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Effect of endoscopic sinus surgery on quality of life among the patients of chronic rhinosinusitis with nasal polyposis

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Abstract

Background Quality of life (QoL) tests are usually used to assess the response to different therapies. They are the tools that best reflect the patients' complaints, the severity of their pathology, and the post-therapeutic gains.

The aim of the present study is to assess the effect of endoscopic sinus surgery (ESS) on quality of life (QoL) among the patients of chronic rhinosinusitis with nasal polyposis (CRSwNP), using the Sino-Nasal Outcome Test 22 items (SNOT-22).

Methods This is a prospective, descriptive, and monocentric study involving all the patients who underwent surgery for CRS with nasal polyposis at Bejaia University Hospital over a period of 36 months, from January 1st, 2017, to December 31st, 2019.

A SNOT-22 test was completed item by item with our patients, before any surgery, and after endoscopic sinus surgery at 1 month, 3 months, 6 months, 9 months, and 12 months.

Results Sixty-five patients, having undergone ESS for CRS with nasal polyposis, were followed during a period 12 months. The average age of our patients was 42.06 ± 12.47 years, with 41.5% females and 58.5% males.

Clinical examination showed that impairment was bilateral in 100% of our patients, while the nasal endoscopy showed that the polyps reached stage III in 87.7% of the cases on the right and 80% on the left. The mean Lund-Mackay CT score was 18.71 ± 4.77/24.

All of the patients were treated with local and general short courses of corticosteroid therapy before ESS was indicated.

Our results showed improvement in the QoL of our patients and maintenance of this gain after surgery. The average total SNOT-22 score for them was 49.41 ± 17.12 pre-operatively; post-operatively it was 12.14 ± 10.22 after 1 month; 10.31 ± 8.17 after 3 months; 9.35 ± 8.93 after 6 months; 12.21 ± 15.45 after 9 months and 12.63 ± 16.23 after 12 months.

Conclusion ESS is the gold standard in the treatment of chronic rhinosinusitis with nasal polyposis after failure of medical therapy.

The use of SNOT-22 test enabled us to confirm that whatever the surgical procedure applied, the QoL improves after surgery.

Keywords CRSwNP, Endoscopic sinus surgery, Quality of life, SNOT-22

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Background

Chronic rhinosinusitis (CRS) is one of the most common diseases in the world, affecting approximately 14% of people in the USA [1]. It is defined as chronic inflammation of nasal and sinus cavities lasting longer than 12 weeks, it can be with or without nasal polyposis (CRSwNP or CRSsNP), primary and secondary, localized or diffuse disease regarding anatomic distribution, either type 2 or non-type 2, considering the endotype dominance, eCRS, and non-eCRS for eosinophilic and non-eosinophilic CRS [2].

CRSwNP may be isolated or associated with other comorbidities such as atopy, bronchial asthma, Acetylsalicylic acid exacerbated respiratory disease (Samter's disease), and Aspirin intolerance [2, 3].

CRSwNP is characterized by multifocal, bilateral oedematous degeneration of the mucosa of the ethmoid sinus, clinically manifested by the development of polyps in the nasal cavity [3, 4].

Its physiopathology remains poorly elucidated, and several studies and theories have tried, and continue to try, to explain it. That is why treatment's objectives are not to cure this pathology, but rather to improve patients' functional symptoms [3].

The accepted treatment for CRSwNP is primarily medical, based on topical corticosteroids, interspersed with short courses of systemic corticoids [2, 3].

Several surgical procedures have been used over the years in CRSwNP, such as polypectomy, functional endoscopic sinus surgery, or nasalization. However, surgery should only be chosen after the failure of medical treatment [5, 6].

To assess the response to different therapies, several tools are available, such as endoscopic scores, CT-scanner scores. But, QoL tests, are best reflecting the patient's complaints, the severity of their disease, and the post-treatment gain [7]. The SNOT-22 is the most suitable and specific tool in rhinologic pathologies, and the most widely used worldwide, due to its easy use and interpretation [8].

The aim of the present study is to assess the effect of endoscopic sinus surgery (ESS) on quality of life (QoL) among the patients of chronic rhinosinusitis with nasal polyposis (CRSwNP), using the Sino-Nasal Outcome Test 22 items (SNOT-22), at the University Hospital of Bejaia in Algeria.

Methods

This study was conducted in the ENT Department of Bejaia University Hospital in Algeria. This study lasted 36 months and was conducted between January 1st, 2017, and December 31st, 2019.

During the 36 months of our study, 75 patients undergoing endoscopic sinus surgery for CRSwNP were recruited. Sixty-five patients were retained for the study due to the 12-month follow-up period required for the application of our post-operative follow-up and evaluation protocol.

All patients consulting for CRSwNP at the University Hospital of Bejaia and treated surgically during the study period were included in the study.

Our exclusion criteria were

Patients consulting for rhinologic disorders, other than CRSwNP, to stay within the aim of our study.

Patients who had already undergone endoscopic or external sinus surgery for CRSwNP, except for polypectomy, have a homogeneous population.

Operated patients who have not reached 12 months of post-operative follow-up are necessary for our study.

This is a prospective, descriptive cohort study, monocentric, involving all patients consulting at the University Hospital of Bejaia for CRS with nasal polyposis, and undergoing surgery, from January 1st, 2017 to December 31st, 2019.

A standardized questionnaire was established, and the values obtained from the interrogation, clinical examination, paraclinical examination, and treatments were either coded according to a binary mode (yes or no) or presented as tick boxes or scores to be attributed.

All statistical analyses were performed using the Epi-Info version 3.5.3 software from the Center for Disease Control and Prevention (CDC) in Atlanta, USA. Measurement data or quantitative variables (such as scores on Lund–Mackay and SNOT-22) are presented as mean ± SD. Enumeration data or qualitative variables (such as medical and surgical history) are presented as *N* (%), and Fisher's exact test or the chi-squared test was used. A value of $P < 0.05$ was considered to be statistically significant.

In this study, our protocol consisted of four stages:

The first stage is the diagnosis stage, which allows a positive diagnosis of CRS with nasal polyposis and the recruitment of patients for this study (Fig. 1). The diagnosis was clinically confirmed by a nasal and sinus CT scan, which was systematic.

The second stage is the stage of registration of the patient on the surgical program and the completion of the technical form and the pre-operative quality of life test SNOT-22.

The third stage was the surgical intervention itself, where the endoscopic sinus surgery was performed.

Before considering surgical treatment, all our patients were treated with long-term local and short courses of general corticosteroids with Prednisolone 1 mg per

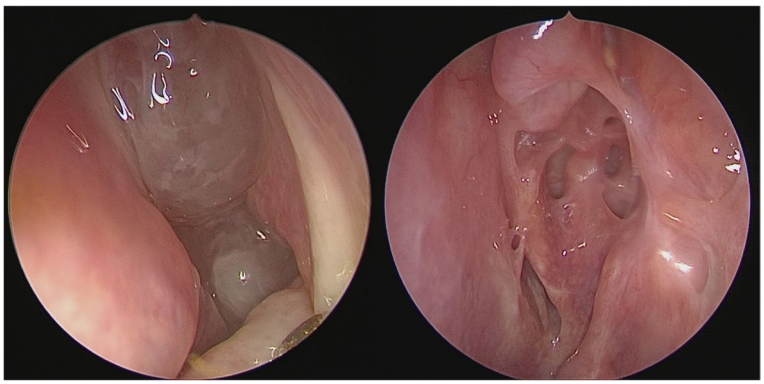

Fig. 1 Preoperative and 12-month post-operative aspects

kilogram per day, for 10 days at most. After the declaration of resistance, dependence, intolerance, or contraindication to corticosteroid therapy, the surgery was proposed in the form of functional endoscopic sinus surgery (FESS) or a nasalization procedure for patients with comorbidities.

In both FESS and nasalization, we performed, middle meatotomy, anterior and posterior ethmoidectomy, with or without sphenoidotomy, and frontal procedure. In nasalization, we added partial middle turbinectomy and removed all the mucosa.

The fourth and last stage, which was the longest, was the patient follow-up stage and regular check-ups at 1 month, 3 months, 6 months, 9 months, and 12 months post-operatively (Fig. 1). During this stage, patients were clinically monitored, their treatments were renewed, and the SNOT-22 quality of life test was filled in.

Results

Of the 65 patients included in this study, the average age of our patients was 42.06 ± 12.47 years. The majority of our patients were young adults, with more than half of them aged between 30 and 50 years.

The male sex was the most represented with 38 (58.5%) males and 27 (41.5%) females, and the sex ratio was 1.41 ($t = 0.677$, $P > 0.05$).

Out of the 65 patients in our series, 41 (63.1%) had a medical history of asthma, Samter's disease, aspirin intolerance, or respiratory allergy (Table 1). A history of rhinologic surgery was present in 14 (21.5%) patients, such as septoplasty or polypectomy (Table 1). A family history was found in 20 (30.8%) patients, with CRSwNP and/or atopy (Table 1).

On anterior rhinoscopy at the time of our clinical examination, all our patients had bilateral CRS with nasal

Table 1 Patient characteristics

Parameters		Means ± SD/number (%)
Age		42.06 ± 12.47 ans
Gender	Male	38 (58.5%)
	Female	27 (41.5%)
Personnel history	Samter's disease	17 (26.2%)
	Bronchic asthma	35 (53.8%)
	Aspirine intolerance	23 (35.4%)
	Respiratory allergic	5 (7.7%)
	Nasal and sinus surgery	4 (6.1%)
	Polypectomy	10 (15.4%)
Familial history	Familial atopy	9 (13.8%)
	CRSwNP	4 (6.2%)
	CRSwNP and atopy	7 (10.8%)
Endoscopic stage	Rignt	**I** [3 (4.6%)]; **II** [5 (7.7%)]; **III** [57 (87.7%)]
	Left	**I** [4 (6.2%)]; **II** [9 (13.8%)]; **III** [52 (80.0%)]
Lund-Mackey CT-scan score		18.71 ± 4.77

polyposis. At nasal cavity endoscopy, stage III of the French ENT Society (SFORL) classification was the most frequent on both the right and the left (Table 1).

In our study, a CT scan was the paraclinical investigation of choice. It was performed in all our patients. The mean total Lund-Mackay CT score in our series was 18.71 ± 4.77/24.

Before considering surgical treatment, all our patients were followed up and treated with long-term local and short courses of general corticosteroids with Prednisolone 1 mg per kilogram per day, for 10 days at most. After the declaration of resistance, dependence, intolerance, or contraindication to corticosteroid therapy, a surgical procedure was proposed in the form of functional endoscopic sinus surgery (FESS) in 29 (44.6%) patients; and a radical procedure or nasalization in 36 (55.4%) patients, nasalization procedure was chosen for patients with comorbidities.

All our patients underwent a middle antrostomy, and anterior and posterior ethmoidectomy. In cases of frontal or sphenoidal sinus filling on imaging, a frontal sinus procedure was performed in 76.9% (50) of cases on the right, and 75.4% (49) on the left, a sphenoidotomy was performed in 73.8% (48) of cases both on the right and the left, partial middle turbinectomy was performed in 55.4% (36) of cases on the right, and 56.9% (37) on the left, lower turbinoplasty was performed in 4.6% (3) of cases both on the right and the left due to their hypertrophy, and endoscopic septoplasty was performed in 9.2% (6) of cases when the septal deviation hindered our endoscopic procedure.

In our study, the average pre-operative SNOT-22 quality of life test score was 49.41 ± 17.12. The pre-operative SNOT-22 total score of our patients ranged from 16 to 85. Figure 2 shows the evolution of the SNOT-22 quality of life scores from the pre-operative period to 12 months post-operatively. The average score of the SNOT-22 quality of life test was 12.14 ± 10.22 at 1-month post-operative; 10.31 ± 8.17 at 3 months post-operative; 9.35 ± 8.93 at 6 months post-operative; 12.21 ± 15.45 at 9 months post-operative; and 12.63 ± 16.23 at 12 months post-operative.

The evolution in the scores of the five domains of the SNOT-22 test is summarized in (Fig. 3), where a clear improvement of the scores is remarkable in the post-operative period, between the 1st and the 12th post-operative month, with stability in the scores noted. The evolution of rhinological symptom scores is summarized in (Fig. 4). All symptoms are improved after surgical treatment, with stabilization of results over the 12 post-operative months for all rhinological symptoms, except for anosmia, which started to deteriorate over time from the 3rd post-operative month. The difference (Δ) in the total score from the pre-operative period to 12 months is summarized in (Table 2), confirming the decrease in quality-of-life scores between the pre-operative and post-operative periods and their stability at 3, 6, and 12 months.

Discussion

CRS with nasal polyposis is a disease that affects young adults in the majority of cases [9–11]. The average age of the patients in our series is close to the results found in the literature.

In the study of Lal et al., published by the Mayo Clinic in the USA, in 2016, the age range of 41–60 years is the most represented, which is consistent with the age range of our study within this interval [12].

We found a male predominance, as in most similar studies, including Bonfils [3] and Duc Trung in France [13], Sahlstrand-Johnson in Sweden [14], and Andrews

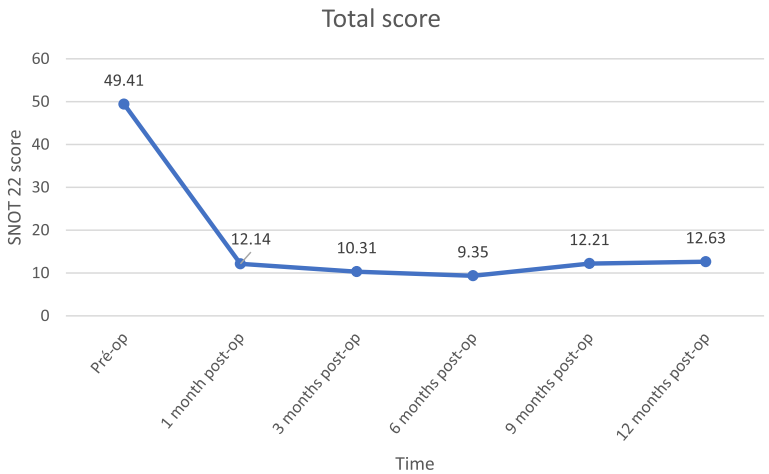

Fig. 2 Evolution of the total SNOT 22 score over time

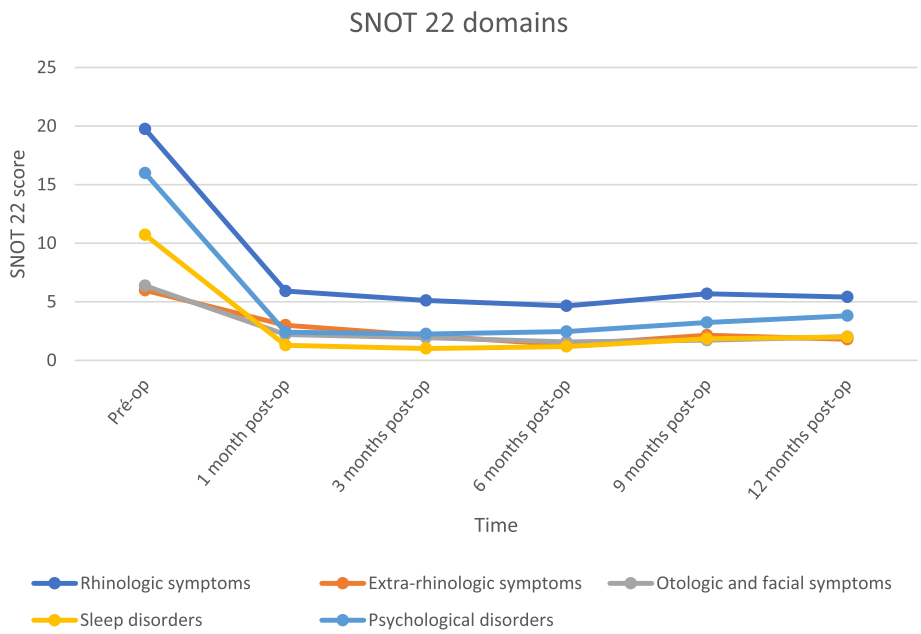

Fig. 3 Evolution of the score of the 5 SNOT 22 domains over time

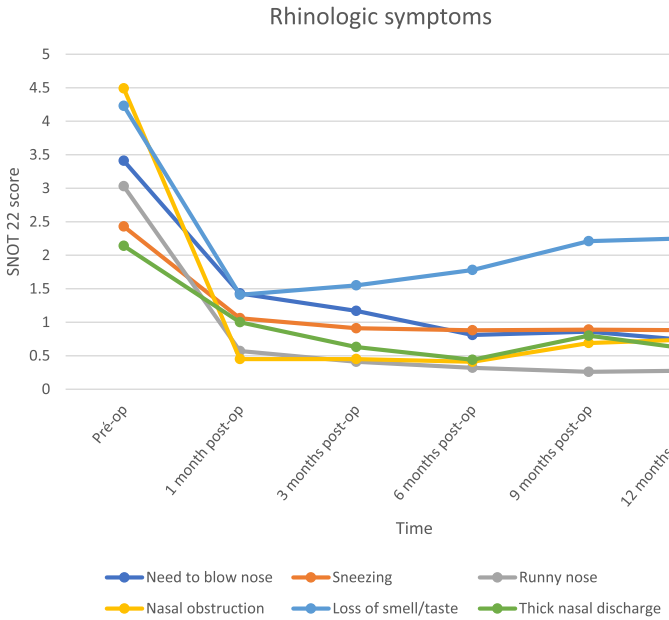

Fig. 4 Evolution of SNOT 22 rhinological symptoms scores over time

Table 2 Difference in SNOT 22 scores between pre- and post-operative periods (Δ) in our study

Δ SNOT 22 total score	Δ (3 months—pre-op) (p)	Δ (6 months—pre-op) (p)	Δ (12 months—pre-op) (p)	Δ (6 months—3 months post-op) (p)	Δ (12 months—3 months post-op) (p)	Δ (12 months—6 months post-op) (p)
	39.10 (< 0.00001)	40.06 (< 0.00001)	36.78 (< 0.00001)	0.96 (0.5237)	- 2.32 (0.3052)	- 3.28 (0.1559)

in the UK [15]. The association between CRSwNP and bronchial asthma is commonly reported. According to Settipane and Chafee, the risk of developing nasal polyposis in an asthmatic patient over the age of 40 is 4 times higher than in a non-asthmatic patient [16]. Our results concerning the existence of bronchial asthma are close to Bonfils' and Adnane's results [3, 17].

In their study, Settipane and Chafee found that it is more common to diagnose CRSwNP in a non-allergic patient than in one with an allergy. We did not find an allergic background in the majority of our patients [16].

From these findings, it can be said that CRSwNP cannot be considered a disease affecting allergic patients or influenced by the atopic terrain, but rather as a factor aggravating the clinical symptomatology of CRSwNP already present in this category of patients.

Regarding the presence of Samter's disease and aspirin intolerance, we had almost the same results as Bonfils in his study [3]. The high rate of patients with aspirin intolerance can be explained by the means of diagnosis, which was based on simple questioning of the patients, without performing aspirin challenge tests.

CRSwNP is a disease known for its recurrence despite adequate therapeutic management, which explains the high rate of cases with a history of rhinological surgery in the series of Duc Trung and DeConde [13, 18]. The rate recorded in our study is due to the peculiarity of the recruitment criteria of our patients, where we excluded those undergoing ESS.

When we look at the family history of rhinological pathology, one-third of our patients have atopy and/or CRSwNP in their history. Settipane et al. found a family history of CRSwNP in 14% [9]. Toledano Munoz et al. in analyzing the familial incidence of CRSwNP, found that 20% of their patients had a first-degree relative with CRSwNP [10]. The authors agree that the hereditary factor and genetic predisposition in the development of CRSwNP are a fact [9, 10, 19]. Bonfils et al. found an endoscopic stage I in 20.8% of patients, stage II in 35.1% of cases, and stage III in 44.2% of cases [3]. This distribution can be explained by the criteria of operability adopted by this author. In our study, patients presented significant clinical discomfort, particularly nasal obstruction, in correlation with high endoscopic stages.

The Lund-Mackay CT staging system is the most widely used monitoring tool in the international literature [20]. This score assesses sinus opacities on a total of 24 for both sides and 12 for one side. Our scan scores are close to those of Bonfils et al. and Adnane et al. in relation to the high endoscopic stages of CRSwNP, most represented in these studies [3, 17].

CRSwNP is a typical example of a disease with medical and surgical management [3]. In the international literature, all authors agree on the need for medical treatment before surgery [3, 21, 22]. This medical treatment is based on long-term local corticosteroids, interspersed with short courses of systemic corticosteroid therapy [23]. Systemic corticosteroids are also used in preparation for surgery or to control unstable or severe asthma [24, 25]. Some authors recommend it post-operatively to improve healing [24].

CRSwNP is most often resistant to medical treatment [26, 27]. Hence, the importance of making doctors aware of the limits of medical treatment in this condition, the complications, and side effects of corticosteroid treatment, and the need to make an early indication for surgery.

Despite the effectiveness of ESS in the treatment of CRSwNP, improvement is often temporary and tends to worsen over time [28]. The choice of the best technique to adopt remains difficult and depends on several factors, including the surgeon's habits, the patient's preferences, and the presentation of the disease itself [29, 30].

It is recognized that CRSwNP is a pathology with a frequent tendency to recur even after radical surgery [31]. Most authors agree on the minimum time of 6 months before talking about endoscopically visible recurrence [28].

Psychological and sleep disorders are the domains of SNOT-22 most likely to have a greater influence on patients opting for surgical treatment than other sinus-specific domains (rhinologic, extra-rhinologic, otologic, and facial) [18]. In the literature, improvement was found for all domains of SNOT-22 in both medically and surgically treated patients, but the greatest improvements were found for patients who chose surgical treatment [18].

Pre-operative QoL scores are a significant predictor for the choice of the best therapeutic management [32]. The latest recommendations for this choice focus on the "cardinal" symptoms associated with CRS (thick nasal discharge, nasal obstruction, hyposmia, pain, or facial pressure) [2, 33]. When analyzing these pre-operative scores for rhinological symptoms by Abdalla et al., compared to our scores, we find almost similar results [34].

The scores of the different items of the SNOT-22 test, which vary between 0 and 5, put our results for most rhinological symptoms above average. The scores for the symptoms of needing to blow the nose, nasal obstruction, disturbance of taste, and smell are the highest, sometimes reaching the maximum level of discomfort for the patient and consequently a very poor QoL. These findings are also highlighted in the study by Abdalla et al. [34].

In the literature, few studies have looked at early post-operative variations in the SNOT-22 score. Most of the studies set a limit of 3 to 6 months post-operatively to

start talking about significant changes in post-operative QoL scores.

Compared to the results of our study, Zhang et al. recorded a higher SNOT-22 score at 1-month post-operatively, almost double that recorded in our series [35].

Compared to the total preoperative SNOT-22 score, there was an improvement in the scores at 1 month post-operatively, from 49.41 ± 17.12 preoperatively to 12.14 ± 10.22 at the 1-month post-operative check.

The improvement in the 1-month post-operative scores was highly significant compared to the preoperative SNOT-22 score, with a regression of about three-quarters. This means an improvement in QoL at 1 month post-operatively after ESS. What is remarkable in our study is the significant improvement in the scores of the different SNOT-22 domains at 1-month post-operatively, particularly for psychological and sleep disorders, sometimes divided by 10. This gives a better QoL to the patients already in the first post-operative month.

Looking at the rhinological symptom scores at 1 month post-operatively, compared to the preoperative scores, the improvement is significant for all rhinological symptom items of the SNOT-22 test in our study.

Hopkins et al., in 2015, concluded that there was an improvement in QoL scores at 3 months post-operatively, after ESS for CRS [36].

Compared to the total SNOT-22 score at 1-month post-operative, there was a slight improvement in the scores at 3 months post-operative, ranging from 12.14 ± 10.22 at 1-month post-operative to 10.31 ± 8.17 at the 3-month post-operative check-up, but the difference remained non-significant. The improvement in scores at 3 months post-operative was slight compared to the SNOT-22 score at 1-month post-operative. This means that there is stability in QoL at the 3-month post-operative check-up after ESS.

The difference in SNOT-22 scores recorded between the 3-month post-operative period and the preoperative period in our study is 39.10. This difference is evidence of a considerable improvement in QoL between the preoperative period and the 3-month post-operative control period.

In our study, there were slight non-significant improvements in the scores of the 5 domains of the SNOT-22 test. This can be interpreted as the stability of the gain obtained by the surgery at 3 months post-operatively. We note the maintenance and stability at 6 months post-operative of the better quality of life recorded at 3 months post-operative in our study.

Zhang et al. showed that compared to CRS patients without asthma and polyps, CRS patients with both asthma and polyps can significantly improve their QoL from the preoperative visits to the post-operative visits at 1 month and 3 months. However, this improvement becomes insignificant at the 6-month post-operative visit, which may be due to the deterioration in QoL in CRSwNP over time [35]. In their study, Ling and Kountakis found that the most frequent and severe symptoms were nasal obstruction, posterior rhinorrhea, and facial pain. They were able to demonstrate an improvement in symptom scores after surgery [37].

For Abdalla et al., nasal obstruction and anosmia were the most frequent and severe symptoms in CRS. The need to blow the nose was the third most severe symptom. However, this symptom was more frequent in patients with polyps (79.8%) compared to those without polyps (62.1%) [34].

If we compare our results at 6 months post-operative with the results at 3 months post-operative, we find an improvement in the scores for the different SNOT-22 domains, as well as for the different rhinological symptoms. The difference between the score at 6 months post-operative and the score at 3 months post-operative (Δ 6 months–3 months post-op = 0.96; $P = 0.5237$) shows a non-significant improvement in the QoL scores between the 3 months and 6 months post-operative control. The significant difference between the score recorded at 6 months post-operative and preoperative period (Δ 6 months-pre-op = 40.06; $P < 0.0000001$) shows us a clear improvement in QoL at 6 months post-operative compared to the period before any surgery. An improvement in QoL scores was observed from the first post-operative month to the sixth month.

In the literature, no study has looked at the variations in QoL scores at 9 months post-operative. In our study, our patients are followed up every 3 months, so we take the opportunity to renew the treatment and fill in the QoL test of our patients.

Compared to the SNOT-22 score recorded in the sixth post-operative month, we found a slight deterioration in the total score, but this was not significant.

Regarding the 5 domains of the test, we noticed a slight deterioration in the scores of rhinological symptoms, extra-rhinological symptoms, and psychological disorders, while the scores for otological and facial symptoms and sleep disorders were stable between 6- and 9 months post-operative. If we look at rhinological symptoms, the deterioration of scores at 9 months post-operative was mainly related to symptoms of taste and smell disturbance and thick nasal discharge, and to a lesser extent, to symptoms of the need to blow the nose, sneezing, and nasal obstruction.

From these findings, the conclusion can be drawn that there is a tendency for the QoL scores to deteriorate beyond 6 months post-operative.

Compared to the total SNOT-22 score recorded at 9 months post-operative, we found stable QoL scores at 12 months post-operative. However, compared to the results at 6 months post-operative, a slight and non-significant deterioration is still observed. The difference between the score at 12 months post-operative and the score at 6 months post-operative (Δ 12 months–6 months post-op = −3.28; $P=0.1559$), and the score at 3 months post-operative (Δ 12 months–3 months post-op = −2.32; $P=0.3052$), shows a deterioration of the QoL scores between the 3 months, 6 months post-operative, and 12 months post-operative control. However, this difference remains non-significant.

The considerable difference between the score recorded at the 12 months post-operative period and the pre-operative period (Δ 12 months–pre-op = 36.78; < 0.0000001) shows us a clear improvement in the QoL at 12 months post-operative compared to what was recorded during the pre-operative period.

Compared to the results of the 5 domain scores of SNOT-22 at 9 months post-operative, stability of the results for all the domains of the test is noted at 12 months post-operative.

Looking closely at rhinological symptoms at 12 months post-operative, we note that the stability in the results of the QoL test, compared to that found at 9 months post-operative, is also present.

From these findings, we can say that our results on QoL after ESS stabilized between 6- and 12 months post-operative. The same conclusions have been reported by several authors, such as Aghdas et al., who conclude that according to the SNOT-22 test at 12 months post-operative, ESS was significantly associated with improved QoL in patients with CRSwNP [38]. Saedi et al. and Metson et al. showed a significant improvement in the QoL and the majority of rhinological symptoms of patients with CRS after ESS at 12 months post-operative [39, 40].

Ling and Kountakis, at 12 months after ESS, report a statistically significant improvement in visual analogue scale (VAS) scores and SNOT-20 scores in patients with CRS [37].

In his study, Soler et al. pointed out that there were no significant changes in QoL after follow-up beyond 6 months post-operatively in CRS. The same author found that QoL outcomes after ESS stabilized at 6, 12, and 20 months of follow-up [41]. Furthermore, Hopkins et al. found relative stabilization of SNOT-22 scores at 3, 12, and 36 months after surgery for CRSwNP [42].

For Mascarenhas et al., ESS improved the QoL in CRS patients, at the long-term follow-up, 24 months and beyond [43]. Rhinorrhea and hyposmia were the most common symptoms at late follow-up beyond 6 months post-surgery [43]. Nasal obstruction, which is the most troublesome symptom preoperatively in CRSwNP, was found to be improved post-operatively in most patients [34, 44].

Conclusion

CRSwNP is a complex and disabling inflammatory disease, characterized by its tendency to recur despite well-conducted medical and surgical treatment.

Endoscopic sinus surgery has revolutionized the surgical management of CRSwNP alongside corticosteroid therapy, which is the reference treatment.

The benefit of this treatment can only be best appreciated by the patients themselves, by evaluating their QoL before and after treatment using specific tools validated in rhinology, such as the SNOT-22 test.

In our study about the impact of ESS on the QoL of patients with CRSwNP, conducted between January 1st, 2017, and December 31st, 2019, at the ENT department of Bejaia University Hospital, we followed up for 12 months with 65 patients whom we operated on using an endoscopic approach for their CRSwNP.

Using the SNOT-22 test, we were able to evaluate the QoL of our patients pre- and post-operatively and confirm that, regardless of the surgical procedure chosen, the QoL improves after surgery, and the results obtained by this surgery were stable in our study at 12 months for most of them and at 24 and 36 months for our first patients.

The occurrence of complications should not give a false idea about an intervention, which, in good hands, allows for improving the QoL in a great number of patients.

Abbreviations

CDC	Centre of Disease Control
CRS	Chronic rhino-sinusitis
CRSwNP	Chronic Rhino-Sinusitis with nasal polyposis
CRSsNP	Chronic Rhino-Sinusitis without nasal polyposis
ENT	Ear nose and throat
ESS	Endoscopic sinus surgery
QoL	Quality of life
SD	Standard deviation
SFORL	French Society of Oto-Rhino-Laryngology
SNOT 22	Sino-Nasal Outcome Test 22-items
UK	United Kingdom
USA	United States of America
VAS	Visual analogue scale

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Authors' contributions

MS analyzed and interpreted the patient data regarding the clinical, pathological, and therapeutic findings and patient follow-up, as well as writing the basic and final manuscript draft. SA has revised the working methodology. FB has revised the final manuscript. All authors read and approved the final manuscript.

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Availability of data and materials
All data generated or analyzed during this study are included in this published article.

Declarations

Ethics approval and consent to participate
Ethics approval from the Bejaia Faculty of Medicine Ethics Committee on September 2016, under the reference number FM/07/16, Written consent to participate was obtained from all participants included in the study.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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