

ORIGINAL ARTICLE

## Using low level laser therapy to reduce early postoperative airway obstruction following modified Hogan's flap



Abdelrahman E. Ezzat<sup>a,\*</sup>, Hanna M. EL-Shenawy<sup>b</sup>, Marwa M. El-Begermy<sup>c</sup>,  
Mustafa I. Eid<sup>a</sup>, Ayman Y. Abbas<sup>a</sup>

<sup>a</sup> ENT Department, Faculty of Medicine, Al-Azhar University, Cairo, Egypt

<sup>b</sup> Oral Surgery and Medicine Department, Orodental Division, National Research Center, Giza, Egypt

<sup>c</sup> ENT Department, Faculty of Medicine, Ain Shams University, Cairo, Egypt

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### KEYWORDS

Low level laser therapy;  
Biostimulation laser;  
Superiorly based (pharyngeal) flap;  
Obstructive sleep apnoea

### Abstract

**Introduction and objective:** The most common postoperative complications of velopharyngeal insufficiency surgery are postoperative bleeding and airway obstruction or obstructive sleep apnoea. Consequently, the aim of this study was to evaluate the effect of low level laser therapy (LLLT) during the first postoperative days in children undergoing superiorly based pharyngeal flap (SBF) surgery.

**Materials and methods:** A randomized double blind clinical study on 30 children divided on two groups 15 patients each, who underwent SBF. LLLT was used in a group and the other was a control group. The study was conducted in academic tertiary care medical centres between 2013 and 2015. The degree of edema, oxygen saturation, occurrence of obstructive sleep apnoea (OSA) and steroid administration were recorded.

**Results:** The mean of the average oxygen saturation was significantly less in the control group in the 1st and 2nd day as compared to the laser group. The need for oxygen and the incidence of OSA in the first 3 days were significantly higher in the control group as compared to the laser group. The degree of edema showed no significant difference in the first day but was significantly higher in the control group in the 2nd and 3rd days. Hence, the need of steroids was significantly higher in the control group in the first 3 days.

**Conclusions:** Preliminary results showed that low level laser therapy is effective in reducing the incidence of early postoperative airway obstruction after SBF operations.

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\* Corresponding author.

E-mail address: [aemei.ibrahim@yahoo.co.uk](mailto:aemei.ibrahim@yahoo.co.uk) (A.E. Ezzat).

**PALABRAS CLAVE**

Terapia láser de bajo nivel;  
Láser  
bioestimulación;  
Superiores faríngea  
Flap;  
Apnea obstructiva  
del sueño

## El uso de la terapia con láser de baja intensidad para reducir la obstrucción de la vía aérea postoperatoria temprana después del colgajo de Hogan modificado

**Resumen**

**Introducción y objetivo:** La más común de las complicaciones postoperatorias tras la cirugía de la insuficiencia velofaríngea son el sangrado y la obstrucción postoperatoria de las vías respiratorias, o la apnea obstructiva del sueño. Por lo tanto, el objetivo de este estudio fue evaluar el efecto de la terapia láser de baja intensidad durante los primeros días del postoperatorio en niños sometidos a colgajo faríngeo de base superior (SBF).

**Métodos:** Estudio clínico aleatorizado doble ciego en 30 niños, entre el grupo de láser y el grupo control, que fueron sometidos a SBF. El estudio se llevó a cabo en dos centros médicos académicos de atención terciaria, entre 2013 y 2015. Se registró grado de edema, la saturación de oxígeno, la aparición de apnea obstructiva del sueño y la necesidad de esteroides.

**Resultados:** Durante los 3 primeros días, la media de la saturación de oxígeno muestra cambios significativos entre los dos grupos. Por otra parte, la necesidad de oxígeno en los primeros 3 días muestra también cambios significativos entre los dos grupos. Así como la incidencia de apnea obstructiva del sueño. El grado de edema no muestra ningún cambio significativo en el primer día, pero sí en los 2 días siguientes. Por lo tanto, la necesidad de esteroides en los primeros 3 días también muestra cambios significativos entre los dos grupos.

**Conclusiones:** Los resultados preliminares mostraron que la terapia con láser de baja intensidad es eficaz en la reducción de la incidencia de obstrucción de vía aérea en el postoperatorio temprano después de las operaciones SBF.

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**Introduction**

Velopharyngeal insufficiency (VPI) occurs in about 20% of cleft palate (CP) patients after primary palatoplasty.<sup>1</sup> The characteristic speech patterns of VPI are due to increased air transmission through the nasal cavity including; hypernasality, nasal emission, and weak pressure consonants and frication.<sup>2</sup> Schoenborn described the inferiorly based pharyngeal flap procedure in 1876 for treatment of those cases.<sup>3</sup> Later, San Venero-Roselli in 1935 designed the superiorly based flap (SBF). Multiple variations have been reported since.<sup>4</sup> In 1973, Hogan used a myomucosal flap of the posterior pharyngeal wall.<sup>5</sup> Later, Shprintzen (1979) modified this technique as 'the tailor-made flap', with the flap width determined by the degree of preoperative lateral pharyngeal wall adduction.<sup>6</sup> The most common of postoperative complications are postoperative bleeding and airway obstruction or obstructive sleep apnea (OSA), postoperative airway obstruction incidence rates from 3% to 15%.<sup>7-9</sup> Later, Liao et al. stated it is up to 32%.<sup>10</sup>

In fact, low-level laser therapy (LLLT) is a technological resource widely used in oral medicine and surgery with favorable results.<sup>11</sup> Several mechanisms of biostimulation of human tissues and organs under LLLT are involved in reduction of edema as the anti-inflammation and re-establishment of arterial, venous and lymph microcirculation effect, consequently better tissue nutrition occurs.<sup>12</sup> Although low-level laser has been applied in the medical field for more than 25 years of practice, no studies were found in the literature involving incidence of postoperative edema and airway obstruction in patients undergoing SBF. Therefore, the aim of this study was to evaluate the effect of

low-level laser therapy during the first postoperative days on children undergoing SBF in reduction of incidence of early postoperative OSA.

**Material and methods**

This study was a randomized double blind clinical study (the family and the assessing doctor were not informed about the group to which the child belonged during the medical assessment, except on the fourth postoperative day) done on 30 children undergoing secondary palatal operation between 2013 and 2015 (no lost or rejected cases). The study was conducted in academic tertiary care medical centers (Al-Azhar university hospitals and, Ain-shams University hospitals in Cairo-Egypt).

Our patients' Inclusion criteria were: 1 – Previous primary repair of the cleft palate (with or without a cleft lip or alveolus), 2 – non syndromic patients and 3 – patients with normal BMI (between the 5th percentile to  $\leq$  the 85th percentile) according the US Centers for Disease Control and Prevention (CDC) growth charts. The Exclusion criteria included one or more of the following: 1 – the cleft being a part of syndrome, 2 – patients with obstructive sleep apnea syndrome, 3 – patient undergone previous surgery for VPI, 4 – patients with BMI  $\geq$  the 85th percentile according the US-CDC growth charts, and 5 – mentally retarded patients.

The patients were randomly divided into two groups: 1 – laser group: included 15 patients who received LLLT with mean  $\pm$  SD of age was  $5.22 \pm 2.53$  and 2 – control group included 15 patients with mean  $\pm$  SD of age was  $6.42 \pm 0.76$ . Regarding the patient epidemiology, there

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