Methylene blue

Methylene blue (CI 52015) is a heterocyclic aromatic chemical compound with the molecular formula C16H18N3SCl.

It has many uses in biology and chemistry; for example, it can be used as a stain and as a pharmaceutical drug. At room temperature it appears as a solid, odorless, dark green powder, that yields a blue solution when dissolved in water. The hydrated form has 3 molecules of water per molecule of methylene blue. Methylene blue should not be confused with methyl blue, another histology stain, new methylene blue, nor with the methyl violets often used as pH indicators.

The International Nonproprietary Name (INN) of methylene blue is methylthioninium chloride.

Methylene blue was first prepared in 1876 by German chemist Heinrich Caro (1834-1910).

It is on the World Health Organization's List of Essential Medicines, a list of the most important medication needed in a basic health system.

see Intradiscal methylene blue injection.

Case series

2016

The aim of a study was to investigate the effects of methylene blue (MB) on preventing postoperative pain and improving QOL in patients with throracolumbar fractures undergoing posterior pedicle screw fixation.

Fifty patients underwent standard posterior pedicular screw fixation for stabilization of the thoracolumbar fractures: 25 received 1ml of MB solution at a concentration of 0.5% and 25 received normal saline on the soft tissue around fusion site. Primary outcomes were the control of pain, evaluated at 48h, 2 and 6 months after surgery with the use of a visual analog scale (VAS), and the improvement of QOL, assessed 2 and 6 months postoperatively by means of Oswestry Disability Index (ODI) questionnaire.

The mean VAS scores for pain were significantly lower in the MB group compared with the control group at 2 months (1.30±0.45 vs. 2.60±1.19, P<0.001) and 6 months (1.17±0.37 vs. 1.60±0.87; P=0.028) after treatment. At 2 months after the surgery, the mean ODI score was significantly lower in the MB-treated patients than the control group (20.4±10.92 vs. 34.8±15.11; P=0.001). The ODI score in the MB-treated patients was better than the control group at 6 months after the surgery (12.2±11.66 vs. 20.8±11.14; P=0.016).

A single dose of MB on the soft tissue around fusion site shows promising results in terms of safety, reduction of postoperative pain, and functional results when compared with placebo 6 months after surgery [1)].

A prospective, randomized, triple-blind, placebo-controlled clinical trial, which was conducted at

Shiraz University of Medical Sciences between July 2011 to January 2012. Of a total of 130 patients, 115 were eligible for participation; 56 received 1 ml of MB solution at a concentration of 0.5% (MB group) and 59 received an equivalent volume of normal saline (control group). Primary outcomes were the control of LBP with or without radicular pain, which was evaluated preoperatively and at 24 hours and 3 months after surgery with the use of a visual analog scale (VAS), and the improvement of QOL, which was assessed preoperatively and 3 months postoperatively by means of the Persian translation of the Oswestry Disability Index questionnaire.

The mean VAS scores for LBP were significantly lower in the MB group compared with the control group at 24 hours (1.25 ± 0.97 vs 2.80 ± 0.69, $p < 0.001$) and 3 months (1.02 ± 1.29 vs 2.07 ± 1.10, $p = 0.019$) after treatment. The mean radicular pain scores decreased significantly in the 2 groups at 24 hours after surgery, but the mean radicular pain score was significantly lower in the MB-treated patients than the control group. However, the difference between radicular pain scores in the MB group (1 ± 1.1) and the control group (1.2 ± 1) was not statistically significant ($p = 0.64$). The reduction in LBP was greater in the MB group than the control group (8.11 ± 1.74 vs 6.07 ± 1.52, $p = 0.023$, CI 95% -1.37 to -0.10). The functional QOL improved significantly 3 months after the operation in both groups ($p < 0.001$). Moderate disability occurred more frequently in the control group than in the MB group (14.5% vs 7.7%, $p = 0.004$). No toxicity, adverse effects, or complications were found in the group of patients treated with MB injection.

A single dose of MB (1 ml 0.5%) for coating the dura and surrounding tissues (facet and muscle) shows promising results in terms of safety, reduction of postoperative pain, and functional outcome compared with placebo [2].

1)
Farrokhi MR, Yazdanpanah H, Gholami M, Farrokhi F, Mesbahi AR. Pain and functional improvement effects of methylene blue injection on the soft tissue around fusion site after traumatic thoracolumbar fixation: A double-blind, randomized placebo-controlled study. Clin Neurol Neurosurg. 2016 Aug 21;150:6-12. doi: 10.1016/j.clineuro.2016.08.018. [Epub ahead of print] PubMed PMID: 27565010.
2)
Farrokhi MR, Lotfi M, Masoudi MS, Gholami M. Effects of methylene blue on postoperative low-back pain and functional outcomes after lumbar open discectomy: a triple-blind, randomized placebo-controlled trial. J Neurosurg Spine. 2016 Jan;24(1):7-15. doi: 10.3171/2015.3.SPINE141172. Epub 2015 Sep 11. PubMed PMID: 26360148.