



Effect of Low Level LASER on acupoint CV-24 and PC-6 to control gag reflex in children- A Comparative Clinical Study.

Dr. Renuka Bhurke¹, Dr. Sandhyarani. B², Dr. Anil Patil³, Dr. Sujatha Paranna⁴,
Dr. Vriti Pursnani⁵, Dr. Ankita Annu⁶

¹Post graduate student Department of Pediatric and Preventive Dentistry, Bharati Vidyapeeth (Deemed to be University), Dental College and Hospital, Sangli, Maharashtra, India

²Associate Professor, Department of Pediatric and Preventive Dentistry, Bharati Vidyapeeth (Deemed to be University), Dental College and Hospital, Sangli, Maharashtra, India

³Professor and Head of Department Department of Pediatric and Preventive Dentistry, Bharati Vidyapeeth (Deemed to be University), Dental College and Hospital, Sangli, Maharashtra, India

⁴Associate Professor, Department of Pediatric and Preventive Dentistry, Bharati Vidyapeeth (Deemed to be University), Dental College and Hospital, Sangli, Maharashtra, India.

⁵Post graduate student Department of Pediatric and Preventive Dentistry, Bharati Vidyapeeth (Deemed to be University), Dental College and Hospital, Sangli, Maharashtra, India

⁶Post graduate student Department of Pediatric and Preventive Dentistry, Bharati Vidyapeeth (Deemed to be University), Dental College and Hospital, Sangli, Maharashtra, India

ABSTRACT:

BACKGROUND:

Gag reflex act produced by the transmission of afferent impulses to the center and outflow as efferent impulses to the musculature of the oropharynx. It has an undesirable impact on the efficacy of dental procedures such as intraoral examination, making dental impressions and many other clinical dental procedures in children. It has an adverse effect on completion of certain dental treatment as it leads to difficulty in dental treatment. Simple dental treatments leads to increased levels of stress in pediatric patients, and can cause excessive salivation, lacrimation, or even vomiting. Its main mechanism is based on stimulating the nerves by altering the processes and perception of pain transmitters. It facilitates releasing natural pain relievers such as endorphins and serotonin.

AIM:

To compare effect of Low Level LASER on acupoint CV-24 and PC-6 to control gag reflex in children.

MATERIALS AND METHODS:

An informed consent from the parent will be taken prior to the procedure. Informed assent will be taken from children. Patients will be assessed for severity of gag reflex using Gagging Severity Index. Patients with moderate gagging Grade 3 and severe gagging Grade 4 will be included in the study. These patients will be randomly divided into 3 groups. The LASER will be applied at a distance of 1 cm from the LASER probe to the skin with power output

0.5mW, energy 4J, wavelength 810nm on defocused energy mode. Activation of the acupoint will be carried out by focusing the laser with a spot size of 1 inch in diameter for 1 minute.

After LASER stimulation at CV-24 point, PC-6 point and placebo point in Group 1, Group 2 and Group 3 respectively, Gagging Prevention Index will be used to assess gag reflex after LASER stimulation.

RESULTS:

Pre and post intervention comparison of Gagging Index in CV 24 Group using Pearson Chi-Square Test and statistical significance at $p \leq 0.05$. CV 24 group showed statistically significant results in controlling the gag reflex. The pre and post intervention comparison of Gagging Index in PC 6 group using Pearson Chi-Square Test and statistical significance at $p \leq 0.05$. PC 6 group showed no statistical significance with p-value of 0.141 in controlling the gag reflex in children.

CONCLUSION:

When CV 24 acupuncture point was stimulated by LLLT, gag reflex was effectively suppressed. Hence, the results of our study indicate that LLLT is an effective technique to control gag reflex in pediatric patients. However, further studies with larger sample size are warranted in future to authenticate its effects.

KEYWORDS: Gagging, Gag reflex, low level LASER, acupuncture

1.INTRODUCTION

Gag reflex is a powerful physiological defensive mechanism to shield the upper respiratory tract from foreign bodies entering the pharynx, larynx or trachea.^[1] It has a deleterious effect on the efficiency of numerous clinical dental procedures including intraoral evaluations, tooth impressions and routine dental procedures in children. Even routine dental procedures cause children to go through higher levels of anxiety and stress that frequently results in salivation, lacrimation, or even vomiting.^[2]

The origin of gagging has been split into two categories somatic and psychogenic. The lateral border of the tongue or the palate are two oral cavity trigger points that could lead to somatic gagging. Psychogenic gagging is caused even without physical contact. All that it takes is the anticipation of the stimuli, such a dental procedure to trigger the response. All aspects of dentistry may be influenced by gag reflex. It leads a prolonged procedure, which leaves the dentist and the patient in an unpleasant situation, causes the appointment to be delayed and might also postpone dental care due to increased anxiety and stress.^[2,3]

The management of the gag reflex can be done in a number of ways. They consist of relaxation, distraction, and desensitization techniques; psychological and behavioral therapies; local anesthesia, conscious sedation, and general anesthesia techniques; and other complementary medicine therapies like hypnosis.^[3,4]

The gag reflex has also been controlled through acupressure points as an effective alternative. The pericardium 6 (PC 6) on the forearm and conception vessel 24 (CV 24) in the labio-mental fold on the chin are two acupuncture points that may help manage the gag reflex. Since needle acupuncture is a painful technique, treating children with it can be very challenging. LASER acupuncture, on the contrary are non invasive and best suited for children.^[3]

The concept of meridians is the foundation of acupressure. Qi or life energy, circulates via meridians as a conductor. This principle predicts that by activating acupressure points on specified meridians boost bioenergy and the ailments could be alleviated. Contrarily, LLLT, commonly referred to as LASER acupressure or biostimulation therapy, relies upon the use of light with the specific wavelength. Instead of increasing tissue temperature, the low-level LASERS applied in this therapy activate the tissues via photobiomodulation. ^[1]

In the present study we evaluated the effect of low level LASER on acupoint CV-24 and PC-6 to control gag reflex in children.

2.MATERIALS AND METHODS

The study was conducted in the Department of Pediatric and Preventive Dentistry. The study protocol was approved from the institutional review board of ethics .

2.1.Inclusion criteria

Patient who exhibited a gag reflex of moderate category (Grade 3) and severe category (Grade 4) according to the Gagging Severity Index (GSI) [given by Dickinson and Fiske]^[4] were included in the study.

2.2.Exclusion criteria

Patient who had history of systemic disease and handicapped children were excluded from the study.

An informed consent from the parent was taken prior to the procedure .Informed assent was taken from children. Patients were assessed for severity of gag reflex using Gagging Severity Index .Patients with moderate gagging Grade 3 and severe gagging Grade 4 were included in the study.

These patients were randomly divided into 3 groups.

Group 1- Low Level LASER Therapy to CV-24point.

Group 2- Low Level LASER Therapy to PC-6 point.

Group 3- Low Level LASER Therapy to a placebo point.

The placebo point is different from the two other groups and has no effect on gag reflex. (According to traditional Chinese medicine, the selected placebo point is used for treating circulatory disorders in the upper extremity.)^[7]

Participants were unaware of whether they are in active or placebo group. The evaluator was unaware of allocation of participants in different group. The research investigator who did not participate in the evaluations, administered the LASER therapy.

The skin over the acupoint was cleaned with alcohol (Medi-10X Isopropyl Alcohol 78%, Manufacturer - Ecogonic Pvt Ltd, Kolkata, India.) before application of the LASER stimulation. Marking of the acupoint was done before starting the procedure. The LASER was applied at a distance of 1 cm from the LASER probe to the skin with power output 100mW, energy 6J, wavelength 810nm on defocused energy mode . Activation of the acupoint was carried out by focusing the laser with a spot size of 0.5cm in diameter for 1 minute.

After LASER stimulation at CV-24 point, PC-6 point and placebo point in Group 1, Group 2 and Group 3 respectively, Gagging Prevention Index was used to assess gag reflex after LASER stimulation.

2.3. Description of the Acupoints:

In this research, the acupoints CV-24 and PC-6 were chosen. The location of CV-24 is at the mentolabial sulcus.^[7] Between the tendons of the flexor carpi radialis and the palmaris longus, PC-6 is located on the anterior forearm two cun (A traditional Chinese unit of length, originally the width of a person's thumb at the knuckle) from the transverse wrist crease. Acupoints are located by measuring the cun in relation to the patient's body in acupuncture. The thumb of the patient is one cun.^[8] The acupoint is situated on the anterior surface of the wrist, above the distal skin crease on the wrist joint, with a measurement equivalent to the width of the patient's three fingers. The placebo point PC 3 (Pericardium 3) was chosen for group C. It is located on the forearm measuring 6 cuns from the wrist of the patient.^[9]

2.4. Scoring Criteria:

In the study, the gag reflex was assessed using a criterion given by Dickinson and Fiske. Gagging severity index (GSI) and gagging prevention index are included in the criteria (GPI). GSI rates the patient's response to stimuli that make them gag on a scale from mild (grade 1) to very severe (grade 5). On the other hand, GPI evaluated the effectiveness of the intervention used to regulate the gag reflex. It ranges from obtunded gag reflex with successful treatment (Grade 1) to severe gag reflex where treatment is not possible (Grade 5).^[4]

GAGGING SEVERITY INDEX^[4]

GAGGING SEVERITY	DESCRIPTION
Grade I Normal gagging reflex	Very occasional gagging occurs during high-risk dental procedures such as maxillary impression taking or restoration to the distal, palatal or lingual surfaces of molar teeth. This is basically a 'normal' gag reflex under difficult treatment circumstances. Generally controlled by the patient
Grade II Moderate gagging	Gagging occurs occasionally during routine dental procedures such as fillings, scaling and impressions. Control can usually be regained by the patient, although they may need assistance and reassurance from members of the dental team, and treatment continued. No special measures are generally needed to facilitate routine treatment but may be required for more difficult procedures.
Grade III Moderate gagging	Gagging occurs routinely during normal dental procedures. This may include simple physical examination of high-risk areas, such as the lingual aspect of lower molars. Once instigated, control is difficult to regain without cessation of the procedure. Re-commencement may be

	difficult. Gagging prevention measures are usually required. The gag may influence treatment planning and may limit treatment options
Grade IV Severe gagging	Gagging occurs with all forms of dental treatment including simple visual examination. Routine treatment is impossible without some form of special measure to attempt to control the gag reflex. Treatment options may be limited and the gagging problem will be a major factor in treatment planning.
Grade V Very Severe gagging	Gagging occurs easily and may not necessarily require physical intervention to trigger the reflex. The patient's behaviour and dental attendance may be governed by the gagging problem and it will be one of the prime factors when planning treatment. Treatment options may be severely limited. Dental treatment will be impossible to carry out without specific, special treatment for control of the gagging problem.

GAGGING PREVENTION INDEX ^[4]

GAGGING PREVENTION	DESCRIPTION
Grade I Very occasional	Gagging occurred during high-risk dental procedures such as maxillary impression taking or restoration to the distal, palatal or lingual surfaces of molar teeth. This is basically a 'normal' gag reflex under difficult treatment circumstances. Generally controlled by the patient.
Grade II Partial control	Partial control of the gag reflex. The proposed treatment was possible but occasional gagging occurred.
Grade III Partial control	Partial control of the gag reflex. The proposed treatment was part completed or alternative treatment was carried out. This involved simpler procedures at lower risk of producing gagging. Gagging occurred frequently.
Grade IV Inadequate control	Inadequate control of the gag reflex. The proposed treatment was not possible. Some 'treatment' was carried out but only very simple procedures. Gagging occurred regularly.
Grade V No control	Failure to control the gag reflex. Gag reflex was so severe that even simple treatment was not possible. No treatment was provided or possible.

2.5.STATISTICAL ANALYSIS

SPSS software version 23 was used to perform all the statistical analysis. The descriptive statistics such as frequencies and percentages were calculated. The categorical data was compared within and between group using Pearson chi-square test. The statistical significance was fixed at $p \leq 0.05$.

3.RESULTS

Pre and post intervention comparison of Gagging Index in CV 24 Group using Pearson Chi-Square Test and statistical significance at $p \leq 0.05$. CV 24 group showed statistically

significant results with p-value of 0.018 in controlling the gag reflex (Table 1). The pre and post intervention comparison of Gagging Index in PC 6 group using Pearson Chi-Square Test and statistical significance at $p \leq 0.05$. PC 6 group showed no statistical significance with p-value of 0.141 in controlling the gag reflex in children (Table 2). The pre and post intervention comparison of Gagging Index in the placebo group using Pearson Chi-Square Test and statistical significance at $p \leq 0.05$. p value in this group cannot be estimated because of no variation in values in pre and post intervention. Intergroup comparison showed that LLLT to acupoint CV 24 point showed significant reduction in gag reflex.(Table 3)

4.DISCUSSION

Dental procedures are hampered by gag reflex, thus it's crucial to find easy, non-invasive ways of managing it. Both acupuncture and acupressure are known to be incredibly effective, fast, and simple therapies.

LASER was developed in the early 1960s. In the 1970s, acupuncturists first started experimenting with soft LASERs.^[10] Low-intensity LASERs are used in LASER acupuncture to stimulate the trigger points and treat a variety of illnesses (LLLT). Low-power LASERs were used in the initial experimental applications of LASERs in acupuncture. Endre Mester in Hungary initially reported its usage in medicine. The terms "needleless acupuncture," "pain attenuation," and similar expressions first appeared when he discussed the application of Ruby and Argon LASERs in the promotion of healing of chronic ulcers.^[11] Contrary to needle acupuncture, which begins with the micro-traumatic mechanical impacts of the needle on local tissue, LASER acupuncture depends on the absorption and scattering of light within tissues. The LASER's photons have a bio-stimulating and modulatory effect. According to magnetic resonance imaging, laser acupuncture affects particular brain regions that release endorphins and enkephalins, which aid in the healing process.^[12] Acupuncture is suggested to be used on certain body points along the 14 meridians, including conception vessel 24 (CV-24), PC6, and Li-4 (Hegu Point).^[2,13,14] According to research, these can reduce nausea similar to traditional medications, if not better.^{15,16}

In purpose of treating individuals with a gag reflex, Rosted et al. (2006) performed needle acupuncture on the acupuncture point CV 24. They discovered that CV 24 had an 80% rate of success in helping individuals in impression making. The current study also showed significant reduction of gag reflex after stimulation of acupoint CV 24.^[17]

Somri et al. (2001) examined the effects of intravenous saline injection as a placebo, ondansetron (an anti-emetic medication), and acupuncture at sites PC-6 and CV-13 (placed over the sternum) for post operative nausea and vomiting. Immediately after receiving the anaesthesia, the treatment or placebo was administered. While there was no significant difference between the effects of acupuncture and ondansetron, there was a significant difference between the two treatment groups (acupuncture and Ondansetron) and the placebo group ($p < 0.0001$). Ondansetron is a serotonin antagonist that first affects the potassium (K⁺) channels and then the 5-HT₃ receptors. According to research, serotonin (5-HT) inhibits by acting on post-synaptic 5-HT₁ receptors, which opens K⁺ channels. Some serotonin receptors, on the other hand, might have a reverse effect on 5-HT, causing the same neurons to become excitatory, and an opposite effect on the K⁺ channels. Acupuncture likely has a

comparable impact on the 5-HT₃ receptors to Ondansetron because it directly affects the production of serotonin and noradrenaline.^[18] Our study compared the efficacy of acupoint PC 6 and CV 24 ,wherein PC 6 showed control of gag reflex in few individuals but was not statistically significant.

The acupuncture points CV 24 and PC 6 proved successful in treating individuals with gag reflexes. Since LASER acupuncture provides a much less painful stimulation over acupuncture with needles, it was taken into consideration for this investigation. Acupuncture has been proven to enhance the amount of circulating beta-endorphine and accelerate the production of serotonin and nor adrenaline. Both an emetic and an anti-emetic action is produced by opiates. Beta -receptors mediate the anti-emetic effect, whereas delta-receptors mediate the emetic effect. According to some theories, anti-emetic effects of acupuncture are brought about by an elevated amount of β -endorphine. Additionally, it has been proposed that acupuncture may have an anti-emetic effect by desensitising chemoreceptor trigger zones in the brain via neurochemical agents.^[18]

The gag reflex was controlled by both CV-24 and PC-6 in a similar investigation by Bilello and Fregapane (2019) . They included 20 patients between 19 to 80 years who needed maxillary and mandibular impressions and had a severe gag reflex. Without previously performing acupuncture, the initial impressions of both jaws were taken. However, the second impressions were made after acupuncturing . The VAS showed that acupuncture gave the patients more relief.^[19]

An assessment of the effectiveness of acupuncture in preventing gag reflex during orthodontic treatment was performed by Sari and Sari et al (2010) . In that study, 45 patients (mean age -10.5+/-2.6 years) were included and split into three groups. A red-light soft magnetic field LASER was used in group 1 to stimulate the CV-24 point for a minute. The group 2 underwent both acupressure on PC-6 and LASER stimulation of CV-24. The group 3 was regarded as the control group. During the process of taking dental impressions, the GSI and GPI were recorded. In the second group before and after the LASER stimulation, the average difference between the GSI and GPI was 58.9%, compared to 37.9% in the first group. They stated that both acupuncture points CV-24 and PC-6 had a significant role in controlling the gag reflex.^[2]

In the current study, both CV-24 and PC-6 were activated using low level LASER therapy for managing the gag reflex in children with moderate and severe gag reflex according to criteria given by Dickinson and Fiske.^[4] The placebo point PC 3 (Pericardium 3) was chosen for group C to reduce bias . Gag reflex was controlled using both PC6 and CV24 . CV 24 showed statistically significant decrease in gag reflex as compared to PC6. According to current study, CV 24 was effective than PC6 in controlling gag reflex.

5.CONCLUSION:

The LASER stimulation of acupuncture point CV 24 was found to be an effective method in the treatment of pediatric patients with gagging reflex. Hence, the results of our study indicate that LLLT is an effective technique to control gag reflex in pediatric patients. However, further studies with larger sample size are warranted in future to authenticate its effects.

6.CLINICAL SIGNIFICANCE:

This study found that application of LASER acupuncture might help in reducing gag reflex .This can help in reducing dental anxiety in pediatric patients while performing simple dental procedures like oral examination,dental impressions,etc.

7.ABBREVIATIONS :

PC 6 - Pericardium 6

CV-24-Conception vessel 24

Li-4 Hegu Point

IMAGES:

FIGURE 1. LOCATION OF CV 24 POINT



FIGURE 2. LOCATION OF PC 6 POINT



FIGURE 3.LOCATION OF PLACEBO POINT



TABLES:

TABLE 1

Gagging Index in CV 24 group - Pre intervention and Post intervention

Group = CV 24		Post intervention						p value
		Grade 1		Grade 2		Grade 3		
		N	%	N	%	N	%	
Pre intervention	Grade 3	4	57.1%	3	42.9%	0	0.0%	0.018*
	Grade 4	0	0.0%	3	42.9%	4	57.1%	

TABLE 2

Gagging Index in PC 6 group - Pre intervention and Post intervention

Group = PC-6		Post intervention								p value
		Grade 1		Grade 2		Grade 3		Grade 4		
		N	%	N	%	N	%	N	%	
Pre intervention	Grade 3	1	14.3%	4	57.1%	2	28.6%	0	0.0%	0.141
	Grade 4	0	0.0%	1	14.3%	4	57.1%	2	28.6%	

TABLE 3

Gagging Index in PLACEBO 6 group - Pre intervention and Post intervention

Group = Placebo		Post intervention				p value
		Grade 3		Grade 4		
		N	%	N	%	
Pre intervention	Grade 3	7	100.0%	0	0.0%	• --
	Grade 4	0	0.0%	7	100.0%	

8.REFERENCES:

[1] Koticha P, Katge F, Chimata V et al. The effect of Low Level Laser Therapy and acupuncture in controlling gag reflex in children undergoing dental procedures. International Journal of Science and Healthcare Research 5 Vol.6; Issue: 2; April-June 2021.

- [2] Sari E, Sari T. The role of acupuncture in the treatment of orthodontic patients with a gagging reflex: a pilot study. *Br Dent J.* 2010;208:E19.
- [3] Miles TS, Nauntofte B, Svenson P. *Clinical oral physiology.* Copenhagen: Quintessence Publishing Co Ltd; 2004. ISBN: 1- 85097-091-2; 1850970912.
- [4] Fiske J, Dickenson C. The role of acupuncture in controlling the gagging reflex using a review of ten cases. *Br Dent J.* 2001; 190:611e613.
- [5] Thayer M L. The use of acupuncture in dentistry. *Dent Update* 2007; 34: 244–250.
- [6] Goel H, Mathur S, Sandhu M, Jhingan P, Sachdev V. Effect of Low-level LASER Therapy on P6 Acupoint to Control Gag Reflex in Children: A Clinical Trial. *J Acupunct Meridian Stud.* 2017; 10(5):317- 23.
- [7] Usichenko TI, Müller-Kozarez I, Knigge S, Busch R, Busch M. Acupuncture for Relief of Gag Reflex in Patients Undergoing Transoesophageal Echocardiography-A Protocol for a Randomized Placebo Controlled Trial. *Medicines (Basel).* 2020; 7(4):17.
- [8] Yin CS, Park HJ, Seo JC, Lim S, Koh HG. Evaluation of the cun measurement system of acupuncture point location. *Am J Chin Med.* 2005; 33(5):729-35.
- [9] Kim J, Kang DI. Positioning Standardized Acupuncture Points on the Whole Body Based on X-Ray Computed Tomography Images. *Med Acupunct* 2014; 26(1):40-9.
- [10] Silva Ju´nior AN, Pinheiro AL, Oliveira MG, Weismann R, Pedreira Ramalho LM, Amadei Nicolau R. Computerized morphometric assessment of the effect of low-level laser therapy on bone repair: an experimental animal study. *J Clin Laser Med Surg.* 2002;20:83e87.
- [11] Bjordal JM, Couppe Roberta C, Chow RT, Tuner J, Ljunggren EA. A systematic review of low level laser therapy (llt) with location-specific doses for pain from chronic joint disorders. *Aust J Physiother.* 2003;49:107e116.
- [12] Duggal P. Laser acupuncture the emerging light of hope.. *Guident.* 2013:60e62.
- [13] Ren Xianyun. Making an impression of a maxillary edentulous patient with gag reflex by pressing caves. *J Prosthet Dent.* 1997;78:533.
- [14] Rosted P. Use of acupuncture in dentistry. *Aust Dent J.* 1998; 43:437.
- [15] Lee A, Done ML. The use of nonpharmacological techniques to prevent postoperative nausea and vomiting: a metaanalysis. *Anesth Analg.* 1999;88:1362.
- [16] Lee A, Fan L. Stimulation of the wrist acupuncture point PC6 for preventing postoperative nausea and vomiting. *Cochrane Database Syst Rev.* 2009;2:GD003281.
- [17] Rosted P, Bundgaard M, Fiske J, Pedersen AM. The use of acupuncture in controlling the gag reflex in patients requiring an upper alginate impression: an audit. *Br Dent J.* 2006 Dec 9; 201(11):721-5.
- [18] Somri M, Vaida S J, Sabo E et al. Acupuncture versus odansetron in the preventing of postoperative vomiting. *Anaesthesia* 2001; 56: 927–932.
- [19] Bilello G, Fregapane A. Gag reflex control through acupuncture: a case series. *Acupunct Med* 2014; 32: 24-27.