The Shrewsbury and Telford Hospital NHS
NHS Trust

Guidelines for administration of Anticoagulation for patients receiving haemodialysis

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Comments:	

1.0 INTRODUCTION

The anticoagulant regime should be tailored to the needs of the individual patient, this includes the appropriate anticoagulant drug for the patients clinical condition.

When blood comes into contact with the extra corporeal circuit, platelet adherence and activation of the intrinsic clotting cascade occurs, leading to thrombosis. Clots in the dialyser reduce the effective surface area of the dialyser and in extreme situations clots in the circuit may prevent treatment from continuing and result in loss of blood in the circuit.
The aim is to anticoagulate the circuit without putting the patient at risk of bleeding.

Fractionated heparin (Tinzaparin) is the recommended choice for stable patients on haemodialysis.
Heparin is widely used for anticoagulation as the dose can be adjusted. It's half-life is dramatically less than Tinzaparin. (30mins-2 hours rather than 4-5 hours)
Indications for use of heparin would be the unwell CHD, AKI, uraemic patient.
Heparin is the anti-coagulant of choice for those patients on Warfarin.

We audit the loss of Haemodialysis circuits (ie when the dialysis lines are clotted and blood is lost to the patient). This audit trail shows that the majority of "Lost Circuits" occur when the patient is being dialysed "Heparin Free" or when the ACT guidelines have been misinterpreted.

At Sath Renal Units we use the following:

- Tinzaparin
- Heparin
- Heparin free dialysis
- Danaparoid (for named HIT positive patients)

2.0 AIM / PURPOSE

To ensure all staff are competent in the anticoagulation of the extracorporeal circuit following best practice guidelines.
To anti-coagulate the circuit with minimal risk of bleeding to the patient.
To monitor the extracorporeal circuit to observe for signs of clotting.

3.0 OBJECTIVES

To safely dialyse the patient without clotting the extracorporeal circuit.
For all renal staff to have clear guidelines for the use of anticoagulants in haemodialysis.

4.0 DEFINITIONS USED

Low molecular weight heparin (LMWH) – Tinzaparin
Unfractionated Heparin (UFH) - Heparin
Heparin Induced Thrombocytopenia (HIT)
ACT – Activated clotting times

5.0 SPECIFIC DETAIL

TINZAPARIN Low Molecular Weight Heparin (LMWH)

Tinzaparin is a low molecular weight heparin. It is administered as a bolus dose into the arterial port of the haemodialysis circuit at the start of dialysis or within half an hour.
Unlike unfractionated heparin, it is not necessary to monitor during dialysis. But the circuit must be observed for any visual signs of clotting, such as: darkening of the blood, clots in the arterial or venous chambers, arterial, venous or TMP alarms and streaks in the dialyser following wash-back.

Contra-indications to Tinzaparin

- Acute renal failure
- Pericarditis
- Disseminated intravascular coagulation (DIC)
- Active major bleeding conditions, including recent stroke.
- Hypersensitivity to tinzaparin or any other ingredients.
- Heparin induced thrombocytopaenia
- Patients on warfarin therapy
- Patients requiring invasive procedures within 12 hours of the end of extra corporeal therapies.
- Pregnancy
- Patients dialysing more than 4 x weekly
- Care should be taken when tinzaparin is administered to patients with severe liver insufficiency during haemodialysis. In such cases reduce the dose.

Tinzaparin dosing guidance

Administration - Tinzaparin should be administered into the injection port on the arterial line as an IV bolus as soon as possible at the beginning of the dialysis session. The drug is dosed according to the length of dialysis session, any incidents of clotting and the patients weight.

INDICATION	DOSE
Haemodialysis < 3 hours	No Tinzaparin
Haemodialysis 3 - 4 hours	Starting dose Tinzaparin 2500 units
Haemodialysis 4 hours or patients dialysing > 4 hours or have incidents of clotting	Starting dose Tinzaparin 3500 units or Tinzaparin 4,500

- Doses > 4500 units to be discussed with the Dr or nurse prescriber and administered in 2 bolus doses, one at the start of the session and the second dose 2 hours into the session.
- Additional doses may be required if the patient is administered blood during dialysis.
- Evidence from trials has shown that patients switched from unfractionated heparin (UFH) to Tinzaparin required approximately 50% of the UFH dose.
- Tinzaparin to be administered by RN who has passed IV competency.
- If patient has had any falls, un-explained bruising or bleeding since previous session, RN to check if Tinzaparin to be omitted & alternative anticoagulant given
- **Antidote: Reversal agent for Tinzaparin is protamine sulphate.**

TINZAPARIN STRENGTHS	CONCENTRATION	COLOUR
2,500 units	2,500 units in 0.25ml	Purple
3,500 units	3,500 units in 0.35ml	Green
4,500 units	4,500 units in 0.45ml	Blue

HEPARIN Unfractionated heparin (UFH)

Heparin is used as the anticoagulant of choice in the extracorporeal circuit for acute dialysis and for those chronic patients where Tinzaparin is contra indicated. The effect of Heparin is immediate and has a short half-life (30 mins to 2 hours after discontinuation).

Cautions

- Uraemia – increased risk of bleeding due to platelet dysfunction
- Peptic ulceration / active bleeding
- Heparin induced thrombocytopenia (HIT) or other coagulopathies
- Pericarditis – increased risk of cardiac tamponade
- Anticoagulant medications Warfarin, Aspirin or anti platelet drugs
- Thrombocytopenia (low platelet count < 100)

Side effects

Long term effects of Heparin have been associated with side effects such as hair loss, pruritis, osteoporosis, rashes, thrombocytopenia & hyperlipidaemia.

Heparin Induced Thrombocytemia (HIT)

Potentially serious but rare problem.

Type 1 HIT is characterised by mild thrombocytopenia (Platelet count >100) Non immune and typically recovers without discontinuation of Heparin.

Type 2 HIT is antibody mediated, occurs 5 – 10 days after the initiation of heparin and is associated with thromboembolism. Heparin must be discontinued. It does not resolve spontaneously and recurs if the patient is rechallenged with Heparin.

NORMAL HEPARINISATION

For patients on haemodialysis who do not have any clotting problems or bleeding disorders and who are not taking anticoagulants.

Dosage (See table below) – Starting dose usually 1000iu loading dose and 1000iu/ hr infusion rate. Primary nurse to adjust rate according to individual patient requirement.

ACT's - Clotting times may be used until dose requirements established. Follow ACT Guideline chart for normal heparinisation.

Monitoring – circuit to be monitored for signs of clotting during session and on washback

Remember if patient unwell, had a fall or is at risk of active bleeding, use Minimal or Heparin free regime.

MINIMAL HEPARINISATION

MINIMAL HEPARIN DOES NOT INCLUDE SALINE FLUSHES

For AKI patients, and chronic patients requiring haemodialysis who are at an increased risk of bleeding or are currently taking oral anticoagulants.

ACT's – Baseline to be taken prior to any loading dose being given and ACT chart followed for minimal heparinisation.

Dosage (See table below) – starting dose 0-500iu loading dose and 0-500iu/hr infusion rate. Nurse to adjust rate according in individual patient requirement and monitoring ACT's half hourly to hourly to ensure clotting times remain within safe range.

Consultant advice to be sought if patient requiring high doses of heparin, as need avoid risk of clotting the circuit as well as not putting patient at risk of bleeding.

ACT GUIDELINES

SCHEDULE	MINIMAL	NORMAL
Bleeding Risk	High	Minimal
Desired clotting time	140 – 170 secs	170 – 300 secs
Loading dose	500 iu	1000 iu – 3000 iu
Infusion Rate	500 iu /hr-1000iu/hr	1000 iu – 3000 iu / hr
Bolus dose	500 iu – 1000 iu / hr	500 iu – 1000 iu / hr
ACT Sampling	30 minutes – 1 hourly	As required

Antidote: Reversal agent to heparin is Protamine Sulphate

Administration of Heparin

Heparin vials should be checked and additive label signed by 2 RN's, or 1 RN + 1 DA.
Heparin is to be drawn up in a **30 ml** luer syringe (As specified by Machine manufacturer Guidelines) at the dialysis station/ drug trolley with additive label. State whether 10 or 20 mls heparin has been drawn up.
Heparin syringe is to be attached to the machine via the heparin infusion line after the arterial pump.
Full amount of heparin is to be visible to allow for monitoring of the syringe driver during the dialysis.
Heparin is to be signed for on patients drug chart.

Stop time for heparin

For a fistula: termination time should be between 30 – 60 minutes before the time off. This may depend on the strength and maturity of the fistula, or dependant on time finished bleeding.
For a graft: termination time should be approximately 60 minutes before the time off.
For a CVC line: no need to stop the heparin before the end of the dialysis.

Observations / Checks

Observe blood lines, bubble traps and dialyser for signs of clotting.
Increase in venous pressure may indicate clots in bubble trap, increase in TMP may indicated clots in the dialyser, patient may need to be washed back if signs of clotting evident to prevent losing a circuit.
The circuit should be observed on washback for clots in the bubble traps and dialyser so anticoagulant dose or stop time can be reviewed if necessary. This observation should be noted on CV.Patient prescription should be changed/ updated on CV if any changes to anti-coagulant regime or drug.
Observe bleeding time post fistula needle removal, if extended (>10 minutes per needle) may need to adjust stop time or anticoagulant dose.

HEPARIN FREE

For new acutes, or patients with risk of active bleeding or pre / post surgery.
ACT's monitored half hourly
Dosage: Saline flushes half hourly to hourly to check circuit.
For saline flush, A line to be clamped and normal saline 0.9% to be connected to A line pre dialyser until 50- 100 mls has been infused. Clamp to be removed from A line and circuit observed as the saline travels through the circuit for presence of clotting. Flush volume may be added to washback volume to remove extra fluid being given during session.
Fresenius 5008 machines can deliver "Pre- Dilution" HDF. Very useful if Heparin Free + Saline flushes are still resulting in poor wash-back or clotted circuits.

DANAPAROID is the drug of choice in HIT positive patients.
Dosage : 3000 iu – 3700iu as a bolus at the start of dialysis.
Monitoring – circuit to be monitored each session.
Bleeding time post needle removal to be observed.
See Danaparoid dosing information from pharmacy.

Antidote : partial reversal with Protamine sulphate (PLASMA EXCHANGE needed in overdose)

FACTORS AFFECTING ANTICOAGULATION DOSE

It is possible to use less heparin if a fast BFR is achieved.
Two needles or dual lumen access is used.
More anticoagulant may be needed if transfusing a patient.
Frequent machine alarms may increase the risk of clots in the circuit.

ACCIDENTAL OVERDOSE

In the event of an accidental overdose of any anticoagulant, Renal Consultant on call to be notified regarding what actions to take. This will be done on an individual patient assessment depending on the anticoagulant administered. A decision will then be made whether to delay patients discharge home, check act or clotting screen and / or administer an antidote.

ACT MEASUREMENTS – Procedure for performing an ACT test using the Actalyte Mini ACT machine and the Actalyte G-ACT tube.

1. The Actalyte Mini ACT machine should be kept plugged into the mains and switched on. After switching on, the machine will perform a self test and if all is ok will display 4 horizontal lines on the display - - - -
2. If you are using the machine after an earlier test, the previous result will be displayed. It is not necessary to zero the readout before a new test.
3. It is important to determine the patients normal clotting time before heparin is administered. This first baseline result will help to determine the post heparin target ACT using the chart below.
4. Take a G-ACT tube from the box, tap it on a flat surface a few times to ensure all the glass beads are in the bottom of the tube.
5. Draw a blood sample from the arterial port on the circuit once the patient has commenced dialysis. Using a 1 ml syringe, draw up 0.4 mls of blood to perform the test. Remove the needle from the syringe before adding the blood to the ACT tube.
6. Flip open the G-ACT tube and dispense exactly 0.4 mls of blood into the tube. The ACT tubes have a black line around the bottom of the tube – you can fill to this line or use the scale on the 1ml syringe. At the same time press the start button on the mini Actalyte machine.
7. Close the flip top on the tube. Holding the tube vertically, tap the side of the tube at the bottom 6 times to ensure blood and glass beads are mixed. Insert the tube into the well of the ACT machine and rotate the tube clockwise in the well to confirm that the green detector light is on and stays on. The tube will rotate slowly in the well until a clot has formed.
8. When the ACT machine has detected the formation of a clot it will beep and the display will show the clotting time in seconds. It is important to record the result before it is lost due to another test being run. The machine has no facility to store results.
9. Baseline test to be performed before heparin is given. The first heparinised sample test should be performed after 5 minutes if a bolus is given or 30 minutes after the start of a continuous infusion. The samples containing heparin will have longer clotting times and should be compared to the chart below to ensure you are reaching the target level. Target levels are a guide only.

6.0 AUDIT

Data collection of clotted circuits
Monthly patient review of anticoagulant.

7.0 REFERENCES

Renal association Guidelines

Reviewed & amended 3/05/17 Karen Elgar, Oonagh Le-Maitre.