Administration of Methylene Blue to Stain Parathyroid Glands

Although this is not a licensed use for methylene blue, it is useful in the surgical exploration of patients with hyperparathyroidism. It shortens the operating time and allows visualization of adenomas and hyperplastic glands.\(^1\)

The active ingredient in methylene blue 1% solution is methylene blue trihydrate (\(3,7\)-Bis (dimethylamino) phenathionium chloride trihydrate, molecular formula C\(_{16}\)H\(_{18}\)ClN\(_3\)S.3H\(_2\)O). It is a dark green, almost odourless crystal or crystalline powder. It is soluble in alcohol, water and chloroform.

Methylene blue 1% injections are available as 10ml ampoules (100mg per ampoule)

**Dose and Administration**\(^4\)

- Methylene blue must be prescribed
- The dose is calculated as 5mg-7.5mg/kg body weight of 1% methylene blue\(^5\).
- This calculated dose must be diluted in either 5% dextrose or Hartmann’s (Ringer-Lactate) solution
- The volume (of infusion) depends upon the calculated dose of methylene blue 1%
- The manufacturers advise a maximum concentration of 350mg in 500mls (a higher concentration may result in thrombophlebitis)
- The solution is infused over 45-60 minutes prior to surgery

<table>
<thead>
<tr>
<th>Calculated Dose (based on patient’s weight)</th>
<th>Infusion Volume (dilution)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 350mg</td>
<td>500mls</td>
</tr>
<tr>
<td>351-420mg</td>
<td>600mls</td>
</tr>
<tr>
<td>421-490mg</td>
<td>700mls</td>
</tr>
<tr>
<td>491-560mg</td>
<td>800mls</td>
</tr>
</tbody>
</table>


\(^2\) Devine et al. The Role of Methylene Blue Infusion in the Management of Persistent or Recurrent Hyperparathyroidism. 1983. 94(5) 916-8. “The dye is simple in use, free of significant complications and aids in identification of the abnormal gland”.

\(^3\) Medsafe health professionals data sheet: www.medsafe.govt.nz/ProfslDatasheet/mlMethyleneBlueing.htm


\(^5\) Medicines Information Department, Kent and Sussex Hospital, Tunbridge Wells, Kent, TN4 6AT

\(^6\) Medsafe health professionals data sheet: www.medsafe.govt.nz/ProfslDatasheet/mlMethyleneBlueing.htm

\(^7\) Meekin et al. Department of Otolaryngology/ Head and Neck Surgery, Keesler Air Force Base, Mississippi. Inteoperative use of Methylene Blue to Localise Parathyroid Adenoma
Contra-indications

- (Hyperto)sensitivity to methylene blue
- Patients with severe renal impairment
- Patients with glucose-6-dehydrogenase deficiency
- Methaemoglobinemia (due to chlorate poisoning, or treatment with cyanide poisoning)
- Intrathecal or subcutaneous injection of methaemoglobinemia is contra-indicated (and may result in neural damage or necrotic abscess formation respectively)
- Methylene blue should NOT be administered in a pregnant women
- It is recommended that breast feeding is discontinued prior and after methylene blue administration

Cautions and Adverse Reactions

- Large doses of methylene blue can result in cardiovascular abnormalities, hypertension and hypotension, arrhythmias and cyanosis.
- Long-term administration of methylene blue may cause anaemia.
- Larger than the recommended doses of methylene blue are associated with neurologic effects, such as headache, dizziness, mental confusion, profuse diaphoresis and methemoglobin formation.

Patient monitoring

- Monitor FBC especially erythrocytes
- Methaemoglobin levels should be monitored throughout (prolonged) therapy
- Methylene blue can affect oxygen saturation measurements during pulse oximetry. This is transient. If there is any concern regarding patient oxygen saturation an arterial blood gas is advised for a definitive measurement

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Bleep 303 (until Feb. 2006)

8 Brass and Fung. 1976
9 Birch and Boyd. 1976
10 Medsafe heath professionals data sheet: www.medsafe.govt.nz/ProfCtsheet/m/MethyleneBlueing.htm
11 Boyd et al. 1984
12 Reynolds et al. 1982