

Intranasal trigeminal sensitivity may be impaired after functional nasal surgery*

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To the Editor:

Functional nasal surgery is frequently performed for sinonasal diseases not responding to medical treatment. Although surgery mostly turns out to be successful in such cases, a potential side effect of manipulating the nasal mucous membrane is impairment of intranasal trigeminal function. Not well known by specialists and clinically scarcely explored, this function provides sensory information from the nasal mucosa. It is responsible for the afferent part of protective nasal reflexes such as sneezing and coughing, but also provides the feeling of nasal airflow⁽¹⁾. Recent work suggests that patients with low intranasal trigeminal function are more prone to suffer from nasal obstruction and may be less satisfied with functional surgery⁽²⁻⁶⁾. It has been suggested that intranasal trigeminal function decreases with mucosal changes, such as chronic inflammation and improves again once the inflammation has been treated⁽³⁾. However, the influence of functional nasal surgery (i.e. surgery aimed at the improvement of nasal function) with consecutive mucosal micro-injuries on intranasal trigeminal function is not yet fully clear⁽²⁻⁴⁾.

We included 32 consecutive newly admitted patients attending the smell and taste outpatient clinic for olfactory complaints. Only those where the underlying cause of the olfactory complaint was identified to be sinonasal (i.e., chronic rhinosinusitis, olfactory cleft congestion, septal deviation, nasal mucosa hypertrophy) were included in the present analysis. Other causes of olfactory complaints such as post-viral, posttraumatic, or idiopathic were excluded. The current study cohort consists of a subset of patients that were included in an analysis that was published in 2020⁽⁷⁾. Within the included 32 patients, we set out to compare intranasal trigeminal sensitivity in those who had undergone previous nasal surgery versus those who never had surgery.

We identified 13 patients (6 women, mean age of 32 ± 17 ; 7 men, mean age of 36 ± 13) who had previously undergone nasal surgery and 19 who never had nasal surgery (8 women, mean age of 36 ± 17 ; 11 men, mean age of 39 ± 10). Specifically, the nasal surgeries performed were endoscopic septal (n=6), polypectomy (n=3), functional endoscopic sinus surgery (n=5) and turbinal interventions (n=13) including turbinoplasty (n=5), turbinectomy (n=5) and cauterization (n=3). In a surgery, more than one intervention could be combined. We assessed the sensitivity of the intranasal trigeminal system by means of the trigeminal lateralization task (TLT) using eucalyptol as a stimulus, according to methods described previously⁽⁸⁾. The measurements of trigeminal sensitivity were performed between 1 and 30 years postoperatively (1 year, n=4; 4 years, n=2; 6 years, n=2; 10 years and more, n=5; there was no correlation between time since surgery and trigeminal sensitivity). There was no difference in olfactory scores between groups.

For the analysis, we calculated the sensitivity index (d' ; Signal Detection Theory⁽⁹⁾) for TLT scores based on hits and false alarms for each patient. We then performed a Mann-Whitney test to examine a potential group difference for this measure.

Patients who had undergone nasal surgery exhibited a mean d' of 1.73 ± 0.30 (SD), while those without previous surgery had an average score of 2.40 ± 0.26 . The Mann-Whitney test showed a trend towards a group difference ($U=73,5$; $p=0.055$).

These data suggest that trigeminal sensitivity tends to be weaker in patients who have undergone any kind of functional nasal surgery. Unfortunately, due to the limited sample size, we were unable to detect a difference that is statistically significant with the usual threshold; nevertheless, the trend has an effect size (r) of 0.34 suggesting that functional nasal surgery may impair trigeminal sensitivity. Our results point towards a potentially important issue for all clinicians performing functional surgery.

They should be aware that even limited endoscopic surgery may influence the trigeminal sensitivity. A decrease of this chemical sense can have consequences in the form of a lower perception of sensation to certain stimuli (warmth, burning, cooling, tickling, or stinging) as well as causing the subjective sensation of nasal obstruction.

The present results contrast with previous reports on the impact of nasal surgery on trigeminal function that showed no major changes in patients after surgery compared to a control group^(2,3). There are some differences between the previous reports and our data. Unlike previous studies, both our groups are not made up of healthy subjects, but of patients, operated vs. non-operated, which had in common that they were suffering from impaired olfactory function related to a nasal cause. Earlier studies evaluated trigeminal sensitivity by assessing detection threshold of (a) nasal CO₂, (b) nasal electrical stimuli, and (c) intranasal pain thresholds^(2,3). These methods may be less representative for airflow perception and have been used very scarcely in contrast to TLT, the currently most used measurement tool for intranasal trigeminal function. TLT assesses sensitivity towards eucalyptol, a known agonist of the trigeminal TRM8 receptor, that is also activated by cool temperature. Sensitivity towards eucalyptol and similar substances may better reflect the perception of nasal airflow.

The primary limitation of our hypothesis-generating study is the limited size of our group due to the retrospective cross-sectional character of the study. Therefore, a prospective study with larger samples should allow for conclusive results. A second limitation of our study is the heterogeneous nature of surgical procedures performed in patients who already had nasal surgery. A prospective study should consider the different nasal interventions realized to evaluate the type of intervention and its influence on the trigeminal sensitivity. A third limitation is the absence of subjective and objective scores of nasal patency, in the two groups of patients. Validated patient rated outcome measures

(PROMs) such as the Nasal Obstruction Symptom Evaluation (NOSE) were not included in the standard preoperative workup in our institution. However, the relation between a subjective sensation of nasal obstruction and a lower trigeminal sensitivity is well known in the literature⁽⁶⁾. In future studies it would be advisable to collect subjective as well as objective trigeminal measurements to confirm this correlation.

This pilot data suggests that the hypothesis of a causal link between impaired airflow perception and nasal surgery merits further, more prospective investigation.

Authorship contribution

Conception or design of the work (all authors); data acquisition (FJMB, BNL), data analysis (CMB, JF), drafting work (all authors), final approval (all authors).

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Ethics approval and consent to participate

No approval or consent needed.

Consent for publication

Not applicable.

Availability of data and materials

On request, all data and study protocol can be made available.

Conflict of interest

The authors declare no conflict of interest.

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