Regional Anaesthesia in Patients with Abnormalities in Coagulation

A guidance document produced by a Joint Working Party of the:

Association of Anaesthetists of Great Britain & Ireland (AAGBI)
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Regional Anaesthesia UK (RA-UK)

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Introduction

The questions of whether the risks of regional anaesthetic techniques when performed on patients with abnormalities of coagulation are increased and, if they are increased, whether they are so increased that the techniques should be modified or avoided, are questions that are increasingly being asked. This is not only because the popularity of regional anaesthesia increasing, but also because the use of anticoagulant drugs in the prevention of venous thrombo-embolism is expanding, as are the number of different drugs in use. The serious complications of regional anaesthesia in patients with abnormalities of coagulation are mercifully rare. However, this rarity in itself means that it is difficult to make accurate estimates of the incidence of complications related to abnormalities of coagulation, and therefore offering advice on the basis of "hard data" is far from easy – there are simply not enough high quality data available and it is likely to remain thus. We are therefore reliant on case reports, case series, cohort studies and extrapolations from drug properties such as the time taken to achieve peak plasma levels and the known half-lives of drugs in the human.

Even though data to support guidelines and recommendations are in short supply, there is no shortage of guidelines and recommendations. We have found guidelines produced by the American Society of Regional Anesthesia (ASRA) [1], the European Society of Regional Anaesthesia (ESRA) [2], and there also exist guidelines from Belgium, France, Holland, Spain and the Nordic Countries. There may well be others – we apologise to any national guideline producers whom we have accidentally omitted from this list. With the wealth of guidelines that already exist, it is worth asking the question why the Council of the AAGBI established a Working Party with the express aim of producing a set of guidelines on this topic – why do we need ANOTHER guidance document? The answer lies in the complexity of the published guidelines. Clinicians, when faced with the question of whether to advise a patient who has an actual or potential abnormality of coagulation, need readily comprehensible, concise and accessible guidance – this is what the Working Party was tasked with producing. Quite literally, our brief was to be brief, and this we think we have achieved. In addition to this, we were concerned that much advice was binary in nature and used arbitrary cut-off points for safety. For instance, it is often said that the performance of a neuraxial block in a patient with $<80 \times 10^9.l^{-1}$ platelets is not acceptable whereas its performance in the presence of $>80 \times 10^9.l^{-1}$ platelets is acceptable. It is palpable nonsense that there is likely to be a difference in risk or outcome after neuraxial blockade in two patients, one of whom has a platelet count $79 \times 10^9.l^{-1}$ and the other $81 \times 10^9.l^{-1}$. Risk is a continuum that runs from "normal risk" to "very high risk", and this guidance seeks to stress this point. This guidance is a distillation of the available guidance and inevitably represents "expert opinion". However, it is based on the advice of experts who have a detailed knowledge of the literature surrounding this subject and who have read all the available guidance. It has also been exposed to members of the AAGBI and has been modified in response to their comments.

This guidance must be interpreted and used after consideration of an individual patient's circumstances. Although we aim to be as clear as we can, none of the advice in this guidance should be taken as being prohibitive or exclusive – clinical medicine should only rarely involve the use of words such as "never" and "always". An abnormality of coagulation – however severe – is always a RELATIVE contra-indication to the use of a regional anaesthetic technique, and there will always be circumstances in which although abnormal coagulation will make the use of a regional technique

very high risk to the patient, the alternative to this for the individual patient in difficult circumstances may be even higher risk. Whether or not to perform a regional anaesthetic technique in a patient with abnormal coagulation is not a decision to be taken lightly. Senior anaesthetists should be involved in these decisions, and the patient with capacity should be given all the information they need to make an informed choice.

Many guidance documents advise that if regional anaesthesia is to be considered in a patient with a known abnormality of coagulation, an "experienced anaesthetist" should perform the procedure. There are, of course, no hard data to support this contention. However, it is advice that we would support. It is likely that an experienced regional anaesthetist will use fewer attempts to gain block success, and it is likely that the complications related to bleeding are in part related to the number of attempts at a block. It is reasonable to ask trainees and novices to practise their blocks on patients at "normal risk", reserving attempts in patients at "increased risk" for experienced practitioners.

Some readers may question the absence of a section on haematological conditions associated with abnormalities of coagulation – why do we not mention Christmas Disease or other forms of haemophilia? Most of these diseases are the result of the absence or shortage in the body of a particular clotting factor or group of factors. Most of the patients with haematological diseases such as these reach surgery in the full knowledge that they have the disease. The standard treatment of bleeding resulting from a deficiency of a clotting factor or other contributor to normal coagulation when faced with surgery is the administration of that factor or other contributor after guidance from a haematologist. Therefore, for elective surgery, the solution is almost always the performance of the regional technique after acceptable normalisation of coagulation on the advice of a haematologist. In the emergency situation, urgent advice should be sought from on-call haematologists.

No guidance document is perfect and no guidance document cannot be improved. If you would like to comment on this guidance, please email workingparties@aagbi.org.

William Harrop-Griffiths, Chair, for the Working Party

London, July 2011

Table 1 – Recommendations relating to drugs used to modify coagulation

Drug	Time to peak effect	Elimination Half-life	Acceptable time after drug for block performance	Acceptable time for next drug dose after block	Acceptable time after drug for catheter removal	Acceptable time after catheter removal for next drug dose
Heparins						
UFH s.c. prophylactic	<30 min	1-2 h	4 h and normal APTT	1 h	4 h and normal APTT	1 h
UFH i.v. treatment	<5 min	1-2 h	4 h and normal APTT	4 h	4 h and normal APTT	4 h
LMWH s.c. prophylactic	3-4 h	3-7 h	12 h	4 h	12 h	4 h
LMWH s.c. treatment	3-4 h	3-7 h	24 h	4 h	24 h	4 h
Heparin alternatives						
Lepirudin	0.5-2 h	2-3 h	10 h	4 h	10 h	4 h
Desirudin	0.5-2 h	2-3 h	10 h	4 h	10 h	4 h
Bivalirudin	5 min	25 min	10 h	4 h	10 h	4 h
Argatroban	<30 min	30-35 min	4 h	2h	4 h	2 h
Fondaparinux*	1-2 h	17-20 h	>36 h	12 h	42 h	12 h
Antiplatelet drugs						
NSAIDs	1-12 h	1-12h	No additional precautions			
Aspirin	12-24 h	Not relevant Irreversible effect	No additional precautions			6 h
Clopidogrel	12-24 h		7days	After block performance	7 days	6 h
Ticlopidine	8-11 days	24-32 h but 90 h in chronic use	10 days	After block performance	10 days	6 h
Tirofiban	<5 min	4-8 h	8 h	After block performance	8 h	After catheter removal
Eptifibatide	<5 min	4-8 h	8 h	After block performance	8 h	After catheter removal
Abciximab	<5 min	24-48 h	48 h	After block performance	48 h	After catheter removal
Dipyridamole	75 min	10 h	No additional precautions			6 h
Oral anticoagulants						
Warfarin	3-5 days	4-5 days	INR ≤1.4	After catheter removal	INR ≤1.4	1 h
Rivaroxaban*	3 h	7-9 h	21 h	5 h	*	*
Dabigatran†	0.5-2.0 h	12-17 h	36 h	6 h	†	†
Thrombolytic drugs						
Alteplase, anistreplase reteplase, streptokinase	<5 min	4-24 min	Contraindicated	Contraindicated	Not applicable	10 days

Notes: The data used to populate this table are derived from the German guidelines adopted by ESRA [2], the ASRA guidelines [1] and data presented by drug manufacturers. Ticlopidine no longer has a UK licence. These recommendations relate primarily to neuraxial blocks.

Abbreviations: UFH = unfractionated heparin, APTT = activated partial thromboplastin time, LMWH = low molecular weight heparin, s.c. = subcutaneous, i.v. = intravenous, NSAIDs = non-steroidal anti-inflammatory drugs, INR = international normalised ratio

* Manufacturer recommends caution with use of neuraxial catheters

† Manufacturer recommends that neuraxial catheters are not used

Table 2 – Relative risks related the performance of blocks in patients with abnormalities of coagulation

Normal Risk	Increased Risk	High Risk	Very High Risk
Local infiltration	Fascial blocks	Deep blocks	Epidural with catheter
	Superficial blocks	Superficial perivascular blocks	Paravertebral blocks
			Single-shot epidural
			Spinal

Notes relating to Table 2

Specific blocks and risk in patients with abnormalities of coagulation

There have only been 26 reports of significant haemorrhagic complications of peripheral nerve blocks and plexus blocks. Half of these were in patients being given anticoagulant drugs [1]. The one death in this series was in a patient on clopidogrel who underwent a lumbar plexus block. The majority of the 26 cases were in deep blocks and perivascular blocks. From these data, and from other data relating to neuraxial blocks, we have placed blocks in the following order of relative risk.

Epidural	With catheter probably higher risk than single-shot
Spinal	
Paravertebral block	Cervical paravertebral Thoracic paravertebral Lumbar paravertebral Lumbar plexus block Lumbar sympathectomy Deep cervical plexus block
Deep block	Coeliac plexus block Stellate ganglion block Sciatic block (Labat, Raj, subgluteal) Obturator block
Superficial perivascular block	Popliteal sciatic block Femoral nerve block Intercostal nerve blocks Interscalene brachial plexus block Axillary brachial plexus block Supraclavicular brachial plexus block Infraclavicular brachial plexus block Vertical infraclavicular block
Fascial block	Ilio-inguinal block Ilio-hypogastric block Transversus abdominis plane block Fascia lata block
Superficial block	Ulnar, radial and median nerve blocks in the forearm Saphenous nerve block at the knee Sural nerve block Superficial peroneal nerve block Deep peroneal block (ankle) Tibial nerve block Superficial cervical plexus block Wrist block Digital nerve block Bier's block
Local infiltration	

NOTES: Catheters seem to carry a higher risk than single-shot blocks
Ultrasound when used by experienced clinicians decreases the incidence of vascular puncture

Table 3 - Relative risks related the performance of neuraxial blocks in obstetric patients with abnormalities of coagulation

Normal Risk	Increased Risk	High Risk	Very High Risk
		GA with full stomach	
Pre-eclampsia Platelets >100 within 6 h	Platelets 75-100 stable and normal coagulation tests	Platelets 75-100 falling and normal coagulation tests	Platelets <75 or abnormal coagulation tests with indices ≥1.5 or HELLP
Idiopathic thrombocytopaenia Platelets >75 within 24 h	Platelets 50-75	Platelets 20-50	Platelets <20
LMWH Prophylactic does >12 h Therapeutic dose >24 h	Prophylactic dose 6-12 h Therapeutic dose 12-24 h	Prophylactic dose <6 h Therapeutic does 6-12 h	Therapeutic dose <6 h
UFH - infusion Stopped >6 h and APTTR ≤1.4		APTTR 1.4 – 1.7	APTTR >1.7
UFH – prophylactic bolus dose Last given >6 h	Last given >6 h		
NSAID + aspirin Without LMWH in addition	With LMWH dose 12-24 h	With LMWH dose <12 h	
Warfarin INR ≤1.4			
IUFD FBC and coagulation tests normal within 6 h	No clinical problems but no investigation results available		With abruption or overt sepsis
Cholestasis INR ≤1.4 within 24 h	No other clinical problems but no investigation results available		

Abbreviations: GA = General Anaesthetic, LMWH = low molecular weight heparin, NSAID = non-steroidal anti-inflammatory drug, FBC = full blood count
UFH = unfractionated heparin, APTTR – activated partial thromboplastin time, INR = international normalised ratio, IUFD = intra-uterine fetal death

Notes relating to Table 3

Low platelets

The debate regarding the safety of neuraxial blockade in women with thrombocytopenia is guided by expert consensus opinion in the absence of clinical trials; it is not therefore possible to give definitive values for a lower limit at which there is an increased risk of haematoma. For normal healthy women, there is no increased risk of complications with platelet counts >100 x $10^9.l^{-1}$ [3]. A count of >75 x $10^9.l^{-1}$ has been proposed as an adequate level for regional blocks when there are no risk factors and the count is not decreasing [4]. In pre-eclampsia, a decreasing platelet count is accompanied by other coagulation abnormalities and this is assumed to be the case once the platelets drop to <100 x $10^9.l^{-1}$. If platelets are below this value, a coagulation screen should be performed – if this is normal, it would be reasonable to perform a regional block down to a level of 75 x $10^9.l^{-1}$, depending on the rate of decrease of platelet numbers [5]. In idiopathic thrombocytopaenic purpura (ITP) and gestational thrombocytopenia, there are reduced platelet numbers but normal function. In these situations, expert opinion is that an experienced anaesthetist should perform a neuraxial blockade providing the platelet count is >50 x $10^9.l^{-1}$ and stable, but an individual risk-benefit assessment should be made [6-10]. It is possible that spinal anaesthesia with platelet counts below this level may be safe if data is extrapolated from non-pregnant lumbar punctures performed by haematologists using needles considerably larger than those used by obstetric anaesthetists [9]. A stable level of 40 x $10^9.l^{-1}$ may be safe for lumbar puncture in the absence of other coagulation abnormalities.

Platelet count should be checked before any neuraxial procedure if there is any suspicion of decreasing platelet numbers during routine antenatal testing, signs of the development of pre-eclampsia, e.g. proteinuria or hypertension, or other clinical features suggesting coagulopathy, placental abruption, disseminated intravascular coagulation (DIC) or of the patient has been given recent anticoagulant therapy. Otherwise, it would not be routine to check platelet numbers and delay neuraxial block whilst these results are awaited. Platelet numbers can decrease in those patients treated with regular heparin for >4 days.

It would be standard practice to perform a neuraxial procedure within 6 h of the last full blood count (FBC) and clotting studies in patients with mild or moderate pre-eclampsia. However, if the patient has severe or fulminating pre-eclampsia or HELLP Syndrome, an FBC and clotting studies should be checked immediately before performing the procedure, as decreases in platelet count can occur rapidly in these circumstances.

LMWHs with aspirin

Treatment with daily LMWH and aspirin 75 mg may be encountered where NICE guidelines recommend low dose aspirin for obesity or hypertension. Provided the LMWH is stopped for >12 h, platelet count is >75 x $10^9.l^{-1}$, and normal coagulation is confirmed, neuraxial blocks can be categorised as “increased risk” only.

IUFD

After IUFD, there is an increased risk of coagulopathy and sepsis, especially in the second week after fetal demise. Coagulation abnormalities can occur on presentation in about 3% of women with apparently uncomplicated IUFD, and this increases in the presence of abruption or uterine perforation to around 13% [11]. It is therefore prudent to check coagulation status before any regional procedure. The onset of coagulopathy is variable but can be rapid.

Cholestasis

In obstetric cholestasis, coagulopathy may develop as a result of decreased absorption of vitamin K essential for activation of clotting factors. It is important to check coagulation before regional blockade, but changes do not occur rapidly.

Removal of epidural catheters

The recommendations given in Table 1 for the removal of epidural catheters should be noted.

Table 4 - Risks in patients with abnormalities of coagulation – special circumstances

All of the conditions discussed below can, in their "active" state, be associated with significant coagulopathy. When regional anaesthesia is thought to be of potential value, e.g. for postoperative analgesia, it should be conducted with reference to the guidelines outlined in the rest of this publication.

Condition	Special Considerations
Trauma	The coagulopathy of trauma shock has a pathophysiology distinct from that of other causes of coagulopathy. It is precipitated by tissue trauma, shock, haemodilution, hypothermia, acidaemia and inflammation. Following major trauma, it is recommended that an assessment of potential coagulopathy be made before performing any regional anaesthetic techniques.
Sepsis	Severe sepsis is associated with a procoagulant state. Guidelines support the use of chemoprophylaxis against deep venous thrombosis. For advice on regional anaesthesia with intercurrent thromboprophylaxis, refer to Table 1. Septic shock may be associated with the development of a consumptive coagulopathy. Systemic sepsis remains a relative contraindication to central neuraxial anaesthesia due to the presumed increased incidence of epidural abscess & meningitis.
Uraemia	Uraemia may lead to coagulopathy secondary to thrombocytopenia. It is recommended that all patients with significant uraemia undergo assessment of platelet number and function before regional anaesthesia. Platelet function may be improved by the administration of DDAVP. Patients with chronic renal impairment may be managed with regular dialysis. The presence of residual heparinisation must be considered in patients after dialysis, and heparin reversed if indicated. If regional anaesthesia is performed, the safety of catheter removal must be considered in patients likely to receive heparin during further dialysis.
Liver failure	All coagulation factors except factor VIII are synthesised in the liver. Liver failure is associated with haemostatic abnormality, the degree of which must be assessed before regional anaesthetic techniques. There may be an associated thrombocytopenia and abnormal platelet function due to associated hypersplenism. Patients in liver failure represent a high-risk group for general anaesthesia. When regional anaesthesia is considered as an alternative, coagulopathy must be considered and assessed.
Massive transfusion	Massive transfusion is associated with altered haemostasis, with dilution and consumption of coagulation factors being the primary factors in this pathophysiological change. In assessing the degree of coagulopathy before regional anaesthetic techniques, it is recognised that coagulopathy in massive transfusion is a dynamic situation. Assessment should be made when haemorrhage is controlled and the patient is cardiovascularly stable. An assessment of platelet function should occur in patients who have been given platelet transfusion.
Disseminated intravascular coagulation	Disseminated intravascular coagulation (DIC) is the pathological activation of coagulation mechanisms in response to a disease process leading to a consumptive coagulopathy. A diagnosis of DIC is incompatible with safe neuraxial blockade. When peripheral blocks are considered, they should be at compressible sites, and activated protein C infusions should be discontinued for a period either side of the performance of regional blocks.

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