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HEAD & NECK

The gagging patient in ORL examinations: predictors, evaluation and treatment

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Abstract

Purpose Gagging may be a challenge in daily otorhinolaryngology (ORL) routine. This cross-sectional study aimed to examine conditions of gagging as limitation to ORL examination and the efficacy of acupressure as tool to reduce exaggerated gagging.

Methods The study was conducted on a total of 360 study subjects. There was a survey part and a routine ORL examination with observation of gagging behaviour. Through binomial univariate logistic regression, predictors of clinically relevant exaggerated gagging were identified. Wilcoxon signed rank test was used to evaluate efficacy of acupressure point CV-24 to reduce gagging while examination.

Results First gagging's relevance was indicated by over 40% of study subjects showing clinically relevant exaggerated gagging. Furthermore, we found that more psychogenic than somatogenic features proved to be predictors of exaggerated gagging. Third acupressure point CV-24 showed statistical significant reduction of gagging intensity and improved examination feasibility.

Conclusion Awareness of exaggerated gagging's predictors are the first step to deal with gagging in daily practice. Acupressure might be an effective tool to overcome gagging in the affected patients.

Level of evidence We suggest at least Level IV according to Oxford (UK) CEBM Levels of Evidence.

Keywords Gagging · Retching · ORL · Acupressure · Predictors

Introduction

Gagging is a common phenomenon during both dental and ORL examination and may limit the feasibility of examination or even treatment. Different classifications of exaggerated gagging exist like the gagging severity index referring to feasibility of dental examination and treatment [1, 2], predictive gagging survey intending to predict gagging intensity before patients entering the examination room [3] or gagging problem assessment [4] to mention the most relevant.

The cause of exaggerated gagging is considered to be multifactorial with both somatogenic and psychogenic factors [5, 6]. Described medical causes are gastrointestinal, upper respiratory tract and neurological pathologies [2, 5]. Also habits like heavy smoking or excessive alcohol consumption are considered to increase the possibility of exaggerated gagging [7]. Reported psychological causing factors are classical and operant conditioning [5], conscious awareness of gagging stimuli [8] and fear as "always the underlying factor influencing the psychological gagger" [9].

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So far there is no general established treatment concept to control exaggerated gagging while examination. Concepts comprise, for example, local or general anaesthesia, active relaxation methods, distraction techniques, systematic desensitization and acupuncture or acupressure [5]. Conception vessel 24 (CV-24) or also called Chengjiang (REN 24) is one of these acupressure and acupuncture points [10, 11].

The aim of this study was first to determine frequencies and intensities of gagging in the ORL examination situation. Second, we examined predictors of clinically relevant exaggerated gagging while ORL examination.

In a third step, we intended to test the acupressure of point CV 24 as a treatment for exaggerated gagging to improve examination feasibility and patient's comfort.

Materials and methods

A cross-sectional study was conducted on a total of 360 study subjects over a period of 10 months (2014/2015) at the Department of Otorhinolaryngology and Head and Neck Surgery tertiary care. The study was institutional ethical review board approved by the Institutional Review Board (Identification number: 167/13) and every patient gave written consent to the study.

The study investigated exaggerated gagging in patients while ORL examinations with an examination protocol and questionnaire. The 34-item questionnaire comprised the patient's gagging intensity assessment (before and after acupressure) and possible predictors of exaggerated gagging.

The protocol included 13 sites of possible gag reflex triggering points and the subject's punctum maximum of gagging as well as dental condition, Mallampati classification [12, 13] and the examiner's assessment of gagging intensity before and after performing acupressure.

Routine ORL examination of mouth, pharynx and larynx was performed including additional gagging provocation with tactile stimulation of buccal cavity, mouth base, teeth, tongue, palate, palatal arch and uvula and posterior pharyngeal wall with tongue blades or a laryngoscope. All examinations were performed by an experienced otorhinolaryngologist.

The full questionnaire and the examination protocol are to be found in the appendix (8.1 and 8.2).

Table 1 shows the examiner's gagging intensity assessment and its subsequent categorization into "gagging groups" for analysis. Clinically relevant gagging was supposed to describe limitation of examination parts, especially accurate rigid laryngoscopy and hypopharyngoscopy. All subjects with gagging intensity scale scoring 0–3 points at the examiner's assessment were assigned to "non-clinically relevant gagging" and those scoring 4–10 points to "clinically relevant gagging".

Observing the occurrence of clinically relevant exaggerated gagging while examination and in 20 cases of non-clinically relevant gagging, acupressure of point CV-24 was tested (Fig. 1). The additional 20 subjects with non-clinically relevant gagging volunteered to explore gagging improvement even not necessary.

Finger pressure was applied at point CV-24 with slowly increasing intensity for 90 s. Then a repeated examination of mouth, pharynx and larynx was performed with continuing the acupressure. Afterwards the patient's and examiner's assessment of gagging intensity before and under acupressure as well as the ability to carry out rigid laryngoscopy with 70°- and 90°-directions of view laryngoscopes was recorded.

The used laryngoscopes were Hopkins II 70° by Karl-Storz (8712 CA) with 5 mm diameter and 24 centimetres

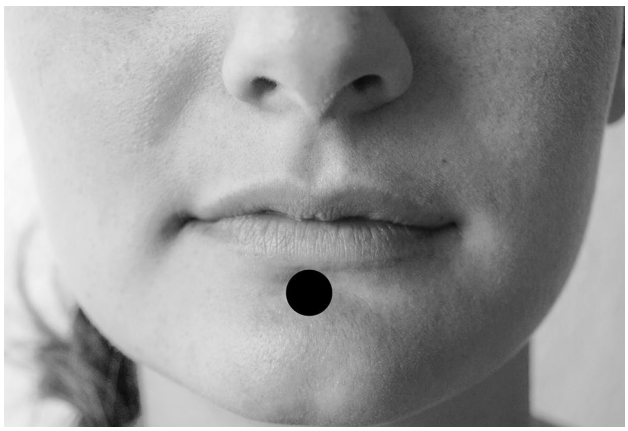

Fig. 1 Conception vessel 24 (CV-24) or Chengjiang (REN 24) CV-24 is located "in the mentolabial groove, approximately midway between the chin and the lower lip" [21]

Table 1 Examiner's gagging intensity assessment and gagging groups

Gagging group	Gagging intensity scale	Description
Non-clinically relevant gagging	0	No gagging
	1–3	Normal gagging without limitation to examination feasibility
Clinically relevant gagging	4–7	Exaggerated gagging with limitation of the examination
	8–10	High exaggerated gagging with unfeasibility of examination parts

length as well as the 90° tele-laryngo-pharyngoscope with 10 mm diameter.

Study subjects—while inpatient or outpatient treatment from the age of 16 years up with the parent's consent or from the age of 18 years up—were assigned to the study. Exclusion criteria were severe vertigo, immobility, head or neck neoplasia and head and neck surgery in previous 2 weeks like tonsillectomy, adenoidectomy, uvulopalatopharyngoplasty, tracheotomy or other surgery affecting the known main trigger areas of the gag reflex. The questionnaire's items were modified on the basis of previous studies [2–5, 14, 15].

All data were analysed by SPSS Statistics® Version 23 by IBM. First descriptive statistics with editing frequency distribution tables of item categories were performed. To identify predictors of clinically relevant exaggerated gagging contingency tables were edited and Chi-squared tests or Fisher's exact tests, respectively, were applied. Fisher's exact test was applied in case of one or more cells in the contingency tables showing an expected frequency less than 5. Further binomial univariate logistic regression was performed and the Bonferroni–Holm method was used for p value adjustment to reduce type one errors in multiple comparisons [16]. For Bonferroni–Holm method the application "R"® version 3.2.0 by "R Foundation for statistical computing" has been used.

For evaluation of the efficacy of acupressure point CV-24 to reduce gagging, Wilcoxon signed rank test was applied to compare the scores at gagging intensity scales before and after the procedure. This test was applied with the subject's and examiner's assessment, respectively.

Results

Prevalence and socio-demographic characteristics

Study subjects were 55.8% female and 44.2% male. 39.2% of the study subjects were between 40 and 60 years old and 37.5% between 20 and 39 years old.

The survey's questionnaire comprised items concerning gagging frequencies in daily life situations and ORL examination. Altogether 16.9% of subjects declared occurrence of gagging while brushing teeth in the morning, 8% in the evening. Gagging occurrence while eating in general was 5.8%. 5% declared gagging with eating solid food and 2% with liquid food. 21% of subjects gagged while inserting dental prosthesis. 14.4% of subjects had experienced gagging while taking their medication.

47.2% of 360 study subjects stated former occurrence of gagging in ORL or dental examination. 13% gagged while mouth examination, 1.8% in nose examination, 38.9% in laryngoscopy and 25.2% especially while pulling and pressuring the tongue as, for example, part of rigid laryngoscopy. 16.3% reported negative experiences with gagging and 12.7% declared anxiety or stress concerning gagging while examinations.

Exact distribution of gagging frequencies can be found in the online appendix (Tables 3, 4 and 5).

The most common trigger areas for gagging were posterior pharyngeal wall (66.8%), palatal arches and uvula (52.2%), back of the tongue (34.8%), and palatum molle (21.7%).

The most common punctum maximum of gagging was the posterior pharyngeal wall (38.1%).

Gagging intensities

43.2% of 360 subjects showed clinically relevant gagging consisting of subjects with gagging intensities at gagging intensity scale from 4 to 7 points with limitation of examination parts and those scoring 8–10 points out of 10 with unfeasibility of examination parts. Table 2 demonstrates the described distributions more precisely.

Having a look at distribution of gagging intensity scales assessed by the study subjects and by the examiner the mode value was 5 in the subject's assessment and 0 in the examiner's assessment. Also, bar charts reveal subject's assessment showed a trend to higher scoring compared to the examiner's assessment, but both do not show Gaussian distribution at all (Fig. 2). However, the relationship between the examiner's and the subject's assessment of gagging intensity scales were also investigated using Spearman rank order correlation coefficient. There was a strong positive correlation between both assessments $r = 0.613$, $p < 0.001$ with high levels at both scales associated. This test was performed to make sure

Table 2 Frequency distribution of the dichotomous variable "gagging intensity group"

Gagging intensity group	Absolute frequency	Percent (%)[a]
Non-clinically relevant gagging No gagging (gagging intensity scale: 0) Normal gagging (gagging intensity scale: 1–3)	204	56.8
Clinically relevant gagging Exaggerated gagging with limitation of the examination (gagging intensity scale: 4–7) Highly exaggerated gagging with unfeasibility to examination parts (gagging intensity scale: 8–10)	155	43.2
Total	359	100

[a]Valid percentage: percentage excluding missing values (1 missing out of 360)

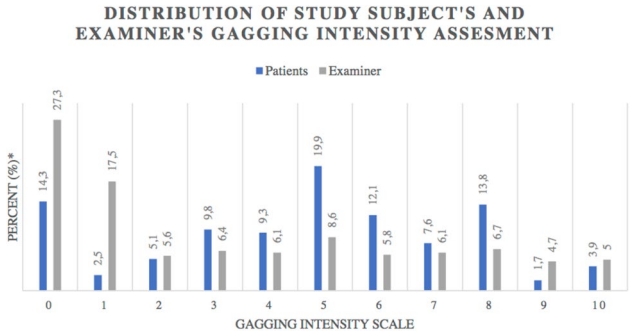

Fig. 2 Distribution of the study subject's and examiner's gagging intensity assessment (without acupressure) in the examination group B. *Percentage relates to $n = 360$ subjects within the examination group B

the assessments by the examiner and the study subject are not too divergent.

Predictors of clinically relevant exaggerated gagging while ORL examination

The results indicated clinically relevant exaggerated gagging due to anxiety or nervousness in ORL examination (OR = 2.349, $p < 0.001$), high frequency of gagging while previous examination of larynx (answer "always" OR = 10.771, $p < 0.001$), while examination of mouth as well as pharynx by an ORL practitioner (OR = 3.755, $p < 0.001$), and while pulling and pressuring the tongue (answer "always" OR = 9.852, $p < 0.001$).

Evaluation of anxiety was performed with a numeric rating scale from zero to ten. Retrospectively 0–1 point was named no or not relevant anxiety and all higher points as clear anxiety of the examination regarding distribution of answers.

Acupressure point CV-24 to control gagging in ORL examination

Altogether 175 out of 360 study subjects underwent acupressure, 155 study subjects with clinically relevant gagging and additional 20 subjects with non-clinically relevant gagging, which volunteered to explore gagging improvement even not necessary. Wilcoxon signed rank tests revealed statistical significant reduction ($p < 0.001$) in the gagging intensity scale from zero to ten in the subject's and examiner's assessment. The median value of differences between the subject's and examiner's assessment after to before acupressure was "− 1".

In the assessment, 52.6% of the study subjects declared a reduction of gagging after the acupressure, 42.9% declared no difference and eight subjects declared an increase in gagging intensity. The examiner noticed in 53.9% a reduction, in 44.9% no difference and in two subjects an increase in gagging intensity.

The rigid laryngoscopy feasibility with 70°- and 90°-directions of view laryngoscope, respectively, before and after the acupressure was recorded.

Out of 64 subjects with unfeasibility of laryngoscopy using the 70°-direction of view laryngoscope 33 could be examined after acupressure treatment. This means about 51.6% more subjects were able to receive a laryngoscopy than before. Out of 65 study subjects with unfeasibility of laryngoscopy using the 90°-direction of view laryngoscope, 24 could be examined after acupressure treatment. So, there was an increase of 36.9% in successful laryngoscopy due to acupressure.

Discussion

According to our results, gagging during ORL examination appears to be indeed a common issue in daily routine: we found 43.2% of 360 subjects showing clinically relevant gagging with the limitation of a successful ORL examination. In literature, it is rare to find reliable data on prevalence for gagging in ORL examination. During a dental examination, gagging is described to occur in 8.2% of study subjects ($n = 11\,771$) [17] or even over 50% [18]. So, gagging should receive more attention in daily practice focussing on aetiology and possible treatment to improve both examination feasibility and patients' comfort.

Predictors of clinically relevant exaggerated gagging

Among all 34 items of the questionnaire and examination protocol in the examination group B, four items revealed to be statistically significant predictors of clinically relevant exaggerated gagging after p value adjustment with the Holm–Bonferroni method. Gagging experience while previous examinations of mouth, pharynx and larynx as well as a higher level of self-reported anxiety or nervousness of the examination scenario were related to clinically relevant exaggerated gagging. Anxiety and negative experiences are already named causes of exaggerated gagging in dental literature. For example, Kramer named fear as "always the underlying factor influencing the psychological gagger" [9]. But the present results show emphasis on these psychogenic factors compared to all other somatogenic ones tested.

Future studies should perform professional psychological assessment concerning anxiety, expectations and poor experiences as predictors of exaggerated gagging while ORL examination to support our findings resulting from subjective questionnaires.

Not confirmed causing factors

In the literature, there are a lot of proposed causing factors for exaggerated gagging [2, 15]. Some of the already in the literature disproved causing factors, also failed statistical significance in our study.

Excessive alcohol consumption ($p = 0.159$) as well as smoking ($p = 0.363$) showed no statistical relation to gagging in our study group. This supports findings by Wright with a smaller sample size of only exaggerated gaggers [15].

Interestingly, chronic nasal airway obstruction ($p = 0.528$ with Chi-squared test or exact Fisher's test, respectively) and acute nasal airway obstruction ($p = 0.521$) failed as predictors, according to our data. This finding matches Dickinson and Fiske's rejection of nasal airway obstruction as a cause [2].

After review of literature concerning gagging during oral examination in dentistry, there were several statistically significant causing factors that we could not confirm for ORL examinations: For example, chronic gastrointestinal diseases and especially gastroesophageal reflux disease were identified as causing factors in the literature [19], but showed no statistical significance in our study ($p = 0.0.570$). Also, psychological or psychiatric diseases [20] showed no relation to gagging in our study subjects ($p = 1.0$). There are also a lot of hypotheses concerning differences in gagging with the genders. The common literature declares especially women more likely to gag in an exaggerated way [15]. With $p = 0.163$, we could not support such hypotheses.

With the self-assessment question "Do you gag more often with an empty stomach?", we did not confirm a hypothesis by Wright ($p = 0.445$), which says, "carbohydrate starvation, dehydration with ketosis" in the morning may lead to gagging problems in some patients, comparing it to morning sickness in pregnancy.

Efficacy of the anti-gagging acupressure point cv-24

Acupressure of anti-gagging point cv-24 revealed to be an appropriate method to reduce gagging while examination of mouth, pharynx and larynx. Not only Wilcoxon signed rank test confirmed the efficacy of acupressure of point cv-24 but also the observation that more than 50% of subjects reported a reduction of gagging as well as improvement of rigid laryngoscopy feasibility due to acupressure.

Using the 70°-laryngoscope, we observed an increase of 51.6% successful laryngoscopy examinations after acupressure and using the 90°-laryngoscope there had been an increase of 36.9%. The 70°-laryngoscope Hopkins II (8712 CA) by Karl-Storz had a diameter of 5 millimetres and the 90°-laryngoscope (8707 DA) Hopkins had a diameter of 10 millimetres. The expected higher rate of feasibility improvement by acupressure with 70°-laryngoscopes should, therefore, consider the lower diameter of these endoscopes.

Vachiramon and coworkers postulated the efficacy of acupressure point CV-24 pressured at least 5 min before and continued throughout a maxillary impression making to reduce gagging [21]. In the present study, a shorter acupressure time of 90 s before and throughout the examination was tested and seemed to be sufficient to reduce gagging while the examination resulting in time advantage in daily routine.

There are numerous scientific hypotheses of acupressure and acupuncture effects including stimulation of peripheral and central nervous system as well as reducing stress and anxiety levels [22, 23]. Rosted, for example, explained the effect of point cv-24 through stimulation of the trigeminal nerve. He described afferents from the trigeminal nuclei would result in release of serotonin and ß-endorphin in nucleus raphe magnus. And these neurotransmitters are believed to mediate the anti-gagging effects [10]. But also, the psychological process of suggestion should be considered contributing to this acupressure effect. Suggestion is named as basic factor in development and management of exaggerated gagging in the literature in general [5]. Also, the fact two or, respectively, eight study subjects showed higher gagging intensity after receiving acupressure may be an indication that complex psychological conditions may contribute to acupressure's anti-gagging effects.

Limitations of the study

One limitation of the study is especially the not-controlled and not-randomized testing of acupressure point cv-24. A randomized controlled trial should be performed to confirm the described efficacy to control among others habituation effects.

Also, the study design proved to be difficult. The several target variables and a long list of hypotheses led to multiple comparisons and a higher chance of type one errors as well as reduction of statistical power [16, 24].

Conclusion

There are three main findings of the present study. First, our data revealed a high prevalence of gagging in ORL examinations. Second, testing several possible predictors of exaggerated gagging, almost only psychogenic features showed statistical relevance. And third, acupressure of anti-gagging point CV-24, applied 90 s before and throughout the examination, showed reduction of gagging while examination and improvement of study subject's comfort as well as feasibility of examination.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Research involving human participants and/or animals This study is based on research involving human participants. This article does not contain any studies with animals performed by any of the authors.

Ethical approval All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards (Identification number of the Institutional Review Board: 167/13).

Informed consent Informed consent was obtained from all individual participants included in the study.

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