Drug Guideline  Bivalirudin (Angiomax)

Summary: This guideline outlines the use of bivalirudin as an anticoagulant during extracorporeal membrane oxygenation. Bivalirudin is a direct thrombin inhibitor and can be used as an alternate to heparin as it does not cause HIT (heparin-induced thrombocytopenia).

Approved by: ICU Medical Director

Publication (Issue) Date: May 2015

Next Review Date: May 2018

Replaces Existing Drug Guideline: none

Previous Review Dates: Not applicable

1. Introduction:

| Patient safety |

The Aims / Expected Outcome of this drug guideline:

Bivalirudin will be administered safely and appropriately without any adverse side effects.

Related Standards or Legislation

- NSQHS Standard 1 Governance
- National Standard 4 Medication Safety

Related Policies

- LH_PD2013_C03.01 Drug Administration
- LH_PD2010_C03.00 Drug Prescribing
- LH_PD2008_C03.12 Administration of IV Medication

2. Drug Guideline: Policy Statement

- All care provided within Liverpool Hospital will be in accordance with infection control, manual handling and minimisation and management of aggression guidelines.
- Medications are to be prescribed and signed by a medical officer/authorised nurse practitioner (NP) unless required during an emergency.
- All drugs administered during an emergency (under the direction of a medical officer/authorised nurse practitioner) are to be documented during the event, then prescribed and signed following the event.
• Medications are to be given at the time prescribed (as close to the time as is possible when multiple drugs require ‘same time’ administration and, when the nurse is caring for more than one patient, recognition is given to a possible short delay to administration – antibiotics and other lifesaving drugs are to be prioritised) and are to be signed by the administering nurse.
• Parenteral medication prescriptions and the drug are to be checked with a second registered or endorsed enrolled nurse prior to administration. The “rights of drug administration” must be followed: right: patient, drug, dose, route, administration, time, reason for the drug, documentation, education and evaluation/outcome.
• Adverse drug reactions are to be documented and reported to a medical officer.
• Medication errors are to be reported using the hospital electronic reporting system: IIMS.
• Guidelines are for adult patients unless otherwise stated

3. Guideline

Actions\(^1,^2,^4\)

- Bivalirudin is a synthetic 20-amino acid peptide, which inhibits thrombin by specifically binding both to the active catalytic site and to the anion-binding exosite of thrombin.
- Its unique mechanism of action results in a predictable, consistent anticoagulant effect, that:
  - Directly inhibits thrombin
  - Inhibits both clot bound and circulating thrombin
  - Is highly specific for thrombin, without binding to other plasma proteins
- It does not require the presence of antithrombin III (ATIII) to produce an anticoagulant effect.
- Binds reversibly, with a short half-life (25 minutes in patients with normal renal function).
- Total plasma clearance of bivalirudin is similar for patients with normal renal function (GFR (glomerular filtration rate) greater than or equal to 90 mL/minute) and with mild renal impairment (GFR 60 to 89 mL/minute). In patients with moderate (GFR 30 to 59 mL/minute) and severe (GFR 10 to 29 mL/minute) renal impairment, plasma clearance of bivalirudin is reduced by approximately 20%. In dialysis dependent patients, clearance is reduced by approximately 80%.

Indications\(^1\)

- In patients who develop HIT (heparin-induced thrombocytopenia). Bivalirudin can be used as an alternative for anticoagulation during ECMO (extra-corporeal membrane oxygenation).

Contraindications\(^1\)

- Bivalirudin (angiomax) is contraindicated in patients with active major bleeding.
- It is contraindicated in patients with hypersensitivity to Angiomax or its components.

Precautions\(^1,^3\)

- An unexplained fall in blood pressure or hematocrit, or any unexplained symptom, should lead to serious consideration of a hemorrhagic event and cessation of bivalirudin administration.
- Clearance is reduced in patients with renal insufficiency.

Significant interactions\(^1,^3\)

- Patients can be started on bivalirudin 30 minutes after discontinuation of unfractionated heparin or eight hours after discontinuation of low molecular weight heparin.
The following drugs should not be administered in the same IV line with bivalirudin: alteplase, amiodarone HCl (hydrochloride), amphotericin B, chlorpromazine HCl, diazepam, prochlorperazine, reteplase, streptokinase and vancomycin. Use in the same IV line can result in haze formation, microparticulate formation or gross precipitation.

Adverse effects\(^{1,3}\)
- Bleeding is the main adverse effect. Close monitoring of ACT and APPT levels are necessary.

Presentation
Vial with 250mg (powder) with 5ml water for injection.

Administrations Guidelines

- Reconstitute 250mg vial with 5mL water for injection (swirl to dissolve).
- Each 250mg vial should then be further diluted with 50mL 0.9% sodium chloride. \(( \text{Final concentration 5mg/mL} )\)

**Recommended dose** for anticoagulation with ECMO \(^{1,4,5,6}\)

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<th>0.1mg/kg/hr to 0.25mg/kg/hr</th>
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Aim ACT 160-180, APTT 50-80sec. Monitor 4\(^{th}\) hourly
Reduce dose if clinically significant bleeding

**Eg: for a 80kg patient:**

\[
0.1 \text{mg/kg/hr to 0.25mg/kg/hr} = 8 \text{mg/hr to 20mg/hr} \\
(\text{concentration of infusion is 5mg/ml}) \\
\text{Infusion rate} = 1.6 \text{ml/hr to 4ml/hr}
\]

Clinical Considerations
- Routinely monitor patients ACT / APTT at 4th hourly intervals.
- Perform daily full blood count and coagulation profile.
- Observe for signs and symptoms of bleeding. If patient actively bleeding, check immediately with the cardiothoracic perfusionist and the ICU medical team.
- Perform daily urinalysis and check for presence of blood in urine/faeces.
- There is no reversal agent for Bivalirudin. However, due to its short half-life and enzymatic elimination, it is considerably safer than other direct thrombin inhibitors (argatroban, lepirudin).
- Bivalirudin is cleared by CRRT.

4. Performance Measures
- All incidents are documented using the hospital electronic reporting system: IIMS and managed appropriately by the NUM and staff as directed.

5. References / Links


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