for treating a specific patient.

While the advice and information in this guidance is believed to be true and accurate at the time of going to press, neither the authors, nor BASS accept any legal responsibility for the content of this guidance.

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