

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^{1,2}.

The active ingredient in methylene blue 1 % solution is methylene blue trihydrate (3,7-Bis (dimethylamino) phenazathionium chloride trihydrate, molecular formula C₁₆H₁₈CIN₃S₃H₂O₃³. 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^{4,5}

- Methylene blue must be prescribed
- The dose is calculated as 5mg-7.5mg/ kg body weight of 1% methylene blue^{6,7}
- 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

<u>Calculated Dose</u> (based on patient's weight)	<u>Infusion Volume</u> (dilution)
< 350mg	500mls
351-420mg	600mls
421-490mg	700mls
491-560mg	800mls

¹ Derom et al. The Intra-operative Identification of Parathyroid Glands With Methylene Blue Infusion. The American Journal of Surgery. 1993. 165 (380-2). "Inter-operative staining of parathyroid glands in cervical exploration in 120 cases: the dye clearly stained 98% (66/67) adenomas and 98% (194/198) hyperplastic parathyroid glands".

² Devine et al. The Role of Methylene Blue Infusion in the Management of Persistent or Recurrent Hyperparathyroidism. 1983. 94(6) 916-8. "The dye is simple to use, free of significant complications and aids in identification of the abnormal gland".

³ Medsafe health professionals data sheet: www.medsafe.govt.nz/Profes/Datasheet/m/MethyleneBlueing.htm

⁴ Donald et al. Parathyroid Identification by Methylene Blue infusion. British Journal of Surgery, Vol. 62 (1975) 747-749

⁵ Medicines Information Department, Kent and Sussex Hospital, Tunbridge Wells, Kent, TN4 8AT

⁶ Medsafe health professionals data sheet: www.medsafe.govt.nz/Profes/Datasheet/m/MethyleneBlueing.htm

⁷ Meekin et al. Department of Otolaryngology/ Head and Neck Surgery, Keesler Air Force Base, Mississippi.

Interoperative use of Methylene Blue to Localise Parathyroid Adenoma

Administration of Methylene Blue to Stain Parathyroid Glands (contd.)

Contra-indications

- (Hyper)sensitivity to methylene blue
- Patients with severe renal impairment
- Patients with glucose-6-dehydrogenase deficiency
- Methaemoglobinaemia (due to chlorate poisoning, or treatment with of cyanide poisoning)
- Intrathecal or subcutaneous injection of methaemoglobinaemia 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 ^{8,9}.
- Long-term administration of methylene blue may cause anaemia ¹⁰.
- Larger than the recommended doses of methylene blue are associated with neurologic effects, such as headache, dizziness, mental confusion, profuse diaphoresis and methemoglobin formation^{11,12}.

Patient monitoring

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

Written by Manu Sharma
ENT SHO
mpns@doctors.org.uk
(07787 546 899)
Bleep 303 (until Feb. 2006)

⁸ Blass and Fung. 1976

⁹ Birch and Boyce. 1976

¹⁰ Medsafe health professionals data sheet: www.medsafe.govt.nz/Profs/Datasheet/m/MethyleneBlueing.htm

¹¹ Boyd et al. 1984

¹² Reynolds et al. 1982