

Low level laser therapy: a promising adjunct therapeutic modality for pain control after coronary artery bypass graft surgery

Department of Anesthesiology, Cardiac Anesthesia Fellowship, School of Medicine, Sabzevar University of Medical Sciences, Sabzevar, Iran

Manijeh Yousefi Moghadam

LETTERS TO EDITOR

Coronary artery bypass graft (CABG) surgery is one of the most commonly performed cardiac surgeries worldwide [1]. Despite developing new standards and advances in postoperative pain management, many patients experience considerable pain following CABG and postoperative pain continued to be undertreated in these patients [2,3].

Inadequate pain control after CABG can result in increased risk of postoperative morbidities such as pulmonary complications, psychological problems, higher myocardial oxygen consumption, ischemic events, and arrhythmia, as well as increased patients' length of hospital stay and decrease their overall satisfaction. Moreover, it can potentially trigger development of postoperative chronic pain [4]. Therefore, appropriate postoperative pain management after cardiac surgery is crucial, and using a multimodal approach, including the combination of multiple techniques such as pharmacologic and non-pharmacologic interventions for pain control, has been considered a preferred strategy [4,5].

Recently, low level laser therapy (LLLT) has been suggested as a non-pharmacological adjunct therapy to the

modalities that are currently available for pain management after CABG surgery. Although the efficacy of LLLT, as a fast-growing technology for chronic pain management, has been relatively well known, using it for acute postoperative pain management is relatively new and still developing [6].

The results of a study by Fernandes et al. [7] showed the efficacy of LLLT (wavelength-660 nm) in reducing the acute postoperative pain of sternotomy after CABG surgery. In this study, patients' mean visual analogue scale (VAS) scores reduced from 6, in the second day, to 1.5 in the eighth day after surgery.

Another study by Lima et al. [8] revealed the positive analgesic effect of LLLT (wavelength-640 nm) in hyperglycemic and normoglycemic patients who underwent CABG surgery (patients' mean VAS scores decreased significantly from 6 to 2 in the second and eighth day after surgery, respectively).

In these two studies, patients received LLLT immediately after surgery and on subsequent days 2, 4, 6, and 8, postoperatively. A study by Karlekar et al. [9] found that laser therapy (wavelength-980 nm) in the postoperative period is an effective technique for postoperative analgesia

Received April 23, 2018. Revised May 29, 2018. Accepted June 1, 2018.

Correspondence to: Manijeh Yousefi Moghadam

Department of Anesthesiology, School of Medicine, Sabzevar University of Medical Sciences, Sabzevar 9613873136, Iran

Tel: +98-5144011300, Fax: +98-5144011300, E-mail: ymanijeh@gmail.com

© This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Copyright © The Korean Pain Society, 2019

following off-pump CABG surgery. In this study, the patients' mean VAS score decreased from 7.3, before application of the laser, to 4 and 3.4 at 1 and 24 hours after laser therapy, respectively.

Although the precise mechanisms of LLLT are still unclear, promoting the release of endorphins and serotonin, promoting vasodilatation, improving the local circulation, as well as the anti-inflammatory effect of LLLT have been suggested as probable analgesic mechanisms [7,8,10]. In terms of safety, none of the abovementioned studies have reported any side effect related to application of LLLT in patients who underwent CABG surgery. Moreover, it has been revealed that using LLLT in the postoperative period after CABG can decrease patients' myocardial damage and promote their cardiac tissue regeneration and repair [11].

In conclusion, it seems that LLLT can be used as a non-invasive, easily applied, effective, and safe adjunct therapeutic modality for postoperative pain control after CABG surgery. However, further well-design studies are warranted to determine and confirm the potential clinical value of LLLT for postoperative pain management after CABG surgery, as well as its optimal choice of parameters such as power density, wavelength, pulse structure, and influence/timing of the irradiation, which can influence the effectiveness of this therapeutic modality.

REFERENCES

1. Habibi MR, Baradari AG, Soleimani A, Emami Zeydi A, Nia HS, Habibi A, et al. Hemodynamic responses to etomidate versus ketamine-thiopental sodium combination for anesthetic induction in coronary artery bypass graft surgery patients with low ejection fraction: a double-blind, randomized, clinical trial. *J Clin Diagn Res* 2014; 8: GC01-5.
2. Totonchi Z, Seifi S, Chitsazan M, Alizadeh Ghavidel A, Baazm F, Faritus SZ. Pain location and intensity during the first week following coronary artery bypass graft surgery. *Anesth Pain Med* 2013; 4: e10386.
3. Hasanzadeh Kiabi F, Soleimani A, Habibi MR, Emami Zeydi A. Can vitamin C be used as an adjuvant for managing postoperative pain? A short literature review. *Korean J Pain* 2013; 26: 209-10.
4. Huang AP, Sakata RK. Pain after sternotomy – review. *Braz J Anesthesiol* 2016; 66: 395-401.
5. Bigeleisen PE, Goehner N. Novel approaches in pain management in cardiac surgery. *Curr Opin Anaesthesiol* 2015; 28: 89-94.
6. Kingsley JD, Demchak T, Mathis R. Low-level laser therapy as a treatment for chronic pain. *Front Physiol* 2014; 5: 306.
7. Fernandes GA, Araújo Júnior RB, Lima AC, Gonzaga IC, de Oliveira RA, Nicolau RA. Low-intensity laser (660 NM) has analgesic effects on sternotomy of patients who underwent coronary artery bypass grafts. *Ann Card Anaesth* 2017; 20: 52-6.
8. Lima AC, Fernandes GA, Gonzaga IC, de Barros Araújo R, de Oliveira RA, Nicolau RA. Low-level laser and light-emitting diode therapy for pain control in hyperglycemic and normoglycemic patients who underwent coronary bypass surgery with internal mammary artery grafts: a randomized, double-blind study with follow-up. *Photomed Laser Surg* 2016; 34: 244-51.
9. Karlekar A, Bharati S, Saxena R, Mehta K. Assessment of feasibility and efficacy of class IV laser therapy for postoperative pain relief in off-pump coronary artery bypass surgery patients: a pilot study. *Ann Card Anaesth* 2015; 18: 317-22.
10. Rayegani SM, Bayaati M, Sedighipour L, Samadi B. Low intensity laser therapy: basics and clinical applications. *J Lasers Med Sci* 2010; 1: 31-4.
11. Kazemi Khoo N, Babazadeh K, Lajevardi M, Dabaghian FH, Mostafavi E. Application of low-level laser therapy following coronary artery bypass grafting (CABG) surgery. *J Lasers Med Sci* 2014; 5: 86-91.