ORIGINAL STUDY

Quality of life in terms of olfactory dysfunction in patients with nasal polyposis before and after endoscopic sinus surgery

Iuliu Vlad Catana[1], Doinel Gheorghe Radeanu[1,2], Alma Maniu[1,2], Marcel Cosgarea[1,2]

[1]ENT Department, County Emergency Hospital, Cluj-Napoca, Romania

[2]"Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

ABSTRACT

OBJECTIVE. To investigate the impact of olfactory impairment on quality of life in patients with nasal polyposis before and after endoscopic sinus surgery.

MATERIAL AND METHODS. A total of 35 patients with olfactory impairment due to "de novo" nasal polyposis were selected to undergo endoscopic sinus surgery. They were assessed based upon the short version of the QOD questionnaire (Questionnaire for Olfactory Dysfunction), which uses the life quality statements score (LQ). All subjects were tested with "Sniffin' Sticks" for odor identification (OI) and odor threshold (OT) before and 6 months after surgery.

RESULTS. Statistically significant improvements were found in the LQ scores alone or correlated with OI and OT scores after ESS.

CONCLUSION. According to LQ scores, we highlighted an improved quality of life in patients with nasal polyposis and olfactory dysfunction undergoing endoscopic sinus surgery.

KEYWORDS: questionnaire of olfactory disorders (QOD), olfactory dysfunction, nasal polyposis, Sniffin' Sticks.

INTRODUCTION

Olfactory impairment is a frequent and well-documented symptom in patients with chronic rhinosinusitis (CRS) and nasal polyposis (NP)[1]. Olfactory loss can have an important and significant impact on quality of life (QoL) for these patients[2]. In CRS with NP, the inflammation and thickening of nasal mucosa produce an obstruction of the airways with a diminishing ortho and retronasal airflow to the olfactory neuroepithelium[3]. A new developed and validated questionnaire of olfactory disorders (QOD), showing the impact of olfactory dysfunction on quality of life, was used for the subjective assessment[4,5].

The sinus surgery is often used if medical treatment fails to improve the symptoms in these patients. Many studies showed documented advantages of endoscopic sinus surgery (ESS) on the olfactory function, but these data were the result of the subjective olfactory assessment before and after surgical treatment[6,7]. In all cases, the olfactory assessment was done with the well-validated chemosensory nasal test called "Sniffin' Sticks" for odor identification (OI) and odor threshold (OT)[8,9]. For this study, the OI Romanian adapted version was used[10].

The aim of this study was to investigate the relationship between change in OI and OT scores and change in LQ score of QOD before and after ESS in CRS. The hypothesis was that postoperative improvement of OT, but especially OI, significantly correlates with improvement of QoL.

MATERIAL AND METHODS

The objective of this prospective study was to evaluate the impact of olfactory impairment on quality of life in patients with CRS and NP without previous ESS. The study was approved by the Medical Ethics Committee of "Iuliu Hatieganu" University of Medicine and Pharmacy Cluj-Napoca. The patients were informed regarding the study and a written consent was obtained for all the procedures. All investigating pro-

Corresponding author: Catana Iuliu Vlad, MD,
email: orl.iuliucatana@gmail.com

tocols were performed in accordance with the principles of the Declaration of Helsinki/Hong Kong.

Patients

A total of 35 patients (15 females and 20 males) in the age range 22-71 years (mean = 45.97, SD = 12.897) were included in the study.

Inclusion criteria: CRS and "de novo" NP (defined by EPOS 2012) with subjective olfactory impairment and without previous endoscopic sinus surgery. All patients underwent an initial medical treatment with corticosteroids, without significant improvement in symptoms.

Exclusion criteria: Congenital anomalies (primary ciliary dyskinesia, cystic fibrosis), sinus malignant/benign tumor, radiation therapy to the head and neck, upper respiratory tract infections (URTI) in the past or other olfactory disorders such as neurological pathology, head trauma and primary/secondary immune deficiency, asthma and pregnancy.

The patients underwent a complete ENT examination, which consisted in nasal endoscopy (2.7 – 4.0 mm diameter rigid endoscopes) and cranio-facial CT scans. In all patients, the same endoscopic sinus surgery technique (ESS) described by Stammberger and Kennedy was performed[11,12].

The postoperative care included nasal isotonic saline solution for cleaning the nasal crusts and topical corticosteroid treatment[13].

Patients completed the QOD questionnaire 1 day before endoscopic sinus surgery and 180 days after the surgery.

Olfactory testing

The olfactory status of each patient was tested objectively using the odor identification (OI) and odor threshold (OT) from the "Sniffin' Sticks" test applied bilaterally.

The OT test contains 48 sticks and was performed with n-butanol using a single-staircase, triple-forced choice procedure[9]. The OI test consists in 16 sticks with different odorants and it is a multiple choice procedure[9,10,14].

Table 1
Examples of life quality statements of QOD.

LQ statements	*"Negative"*
4	From waking up until bedtime, I am aware of my difficulties with smelling.
13	I am worried if I will ever be able to handle this problem.
	"Positive"
32	I can imagine adjusting to my difficulties with smelling.

Evaluating the Quality of Life

The study used the "life quality statements" from QOD that express the patients' complaints related to the smelling difficulties. There are in total nineteen life quality statements: seventeen statements with 3 points assigned for checking the box "agree", 2 points for "agree partly", 1 point for "disagree partly" and 0 points for "disagree" and two positive statements with 0 points by checking the box "agree", 1 point "partly agree", 2 points "partly disagree" and 3 points "disagree" (Table 1).

The sum of the scores is the Life Quality raw score (LQrv): a maximum of 57 points can be reached. LQrv is transformed into the Life Quality score (LQ) with the formula: LQ=LQrv*0.57 [%]. A higher score denotes a strong impairment[4].

The questionnaire of olfactory disorders (QOD) was used after the cross-cultural adaptation process using the standard technique[15,16].

Statistical analyses

Results were analyzed using SPSS 18.0 for Windows (SPSS Inc., Chicago, IL, USA).

All tests were two-tailed and statistical significance was accepted at $p < .05$ levels.

RESULTS

A total of 35 patients underwent endoscopic sinus surgery for CRS with NP. It should be noted that all patients had an impaired olfactory function before surgery.

The LQ score values showed an important improvement (26.0 *vs.* 8.7) after ESS compared to the initial assessment; the same results were highlighted for OI values (1.8 *vs.* 11.9) and OT values (0.0 *vs.* 7.3) (Table 2). The preoperative value of OT is "0" because none of the patients were able to identify even the highest n-butanol concentration.

Table 2
Univariate statistics

6		Mean	N	Std. Deviation	S,E,Mean
Pair 1	LQpre	26.0	35	4.0	0.669
	LQpost	8.7	35	5.7	0.959
Pair 2	OIpreop	1.8	35	1.5	0.250
	OIpostop	11.9	35	2.8	0.466
Pair 3	OTpreop	0.0	35	0.0	0.000
	OTpostop	7.3	35	2.8	0.467

Table 3
Paired sample t-test

	Paired Differences							
			Std. Error	95% CI of the Difference				Sig.
Pairs	Mean	Std. Deviation	Mean	Upper	Lower	t	Df	(2-tailed)
LQpre Lqpost	17.3	5.9	0.996	15.280	19.327	17.380	34	0.000
OIpreop / OIpostop	-10.1	2.2	0.367	-10.889	-9.397	-27.637	34	0.000
OTpreop / OTpostop	-7.3	2.8	0.467	-8.271	-6.371	-15.661	34	0.000

The *t-test* for sample pairs showed that there is a valid statistical difference between the QOL (LQ score), OI and OT scores pre- and postsurgical treatment assessment (Table 3).

We performed a regression analysis with three linear components, where the dependent variable was represented by all pre- and postoperative differences of LQ, OI and OT assessed values (Table 4).

1. OI score value parameters differences were used for appropriate evaluation of patients' quality of life before and after ESS; therefore, the bigger differences of OI values, the higher differences in perceived quality of life. Each increase of one point difference for OI brings a decrease in LQ score of a 1.31 points average. Right regression explains 45.7% of the variation in quality of life differences. This shows that the improvement of OI score had an important impact on patients' quality of life.

2. The differences between pre- and postoperative OI scores are significantly influenced by age and quality of life. The relationship between OI and age is inversely proportional. OI score differences are smaller with the increasing age. Each additional year for postponing sinus surgery leads to a decrease in OI score with a difference of 14 points. The causal relationship between LQ and OI scores is probably linked to the correlated difference between OI and LQ scores, therefore we chose to use the relationship in the opposite direction to keep the difference of perceived quality of life, to see the impact of age on the variation of OI value and to ensure that the subjective dimension for the quality of life does not interfere with the results. Linear relationship analysis explains 51.1% of the variation differences of OI. As a conclusion, the impact of age on differences in OI is high.

3. Differences in OT scores were significantly determined by age. We introduced the relationship and differences in quality of life to exclude subjective factors; therefore, 73.7% of the OT value variation differences were determined by age. Each year brings a decrease of 0.18 points for the OT value.

Table 4
Linear regression

	Pre- and post operatory differences					
	LQ		OI		OT	
Variables	b	β	b	β	b	β
(Constant)	-12,59		10,88**		16,01**	
	(12.13)		(2.00)		(1.86)	
Sex	-1.25	-0.11	-0.72	-0.17	0.70	0.13
	(1.74)		(0.58)		(0.54)	
Age	0.16	0.34	-0.07	-0.41*	-0.18**	-0.85**
	(0.13)		(0.03)		(0.02)	
Quality Life			-0.16	0.44**	0.04	0.09
differences	-	-	(0.06)		(0.5)	
OI differences	-1.31**	-0.48**	-	-	-	-
	(0.46)					
OT differences	0.29	0.14	-	-	-	-
	(.0.56)					
R^2	.457		.511		.737	

** p<=0.010 * p<= 0.010

DISCUSSIONS

The loss of chemical senses of different etiology can produce a negative impact on QoL[17]. This prospective study shows that patients with CRS and NP have an impaired olfactory function with an important impact on the QoL before and 6 months after ESS. The olfactory function can be improved by ESS[6].

In several studies, the olfactory function was assessed at few weeks to 1 year follow-ups, with a proven effect on olfaction after sinus surgery[18-21]. For patients with nasal polyps, Lund-Kennedy endoscopic scores and the quality of life scores were assessed 2 weeks and 6 months after ESS, with a moderate correlation between them (r <0.50)[22].

Toros et al. evaluated in their study performed on 86 patients diagnosed with NP the endoscopic scores and VAS scores preoperatively and 12 months after surgery; they have shown a significant correlation between the two variables pre- ($r = 0.48$, $p < 0.001$) and postoperatively ($r = 0.63$, $p < 0.001$)[23]. At the same time, a significant improvement in the quality of life of patients with olfactory dysfunction after EES ($r = 0.63$, $p < 0.001$) was seen in a group of 77 patients with chronic rhinosinusitis without nasal polyps. Although the outcomes of these two studies are similar, we should not forget that there are few pathological implications that could make a difference, namely the absence of nasal polyposis in the second group. Also, the authors of these studies have not used an extensive and validated questionnaire to assess the quality of life in all patients.

Another study performed by Birch et al. used a validated questionnaire to assess the quality of life in 53 patients with chronic rhinosinusitis without nasal polyps and olfactory dysfunction; they reported an improvement of the quality of life in all the investigated patients[24]. However, the small number of subjects included in the study and the exclusion of associated nasal polyposis may not include them in the group of those who can provide relevant information.

Our results show a significant improvement of the LQ scores after ESS in patients with olfactory disorders caused by nasal polyposis, evidenced by increased OI and OT scores. Differences between pre- and postoperative scores for OI and OT are also significantly influenced by age and quality of life; age-related relational analysis concluded that age differences have a major impact on OI and OT scores.

CONCLUSIONS

Although our findings are based on relevant statistical data and provide valuable information on the quality of life in terms of olfactory dysfunction in patients with nasal polyps receiving EES, additional studies are needed to increase the validity of the questionnaire that assesses LQ in these patients.

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