Mini-BEAM (carmustine, etoposide, cytarabine & melphalan) for Lymphoma

Indication: Relapsed / refractory Lymphoma

Regimen details: In-patient protocol
- Carmustine 60 mg/m² IV Day 1
- Etoposide 75 mg/m² IV Days 2 to 5
- Cytarabine 100 mg/m² twice daily IV Days 2 to 5
- Melphalan 30 mg/m² IV Day 6

Out-patient (5 day) protocol
- Carmustine 60 mg/m² IV Day 1
- Etoposide 100 mg/m² IV Days 2 to 4
- Cytarabine 150 mg/m² twice daily IV Days 2 to 4
- Melphalan 30 mg/m² IV Day 5

Carmustine injection is not commercially available i.e. it is unlicensed and supply is requested via an import company.

Administration: Carmustine IV infusion in 500ml sodium chloride 0.9% over 60 minutes
- Etoposide IV infusion in 500ml sodium chloride 0.9% over 60 minutes
- Cytarabine IV infusion in 100ml sodium chloride 0.9% over 30 minutes
- Melphalan IV infusion in 250ml sodium chloride 0.9% over 30 minutes

Premedication: None required

Frequency: Up to 2 cycles. Repeat after 21 to 28 days as soon as blood count recovery.

Extravasation: Carmustine is a vesicant and etoposide is an irritant and should be administered with appropriate precautions to prevent extravasation.
If there is any possibility that extravasation has occurred, contact a senior member of the medical team and follow local protocol for dealing with cytotoxic extravasation of vesicant and irritant drugs.

Anti-emetics: High emetogenic potential (60-90%) e.g. ondansetron 8mg and dexamethasone 8mg orally prior to chemotherapy and dexamethasone 8mg orally for 3 days after chemotherapy and metoclopramide 20mg orally tds for 5 days after chemotherapy.

Supportive medication: Allopurinol 300mg od orally (100mg if renal impairment) for prevention of tumour lysis syndrome for first cycle only.
PPI prophylaxis e.g. omeprazole 20mg od orally.
Mouthcare e.g. sodium Chloride 0.9% mouthwash, 10ml qds
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Regular investigations:
- FBC: Prior to day 1
- LFTs: Prior to day 1
- U&Es: Prior to day 1
- Virology screen – Hep B & C, HIV prior to initiating treatment (Hep B includes HBsAg and HBcAb)

Dose Modifications

Haematological Toxicity

Prior to day 1:

<table>
<thead>
<tr>
<th>Neutrophils (x 10⁹/L)</th>
<th>Platelets (x 10⁹/L)</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 1.5 x 10⁹/L &amp; ≥ 100 x 10⁹/L</td>
<td>100% dose</td>
<td></td>
</tr>
<tr>
<td>&lt; 1.5 x 10⁹/L &amp; / or &lt; 100 x 10⁹/L</td>
<td>Hold until recovery.</td>
<td></td>
</tr>
</tbody>
</table>

NB. In the presence of cytopenias due to marrow involvement with lymphoma, it is possible that the cycle 1 day 1 dose will go ahead even if neutrophils <1.5 x 10⁹/L and platelets < 100 x 10⁹/L.
If neutrophils < 1.5 x 10⁹/L and platelets < 100 x 10⁹/L on day 1 of subsequent cycles, delay until as above.

Renal Impairment

<table>
<thead>
<tr>
<th>CrCl (ml/min)</th>
<th>Carmustine Dose</th>
<th>Etoposide dose</th>
<th>Melphalan dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 60</td>
<td>Give 100%</td>
<td>Give 100%</td>
<td>&gt; 50 ml/min give 100%</td>
</tr>
<tr>
<td>45 – 60</td>
<td>Give 80% of the dose</td>
<td>85% of the dose</td>
<td>30 – 50ml/min give 50% of the dose</td>
</tr>
<tr>
<td>30 – 45</td>
<td>Give 75% of the dose</td>
<td>80% of the dose</td>
<td></td>
</tr>
<tr>
<td>15 – 30</td>
<td>Give 50% of the dose</td>
<td>75% of the dose</td>
<td>&lt; 30 ml/min clinical decision</td>
</tr>
<tr>
<td>&lt; 15</td>
<td>Give 25% of the dose</td>
<td>50% of the dose</td>
<td></td>
</tr>
</tbody>
</table>

No dose adjustments are required for cytarabine in renal impairment

Hepatic Impairment

Cytarabine: Bilirubin > 34 micromol/L give 50% dose. The dose can be escalated in subsequent cycles in the absence of toxicity

Etoposide: Bilirubin 26 – 51 micromol/L or AST 60 – 180 u/L 50% dose reduction
Bilirubin > 51 micromol/L or AST > 180 u/L – clinical decision

The dose information for renal and hepatic impairment above is a guide only. Discuss any dose reductions for either renal or hepatic impairment with Consultant because in some circumstances 100% dose may be given.

Toxicities: Nausea, vomiting, severe myelosuppression, mucositis, alopecia.

Drug interactions: If possible, avoid any other potentially nephrotoxic drugs.

Reason for Update: Network Protocol Development
Approved by Consultant: Paul Fields
Version: 1
Approved by Chair Haem TWG: Majid Kazmi
Supersedes: All other versions
Date: 22 Feb 2013
Prepared by: Laura Cameron
Checked by (Network Pharmacist): Jacky Turner 28 Feb 2013
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Comments: Renal function should be assessed by EDTA clearance before prescribing. Monitor trends in serum creatinine between treatments: if > 25% from baseline value re-calculate using the Cockcroft & Gault equation.