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Methylene Blue: A Novel Pain-reducing Agent following Costal Cartilage Harvest Procedure

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Revision rhinoplasty, as well as nasal and auricle reconstruction, involves the grafting of autologous costal cartilage, which is associated with postoperative pain at the donor site during both resting and movement. Although the current standard of care for pain management involves patient-controlled intravenous analgesia (PCIA), oral analgesics, and the local anesthesia infiltration around the donor site, they have not been able to provide efficient relief.

Recent reports have shown that the biologic stain methylene blue (MB) is an effective local analgesic in postoperative management of the anorectal surgery patients.[1] The analgesic mechanism of MB acts by destroying the nerve endings[2] and has been reported to treat clinical pain syndromes,[3–5] and other postoperative pain[6] with an effective analgesic effect of 3 weeks to 2 months.[5,6]

Because there were no reports of its effect in management of pain during the harvesting of costal cartilage, we studied it during this process as a part of our perioperative pain management. Of a total of 56 adult female patients who underwent rib harvest for rhinoplasty, 28 received 5 ml of MB solution (0.1%, MB group), and 28 received 5 ml of normal saline (control group) on the muscle stump around the donor site. During the first 48 h of surgery, the patients in both groups received the same continuous background infusion with non-patient-controlled opioid analgesic regimens. Visual analogue scale (VAS) of resting and movement pain and dosage of oral analgesics were recorded after 6 h, 24 h, 48 h, and 72 h. The usage of medication (nonsteroidal anti-inflammatory drugs or opioid medications) was rated as follows: 1, none; 2, occasional; 3, regular. Other indexes, including opioid-related side effects such as nausea, vomiting and respiratory depression, were also recorded. We observed that the mean VAS scores (both resting and movement pain) and perioperative oral analgesics consumption were significantly lower in the MB group compared with the control group at 24 h, 48 h, and 72 h after surgery. The mean score of VAS in the MB group at 48 h was 2.6, whereas in the control group it was 4.3.

The subcostal nerve innervates both the skin of the incision site and the abdominal wall musculature,[7] and studies have shown that MB interferes with both the peripheral and central nervous systems in multiple ways.[8] Thus, we hypothesize that the MB analgesic effect works through the sensory nerve endings in the muscle. The analgesic effect of MB for the treatment of chronic discogenic low back pain lasted about 3 weeks with 1 single injection[5] and it is proposed that, compared with other kinds of local anesthetic, MB may act much longer.

Liposomal bupivacaine (Exparel), a special dosage form of bupivacaine, has been developed for an extended effect duration of up to 96 h after a single-dose administration.[9] In our institution, we performed a single intercostal nerve block with 0.75% ropivacaine, and even though ropivacaine is an effective long-acting local anesthetic, a single injection is not enough for effective postoperative pain relief.[10] As of now, there is no use of MB in rhinoplasty literature. MB is a novel treatment with proven beneficial effect in the management of early-stage postoperative donor-site pain and can be safely used as a multimodal perioperative pain management system in this group of patients.

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DISCLOSURE

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REFERENCES

1. Fransiska D, Jeo WS, Moenadjat Y, et al. Methylene blue effectiveness as local analgesic after anorectal surgery: a literature review. *Adv Med.* 2017;2017:3968278.
2. Eusebio EB, Graham J, Mody N. Treatment of intractable pruritus ani. *Dis Colon Rectum.* 1990;33:770–772.
3. Kallewaard JW, Geurts JW, Kessels A, et al. Efficacy, safety, and predictors of intradiscal methylene blue injection for discogenic low back pain: results of a multicenter prospective clinical series. *Pain Pract.* 2016;16:405–412.
4. Zhao P, Mei L, Wang W. Clinical study of ultrasound-guided methylene blue thoracic paravertebral nerve block for the treatment of postherpetic neuralgia. *Turk Neurosurg.* 2019;29:811–815.
5. Peng B, Pang X, Wu Y, et al. A randomized placebo-controlled trial of intradiscal methylene blue injection for the

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treatment of chronic discogenic low back pain. *Pain*. 2010;149:124–129.
6. Farrokhi MR, Yazdanpanah H, Gholami M, et al. 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;150:6–12.
7. Nelson M, Gaball C. Technique to reduce time, pain, and risk in costal cartilage harvest. *JAMA Facial Plast Surg*. 2017;19:333–334.
8. Vutskits L, Briner A, Klauser P, et al. Adverse effects of methylene blue on the central nervous system. *Anesthesiology*. 2008;108:684–692.
9. Lovich-Sapola J, Smith CE, Brandt CP. Postoperative pain control. *Surg Clin North Am*. 2015;95:301–318.
10. Niiyama Y, Yotsuyanagi T, Yamakage M. Continuous wound infiltration with 0.2% ropivacaine versus a single intercostal nerve block with 0.75% ropivacaine for postoperative pain management after reconstructive surgery for microtia. *J Plast Reconstr Aesthet Surg*. 2016;69:1445–1449.