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ORIGINAL ARTICLE

Gustatory function after microlaryngoscopy

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Abstract

Conclusion. Quantitative gustatory alterations are rare after microlaryngoscopy (MLS), whereas transient qualitative taste distortions occur more often. Patients undergoing MLS should know that mild but transient qualitative taste disorders may occur. **Objective.** Suspension MLS requires neck extension and tongue compression. Little is known about taste disorders following MLS. To investigate qualitative and quantitative gustatory function after MLS we tested and questioned patients before and several weeks after the MLS. **Subjects and methods.** This was a prospective controlled study carried out in a tertiary care centre. Forty-three patients participated, 33 of whom underwent MLS and 10 septoplasty. Tongue compression time was recorded during MLS. Patients received taste evaluation before and at 1 and 14 days after the intervention. Patients were asked to indicate subjectively changed taste perceptions. **Results.** Psychophysical (quantitative) taste results showed no significant differences before and at 1 and 14 days after the intervention ($p=0.60$). Tongue compression time (MLS group) had no influence on measured post-MLS taste scores. In the MLS group four patients reported distorted taste perception the day after the MLS, whereas no patient in the septoplasty group did so. In all, four patients distorted taste perception, had disappeared after 14 days.

Keywords: *Microlaryngoscopy, suspension laryngoscopy, gustatory function, taste, dysgeusia, taste strips*

Introduction

Microlaryngoscopy (MLS) or suspension laryngoscopy is a routine procedure used for either diagnostic or therapeutic purposes. It allows direct visibility of the laryngeal structures to take biopsies or to perform resections of laryngeal pathologies. The set-up typically consists of a laryngoscope, which unfortunately results in neck extension and compression of the posterior parts of the tongue during surgery. Thus, numerous complications such as dental damage, mucosal injuries and temporary nerve lesions related to MLS have been observed [1–3]. In addition, following MLS taste dysfunction with sometimes severe consequences has been reported [4–6]. All of them are case reports and so far no prospective controlled study has been conducted to investigate the incidence of quantitative (e.g. ageusia or hypogeusia) and/or qualitative (e.g. metallic or persistent bad taste) gustatory disorders after MLS.

One particularity of the complexity of gustatory physiology is that psychophysically measurable taste deficiencies frequently go unnoticed by the patients [7]. This observation is repeatedly made after middle ear surgery. Severing the chorda tympani rarely leads to actively perceived or permanent dysgeusia or ageusia. In turn, psychophysical taste testing in these patients shows the hypogeusia or ageusia to persist for years after the surgery on the operated side [8]. Thus, the fact that patients do not complain of taste alterations after MLS does not mean that there might not be a measurable hypogeusia. Accordingly, studies based on the patients' self-reports of taste sensations [1,9] are difficult to interpret.

The goal of the present study was to investigate the incidence and reversibility of qualitative and/or quantitative taste disorders in a group of patients undergoing MLS. In parallel, a group of patients undergoing septoplasty under general anaesthesia

(undergoing only oral intubation without oral surgery) served as a control group.

Subjects and methods

Patients and intervention

In the Otolaryngology Department of the University Hospital of Geneva a total of 43 patients participated, 33 of whom underwent MLS and 10 septoplasty under general anaesthesia. Mean age in the MLS group (22 men and 11 women) was 54.2 ± 2 years and 34.2 ± 3 years in the septoplasty group (7 men and 3 women). The subjects' age was significantly different between groups ($t=4.6$; $p < 0.001$), while this was not the case for gender distribution (χ^2 test, $p=0.8$). All experimental procedures were explained and demonstrated in full and all subjects provided informed consent. The study was conducted according to the Declaration of Helsinki on Biomedical Research Involving Human Subjects. The study, which was undertaken as part of a quality assurance programme, was approved by the institutional review board. Patients underwent a structured interview including drug intake and previous ear, nose or throat surgery. Previous ear surgery as well as medication known to significantly influence taste were exclusion criteria. All patients were further examined by trained otorhinolaryngologists (R.G., B.N.L.).

Patients scheduled for septoplasty had chronic nasal obstruction for several years with pronounced septal deviation. Previous long-term intranasal topical corticoid treatment did not improve the nasal obstruction. MLS patients had various disorders; most of these patients had vocal cord polyps or nodules ($n=18$) or malignant laryngeal lesions ($n=11$) requiring a biopsy before definitive therapy. Further disorders were Reinke space oedema ($n=3$) and a vocal cord cyst ($n=1$). MLS procedures were done with a Weerda laryngoscope with either jet ventilation or orotracheal intubation. The stabilizing arm was used in all cases and cricoid cartilage counterpressure was necessary in only a few cases for better laryngeal exposure. All biopsies and the majority of the remaining MLS procedures were performed with cold steel instruments. During the MLS, duration of tongue compression was recorded.

Taste strips and questionnaire

Patients were tested on the day before and on day 1 and 14 after completed MLS. In parallel with the psychophysical testing, patients were requested to indicate whether they currently experienced distorted (e.g. metallic) or lowered taste perception.

Taste testing was performed by means of 'taste strips', a technique previously described by Mueller et al. [10]. This test is based on filter-paper strips impregnated with the four basic taste qualities – sweet, bitter, salty and sour (for further details see Mueller et al. [10]). Umami was not tested. One hour before testing, subjects were asked not to eat or drink anything except water. All patients were familiarized with the four tastes before the testing procedure. Testing started with the lowest concentrations. The taste strips were presented in increasing concentrations in a randomized order to each side of the anterior portion of the tongue. We modified the testing procedure described by Mueller et al. [10] by using a forced choice paradigm. Consequently, the subjects' task was to identify the taste from a list of four descriptors (sour, sweet, salty or bitter). Subjects had to extend the tongue with the taste strip on it until they had made their decision by pointing to the respective descriptor. Then they rinsed their mouth with tap water. Sixteen taste strips were presented to each side. The taste score was the number of correctly identified taste strips. Taste scores of eight or more per side were considered normal in the initial study [10].

Statistical analysis

Results were analysed using SPSS 12 for Windows™ (SPSS Inc., Chicago, IL, USA). Descriptive statistics are presented as means and standard errors of the mean (SEM). Analyses of variance (repeated measures-ANOVA) were used to investigate differences in taste strip scores between groups of patients (septoplasty group and MLS group; between-subject factor 'intervention group') before and after the intervention (before, and 1 and 14 days, after the intervention; within subject factor 'day'). Student t tests for independent samples and Spearman correlations were employed for the investigation of MLS time on the taste strip score. For the investigation of differences in taste strip scores between groups a t test for unpaired samples was used. The alpha level was set at 0.05.

Results

The mean preoperative taste strip score in the MLS group was 17.6 ± 0.8 ; in the septoplasty group this score was 24.6 ± 1.1 . This difference between groups was statistically significant ($t=4.05$; $p < 0.001$; Figure 1). During follow-up taste testing (1 and 14 days after the intervention) the difference between both groups remained constant.

Before MLS, the average taste strip score was 17.6 ± 0.8 ; it dropped to 16.8 ± 0.8 at 1 day after

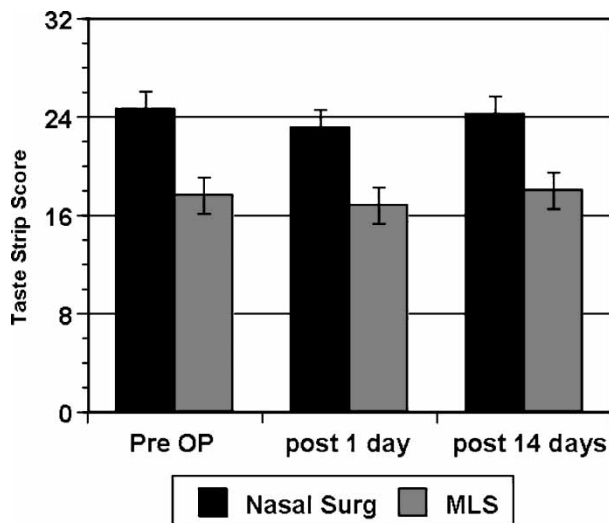


Figure 1. Taste strip scores before septoplasty or MLS at follow-up investigations 1 and 14 days after surgery. Patients undergoing septoplasty had significantly better preoperative gustatory functions. The non-significant decrease of the taste strip score at the day after the intervention was temporary.

surgery and increased to 18.0 ± 0.9 after 14 days. Before septoplasty, the taste strip score was 24.6 ± 1.1 , which dropped to 23.1 ± 0.9 after 1 day and increased to 24.2 ± 0.7 after 14 days (Figure 1). These changes were not statistically significant ('intervention group' * 'day': $F=0.25$; $p=0.6$).

The mean MLS time was 37 ± 4 min, ranging from 3 to 105 min. Of four patients complaining of a postoperative qualitative taste disorder, three had an MLS duration above average. These patients had MLS times of 27, 40, 53 and 60 min, respectively. However, the mean MLS duration for these four patients with postoperative dysgeusia was not significantly different from the mean of the remainder of the patients ($t=0.7$; $p=0.4$).

No significant correlation was found between tongue compression time and the taste strip score 1 day after the MLS ($r_{33} = -0.07$; $p=0.69$; Figure 2). Further splitting the group into patients who underwent 'long MLS' (>30 min; $n=19$, mean change: -0.97 ± 0.42) and those who underwent 'short MLS' (<30 min; $n=14$, mean change: -0.67 ± 0.38) also did not reveal significant differences in taste strip score ($t=0.3$; $p=0.75$).

In the MLS group, four patients reported altered taste sensation 1 day after surgery. Two patients experienced lowered taste sensation and two patients had permanent metallic or bitter taste sensations. The taste strip scores in these four patients were 19.5 ± 1.2 before and 20.25 ± 1.4 ($p=0.5$) after the MLS. No patient in the septoplasty group experienced changes in their sense of taste. In the four patients from the MLS group taste perception had already returned to normal 14 days after surgery.

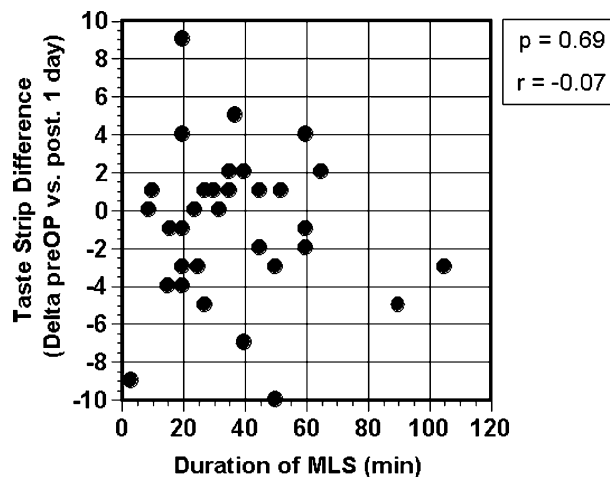


Figure 2. Correlation between the time of tongue compression and changes of the taste strip score between preoperative and postoperative day 1 of MLS on the day after MLS.

Before MLS, 13 (39%) subjects had a taste score <16 correct answers (compatible with an altered quantitative taste function) and 20 subjects (61%) scored >16 (compatible with a normal quantitative taste function). After MLS, the frequency of normal and altered quantitative taste function remained unchanged (10 subjects scoring <16 and 23 subjects scoring >16).

Discussion

The main outcomes of this study are that quantitative taste disorders (ageusia or hypogeusia) occur very rarely after MLS and that occurrence of ageusia/hypogeusia is not increased after MLS. In contrast, qualitative taste disorders (dysgeusia, metallic taste) appear to occur more frequently. These qualitative taste disorders are mostly transient and disappear after a few weeks. Furthermore, qualitative taste disorders occur without being accompanied by quantitative taste disorders.

Finally, MLS time does not influence either the incidence of quantitative gustatory changes or that of qualitative taste distortions.

Apart from numerous case reports on long-lasting taste disorders after almost every oral procedure (e.g. tooth extraction [11] or uvulopalatopharyngoplasty [12], MLS [4–6]) or even intubation, only a few studies have systematically investigated the occurrence of taste disorders after MLS [1,9,13]. With one exception [13], these studies have not measured taste function, but solely asked the patients whether they experienced taste dysfunctions [1,3,9]. Patients' subjective reports reflect the qualitative taste disorders but barely correlate with the quantitative gustatory function. Subjective complaints are thus unreliable to judge quantitative taste function. This

is well known from experiences after middle ear surgery where even severing of the chorda tympani, and consequently ipsilateral hemiageusia of the tongue, frequently goes unrecognized by the patients [7,8].

Taste physiology has the particularity that selective loss of nerves supplying a distinct area of either the tongue or palatal surface are centrally compensated (for details see Lehman et al. [7]). Therefore, measurable quantitative gustatory deficits (e.g. hemiageusia) often remain unnoticed by the patients [7,14]. Quantitative and qualitative taste disorders can occur simultaneously or independently and they might be recognized or not by the patients. Thus, the simple fact that a patient does not complain of lost or lowered taste function after surgery does not mean that such taste dysfunction is not present. Medico-legally, measuring, rather than simply asking patients about the taste function is therefore mandatory to confirm that no taste damage has been caused by a surgical procedure.

Previous studies [1,3,9] and case reports [2,4–6] found transient qualitative taste disorders (dysgeusia, parageusia, metallic taste) to occur in approximately 10% of MLS patients. The authors speculated that these transient taste disorders were due to tongue compression.

However, based on case reports [6] and anatomical studies [15] there were reasons to believe that even quantitative changes of gustatory function may occur more frequently after MLS than is usually assumed. Michel and Brusis [15] seemed to confirm this idea, identifying the MLS procedure, and especially neck extension to considerably stretch the lingual, glossopharyngeal, and even the hypoglossal nerve in certain cases. Their findings might also explain why sometimes even orotracheal intubation has been claimed to cause cranial nerve injuries (e.g. hypoglossus or lingual nerve paresis) [2,16].

In contrast to what we expected, no quantitative gustatory loss or alteration could be observed. Although this is a negative result, it has medicolegal value for otolaryngologists. This seems also to confirm the findings of Tomofuji et al. [13]. Measuring taste by electrogustometry after MLS they did not find any major quantitative impairments of taste. In accordance with the studies mentioned above our findings seem to confirm that qualitative gustatory disorders, such as metallic or bad taste, occur in approximately 10% of the patients and disappear within a few weeks.

The present study is based on a small sample size. However, compared with the previous data on MLS and gustatory function the patients were investigated more thoroughly, as the present study included extensive chemical taste tests. Nevertheless, our study has some shortcomings in that MLS patients

had significantly lower baseline taste scores compared with patients from the septoplasty group. As participants were stratified according to the subjects' sex we mainly identify two reasons for this difference. First, MLS patients were significantly older than patients receiving septoplasty. Second, within the MLS group, almost half of the subjects had pathologies related to chronic tobacco consumption (suspect lesions and Reinke oedema). Both smoking and higher age have been shown to decrease gustatory function [17,18]. However, the question addressed was whether the procedure (MLS) itself induces significant changes in quantitative taste function. The interest was thus focused on taste changes and not on absolute values. The literature shows that intubation without oral surgery also possibly causes taste disorders. Therefore it was required to monitor taste changes before and after intubation without oral surgery (e.g. septoplasty) to exclude simple intubation effects.

In conclusion, quantitative loss of gustatory function seems to be rare after MLS, in contrast to transient qualitative taste disorders, which occur in approximately 10% of the cases. Patients undergoing MLS might be informed of these transient taste distortions.

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