

**Original Research****A Comparative Evaluation of Effect of Electroacupuncture on Different Acupoints to Manage Gag Reflex in Patients Undergoing Prosthodontic Treatment: An In Vivo Study****Keerthi Meghana Nelanuthala , Sushma Munde , Babita Yeshwante**

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## ARTICLE INFO



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## ABSTRACT

This in vivo study evaluated the comparative effectiveness of electroacupuncture at three different acupoints, Hegus (LI4), Auricular, and Neiguan (PC6), in managing the gag reflex in patients undergoing prosthodontic treatment. A total of 45 patients with moderate to very severe gag reflex were randomly assigned to one of the three acupoint groups, where electroacupuncture was applied during maxillary impression making. The severity and prevention of the gag reflex were measured using the Gagging Severity Index (GSI) and the Gagging Prevention Index (GPI), respectively. Results demonstrated a statistically significant reduction in gag reflex across all groups, with Neiguan showing the highest efficacy (75.8% improvement), followed by Hegus (67.75%) and Auricular (51.3%). The findings support electroacupuncture as a minimally invasive, rapid, and effective chairside method to control gag reflex, particularly when targeting the Neiguan point due to its influence on vagal modulation.

**Introduction**

The gag reflex is a natural protective response that safeguards the pharynx, larynx, and trachea from foreign bodies or harmful stimuli. Gagging during dental treatment can be extremely crippling and restricts the patient and also the clinician's capacity to deliver it. Thus, gagging needs to be managed chairside effectively [1].

Various strategies have been explored to manage this reflex, ranging from behavioural techniques to pharmacological interventions. Among these, acupuncture and its modern counterpart, electroacupuncture, have emerged as potential methods for controlling the gag reflex [2].

Acupuncture is a traditional Chinese medicine practice, has gained attention as an alternative approach for gag reflex management. Electroacupuncture, a modern adaptation of traditional acupuncture, involves applying controlled electrical stimulation to specific acupoints to enhance its therapeutic effects. Studies suggest that acupuncture may modulate the autonomic nervous system, regulate sensory processing, and alter pain perception, which could contribute to the suppression of the gag reflex [3].

Its primary method involves modifying the functions and perception of pain transmitters in order to stimulate the nerves. It helps release endorphins and serotonin, which are natural painkillers. It has already been demonstrated to be successful for a variety of dental treatments [4].

The severity of the gag reflex was assessed using the Gag Severity Index (GSI) and the Gag Prevention Index (GPI) [5].

This study aims to compare the effectiveness of electroacupuncture applied to various acupoints in controlling the gag reflex in patients receiving prosthodontic treatment. By systematically assessing the impact of electroacupuncture at key acupoints, this study seeks to provide evidence-based insights into its clinical utility and determine the most effective acupoint stimulation for controlling the gag reflex in dental practice.

**AIM:** The aim of this study is to assess the impact of electroacupuncture at various acupoints in controlling the gag reflex in patients.

**OBJECTIVES:**

1. To assess the effectiveness of electroacupuncture at the Hegus point in managing the gag reflex in patients.
2. To assess the effectiveness of electroacupuncture at the auricular point in managing the gag reflex in patients.
3. To assess the effectiveness of electroacupuncture at the neiguan point in managing the gag reflex in patients.

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4. To compare if there exists any difference in control of gag reflex between these three points.



### ELECTROACUPUNCTURE DEVICE

(Grade III) to very severe (Grade V) gag reflexes were included in the study after obtaining informed consent.

Three acupoints: A] Hegus, B] Auricular, C] Neiguan were considered.

Patients were randomly divided into three groups: A, B, and C, with each group consisting of 15 individuals aged between 20 and 70 years, comprising both male and female participants.

Electroacupuncture device along with a shock absorber gel was used at any one acupoint while making a maxillary alginate impression for one minute.

STAGE II: The effectiveness of electroacupuncture was evaluated using the Gagging Prevention Index (GPI) (Table 2) during the procedure. Patient tolerance was assessed by placing a loaded tray intraorally, during which the GPI score was recorded.

#### STUDY TOOLS:

Electroacupuncture device  
Lubricating media  
Alginate impression material  
Perforated stock trays

#### Electroacupuncture device:

Size: 15 cm × 10 cm × 8 cm

#### METHODOLOGY:

An in-vivo study was conducted on patients needing a maxillary alginate impression for current dental care.

A sample size of 45 patients was considered.

STAGE I: Before making impressions, the Gagging Severity Index (GSI) (Table 1) was assessed, and the patient's ability to tolerate an empty tray placed intraorally was evaluated. Patients exhibiting moderate

#### INCLUSION CRITERIA:

1. Patients needing a maxillary alginate impression for current dental care.
2. Patients with a history of experiencing a gag reflex during dental procedures.
3. Age: 20-70 years
4. Based on the Gagging Severity Index (GSI), patients classified with moderate (Grade III) to very severe (Grade V) gag reflexes.
5. The individual who is capable of giving informed consent.

#### EXCLUSION CRITERIA:

1. Patients with systemic disorders and comorbidities affecting psychomotor function.

2. Patients with cardiac pacemakers, defibrillators or other implanted electrical devices.
3. Patients taking antiemetic medications.
4. Patients who were familiar with electroacupuncture as a method for managing the gag reflex.

#### APPLICATION OF ELECTROACUPUNCTURE DEVICE



#### CLINICAL DEPICTION:



Table 1: Gagging Severity Index	
TABLE	GAGGING SEVERITY INDEX (GSI):
Type I	Very mild, occasional and controlled by the patient
Type II	Mild, and control is required by the patient with reassurance from the dental team
Type III	Moderate, consistent and limits treatment options
Type IV	Severe and treatment is limited.
Type V	Very severe, affecting patient behaviour and dental attendance and making treatment impossible.

Table 2: Gagging Preventive Index	
TABLE	GAGGING PREVENTIVE INDEX (GPI):
Type I	Obtunded gag reflex; treatment successful
Type II	Partially controlled gag reflex; all treatment possible
Type III	Partially controlled gag reflex but frequent gagging; simple treatment possible.
Type IV	Inadequately controlled gag reflex; simple treatment unable to be completed.
Type V	Gag reflex severe, no treatment possible.

## RESULTS:

TABLE: Gagging severity index and Gagging preventive index in all groups

GROUP		MEAN	N	SD	SEM	t
A. Hegus	GSI	3.60	10	0.68	0.22	14.54
	GPI	1.40	10	0.40	0.14	P= 0.0001 (S)
B. Auricular	GSI	3.50	10	0.65	0.20	11.02
	GPI	1.80	10	0.42	0.13	P= 0.0001 (S)
C. Neiguan	GSI	3.70	10	0.71	0.21	15.39
	GPI	1.10	10	0.40	0.14	P= 0.0001 (S)

	Percentage of improvement amongst all the three groups
Group	Percentage of improvement
A. Hegus	67.75
B. Auricular	51.30
C. Neiguan	75.80

GPI: Gagging preventive index, GSI: Gagging severity index, SEM: Standard error mean, SD: Standard deviation, S: Significant

TABLE: Percentage of improvement amongst all the three groups:

Statistical analysis was done using the IBM SPSS (SPSS Inc., Chicago IL, USA) version 24 software. To determine the scores of GSI and GPI, Paired t- test was used.

Intergroup comparison was done by one- way analysis of variance test (ANOVA).

The findings of this study demonstrated a statistically significant decrease in the gag reflex among patients following the application of the electroacupuncture device at all points—Hegus, Auricular, and others.

Neiguan point proved to be most effective of all in controlling gag reflex.

The Hegus point was found to be significantly more effective than the auricular point in reducing the gag reflex.

## DISCUSSION

The gag reflex is a common challenge in dental procedures, often leading to patient discomfort and treatment limitations.

This study aimed to evaluate the comparative effects of electroacupuncture (EA) at different

acupoints on controlling the gag reflex in an in vivo setting. The findings suggest that electroacupuncture significantly reduces the severity and frequency of the gag reflex, with variations in effectiveness depending on the acupoint stimulated.

The results of our study align with previous research that highlights the efficacy of acupuncture in managing gag reflex. Our findings demonstrate that electroacupuncture at acupoints Neiguan and Hegus produced a statistically significant reduction in gag reflex severity compared to the auricular group. This supports the hypothesis that acupuncture-based neuromodulation can influence autonomic and somatic pathways involved in the gag reflex.

One of the key objectives of this study was to compare the efficacy of different acupoints. Our findings indicate that stimulation at Neiguan was more effective than at Hegus, suggesting that certain acupoints have a stronger modulatory effect on the gag reflex. The differential response may be attributed to the varying neurophysiological pathways engaged by different acupoints.

Studies by Çetiner et al. (2016) and Rosted et al. (2019) have shown that stimulating acupoints such as LI4 (Hegu) and PC6 (Neiguan) modulates the vagal and glossopharyngeal nerve activity, reducing hyperactivity in the pharyngeal musculature. Similar findings were observed in our study, where patients receiving electroacupuncture at these points exhibited improved tolerance to intraoral stimuli [6 - 8].

The inhibitory effect of electroacupuncture on the gag reflex is likely mediated through a combination of neurological and biochemical mechanisms. Studies have shown that acupuncture stimulates the release of endogenous opioids, serotonin, and gamma-aminobutyric acid (GABA), which play a role in central inhibition of hyperactive reflexes (Zhao et al., 2017). Additionally, electroacupuncture has been found to modulate

vagal tone, thereby reducing excessive gagging triggered by pharyngeal stimulation [6, 9].

The findings of this study have significant clinical implications for dentistry and other medical fields where gag reflex management is crucial.

Electroacupuncture offers a non-pharmacological, minimally invasive, and patient-friendly approach to controlling gag reflex, making it particularly beneficial for patients with severe gagging tendencies. Integrating electroacupuncture into dental practice could enhance patient compliance and facilitate the execution of complex procedures such as impression-taking, prosthodontic rehabilitation, and intraoral scanning.

#### **ADVANTAGES:**

1. Minimally invasive.
2. Non-pharmacological approach
3. Less clinical time with immediate onset of action.
4. Customizable stimulation (intensity and frequency) based on patient's tolerance.
5. Easy to learn.
6. Cost effective.

#### **DISADVANTAGES:**

1. Variability in patient response.
2. Potential discomfort of electrical stimulation.
3. Cannot be used in individuals with pacemakers, neurological disorders and pregnancy.
4. Lack of standardization of devices.

The results of this study showed that there was a statistically significant reduction in the gag reflex among patients after the electroacupuncture device was applied on all the points Hegus, Auricular and Neiguan.

**Neiguan point proved to be most effective of all in controlling gag reflex.**

The Hegus point demonstrated significantly greater effectiveness in reducing the gag reflex compared to the auricular point.

Electroacupuncture provides painless stimulation without any piercing of skin. It was concluded that it is an effective method of reducing gag reflex effectively chairside without any side effects with minimum clinical time, equipment and expertise.

**CONCLUSION:** Electroacupuncture in Hegus, Auricular and Neiguan sites were successful in reducing the gag reflex with an additional clinical time of 2-3 minutes. It is a quick, safe, affordable, and comparatively non-invasive method. Overall, while all three acupoints contribute to gag reflex management. Neiguan is the most effective acupoint for controlling the gag reflex, especially in patients with strong physiological responses because of its specific action on the vagus nerve. While Hegus and auricular points provide benefits for anxiety-related gagging.

#### ADDITIONAL INFORMATION

##### Disclosures

**Human subjects:** Consent was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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