Recalcitrant chronic rhinosinusitis. Difficulties in diagnosis and treatment
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4.2

Radical surgery: effect on quality of life and pain in chronic rhinosinusitis

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CHAPTER 4.2

ABSTRACT

Objectives
Despite effective medical therapy and repetitive endoscopic sinus surgery in the treatment of chronic rhinosinusitis, there still remains a small group of patients without improvement of symptoms. This study evaluates the effect of radical surgery on quality of life and pain in these patients with recalcitrant disease.

Study design
A prospective, questionnaire-based study was conducted in 23 patients who underwent Denker’s procedure for refractory chronic rhinosinusitis. Quality of life and pain were evaluated before surgery and 12 months and 2 years after surgery with the SF-36 and McGill Pain Questionnaire.

Results
Seven of the eight mean scores of the SF-36 postoperatively improved after surgery, with statistical significance for Role Physical (p=0.048). Bodily pain showed a strong tendency to significance. Results of the McGill Pain Questionnaire show a significant improvement in most of the subscores after surgery implying less pain.

Conclusion
Radical surgery improves the physical burden of chronic rhinosinusitis and pain experience in patients with therapy resistant chronic rhinosinusitis.
INTRODUCTION

Chronic rhinosinusitis with or without nasal polyps (CRS/NP) has been defined as nasal congestion/obstruction/blockage in combination with facial pain/pressure or mucopurulent discharge (anterior/posterior nasal drip) or reduction/loss of smell for more than 12 weeks.\(^1\) Recent data have demonstrated that CRS/NP is among the most common chronic conditions, affecting around 5% to 15% of the urban community in Europe\(^2,3\) and around 12% to 15% of the population in the United States.\(^3\) In literature it is well recognized that CRS/NP has a substantial impact on patient’s quality of life, implying extensive costs to society in terms of use of health care resources, loss of productivity, and absence from the workplace.

Functional Endoscopic Sinus Surgery (FESS) is indicated in cases of CRS/NP that do not respond to adequate medical treatment (intensive nasal saline irrigations, decongestants, nasal steroid spray or drops, courses of antimicrobials, systemic steroid treatments). This surgical approach has become the golden standard in the last 2 decades with first time success rates of 80% to 90%.\(^4-6\) Despite these adequate results, there is still a small group of patients that remains unresponsive to even repetitive endoscopic sinus surgery (ESS) procedures, combined with optimal medical treatment. It was reported earlier\(^7\) that in therapy resistant disease, symptom reduction can be achieved by radical surgery with the use of the Denker procedure that combines the nasal cavity and paranasal sinuses into 1 cavity with the exception of the frontal sinus. The remaining cavity on either side of the nasal septum extends vertically from the ethmoid roof to the floor of the nose and paranasal sinus and horizontally from the lateral wall of the maxillary sinus to the nasal septum. Despite promising data, debate still continues whether radical surgery is a feasible treatment option in refractory CRS/NP.

In recent years there has been a trend in CRS/NP research, not only to investigate symptoms (such as rhinorrhea, nasal obstruction, or headache) and objective measures (such as endoscopic findings and CT scans), but also to evaluate the impact on quality of life with general health measures, disease specific health assessments, and other questionnaires.\(^3,8,9\) The most widely used general health evaluation instrument is the Medical Outcome Study 36-item Short-Form health survey (SF-36).\(^10\) This instrument assesses health-related quality of life (QoL) outcomes that are known to be affected most directly by disease and treatment. The SF-36 has been used extensively to provide information concerning the functional well-being of individuals with chronic diseases such as hypertension, diabetes mellitus II, chronic obstructive pulmonary disease (COPD), congestive heart failure, and low back pain. In the evaluation of patients with CRS/NP, it is a relatively new concept. Ragab et al.\(^3\) used the SF-36 to measure the effect of FESS versus medical treatment. Khalid et al.\(^11\) showed significant improvement in overall general health status after FESS with the SF-36. Our group showed in an earlier study\(^9\) that evaluated the effect of G-CSF (filgastrim) in patients with severe therapy resistant CRS/NP that SF-36 was a valuable method to compare CRS/NP with other chronic diseases like hypertension, diabetes, and angina pectoris.

An important symptom in CRS/NP is pain. Pain was evaluated in this study with the McGill Pain Questionnaire (MPQ). The MPQ is a well-known instrument to assess the multidimensional experience of pain. Although MPQ allows the assessment of different
aspects of pain at different time points, it is seldom used in CRS/NP studies. V. Agthoven et al. used MPQ in the evaluation of the filgastrim study, and Tarabichi investigated persistence of facial pain with the MPQ in patients who underwent FESS. No other reports of the use of MPQ in the evaluation of pain related to sinus surgery were found in the literature.

Additional assessment of 14 CRS-symptoms was performed via a third disease specific questionnaire. These results have been reported earlier.

The aim of this prospective study was to evaluate the effect of radical surgery in patients with refractory CRS/NP on general QoL and pain. A secondary aim was to put the burden of severe CRS/NP in perspective to other chronic diseases.

PATIENTS AND METHODS

Patients
Between 1999 and 2002, data were prospectively collected in patients with therapy resistant CRS/NP in a tertiary care rhinology practice. Approval for the study was obtained from the Ethics Committee of our institution and signed informed consent was obtained from all the patients. Patients scheduled for radical surgery according to the Denker procedure as a last resort to achieve symptom relief for refractory CRS/NP were enrolled in this study. All patients had had this condition for many years and underwent at least 3 ESS procedures combined with optimal medical therapy without long-term improvement. Other eligibility requirements included sufficient command to speak Dutch and a minimum age of 18 years. Criteria for exclusion were: CRS/NP due to cranioabnormalities or anatomic abnormalities of the nose and paranasal sinuses, surgery in case of malignancies or inverted papilloma, cystic fibrosis, gross immunodeficiency (congenital or acquired), congenital mucociliary problems, eg., primary ciliary dyskinesia, systemic vasculitis, or granulomatous disease.

Study design
Patients were evaluated with 2 different questionnaires at different time points. The impact of radical surgery on general QoL was evaluated by the SF-36, whereas different aspects of pain experience were assessed by the McGill Pain Questionnaire-Dutch Language Version (MPQ). After subjects met all eligibility criteria and were enrolled in the study, both the SF-36 and MPQ were self-administered. The baseline questionnaires (t₀) were administered within 1 month before surgery. Questionnaires were administered again at 6 months (t₁), 12 months (t₂), and 24 months (t₃) postoperatively. Demographics and health history of the patients were recorded separately.

General quality of life
General health measures have evolved over the years in an effort to assess general health in a universally valued way that is not age, disease, or treatment specific. These measures are applicable to all health conditions and allow a comparison of QoL impact in different diseases as well as healthy and diseased subjects. The SF-36 was developed during the Medical Outcome Studies of the Rand Corporation, and measures general health and quality of life. The Dutch translation of the SF-36 and psychometric properties of this
version were found adequate. SF-36 is a commonly used, reproducible, and valid generic QoL measure that evaluates general health status by grouping 36 item responses into 8 health domains: physical function (PF), role physical (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role emotional (RE), and mental health (MH). These 8 domains can be aggregated into 2 sum scores, physical and mental health. Analysis of SF-36 scores was performed by calculating the 8 health domains and the 2 weighted summary scores with published algorithms. In this way all raw scale scores were converted to a 0 to 100 scale. Higher scores indicate better levels of QoL. Results were compared with normal values of the Dutch population.

Pain assessment
Evaluation of pain was performed by the MPQ, which is a reliable and validated instrument. It measures 3 different aspects of pain. This instrument consists of a list of 20 groups of adjectives, divided into 12 sensory (S), 5 affective (A), and 3 evaluative (E) subclasses. Each subclass contains 3 words (or 4 in the evaluative subclass) ranked in increasing intensity. The word with the lowest impact gets a score of 1, and the worst adjective will get a score of 3 (or 4 in the evaluative subclass). Two major measures are distilled from the adjective list: the pain-rating index (PRI) and the number of words chosen (NWC). The PRI adds the rank numbers of all words chosen constructing PRI-S (sensory), PRI-A (affective), and PRI-E (evaluative). The sum of these 3 scores forms the total score (PRI-T). Furthermore the number of words chosen (NWC) in all the 3 dimensions can be added to form NWC-S, NWC-A, NWC-E. Summarization of these 3 NWC scores forms the total score (NWC-T). Low scores mean fewer numbers of words selected and/or lower intensity rank words chosen to suggest minor pain impact. Higher scores of both measures denote more pain and more pain impact.

Outcome measures
The major outcome measures were the 8 SF-36 health domains before and after surgery and the differences between the preoperative and postoperative subscores of the MPQ. The SF-36 scores were compared with the scores of other chronic diseases.

Statistical analysis
All data were entered into a computerized database and data analysis was conducted with the SPSS version 12.0 statistical software (SPSS Inc, Chicago, Ill). Preoperative mean scores were compared with scores after Denker’s procedure with the use of Friedman tests. When the preoperative symptoms were significantly different (p<0.05) from the postoperative symptoms, Wilcoxon Rank tests were performed to determine which of the complaints at a certain time point were significantly different from the preoperative situation. In assessment of the internal consistency and reliability of the MPQ questionnaire, Cronbach’s α and reliability coefficients were calculated.

RESULTS
Patient characteristics
Twenty-four patients, who underwent the Denker procedure between January 1999 and January 2002 for refractory CRS/NP were identified. Twenty-three of them completed all pre- and postoperative questionnaires and were included and analyzed in this study. The
group consisted of 11 females and 12 males with a median age of 50 years (range, 27 to 69 years). Evaluation of medical histories demonstrated that patients had experienced CRS/NP for a median of 15 years (range, 4 to 59 years). The first sinonasal surgical procedure was performed at a median age of 32 years (range, 12 to 55 years). Patients had undergone a median of 6 sinonasal operations (range, 3 to 11) before inclusion in the present study. All patients had undergone an infundibulotomy, 91% an ethmoidectomy, 48% had a polypectomy, 43% a Caldwell-Luc, and 35% of the patients underwent a Claué procedure (antrostomy in the inferior meatus of the nose connecting the maxillary sinus to the nasal cavity). Complicating comorbidity was present in a high number of patients including 16 (70%) patients with concurrent asthma, 4 (17%) patients with aspirin intolerance, and 6 (26%) patients with an atopic constitution. Before Denker’s procedure, 14 (61%) patients showed total opacification of 3 or more sinuses at least one-sided.

Diagnostic work-up demonstrated CRS with nasal polyposis in 15 (65%) patients, and CRS without signs of nasal polyps in 8 (35%) patients. In this prospective study, Denker’s procedure was performed bilaterally in 14 (61%) patients and 1 sided in 9 (39%) patients because of unilateral presence of disease. Revision surgery was not indicated for any of our patients within 2 years after surgery. One patient had an oroantral fistula without clinical complaints. No other complications were recorded as a result of surgery.

Quality of life results
Before treatment, the subjects with CRS/NP had significantly worse QoL scores in all SF-36 domains compared with the general Dutch population. RP had the lowest score. GH, VT, BP, and RE all scored below 50. Pre- and post-operative scores are shown in Table 1 and Figure 1. After radical surgery, 7 of the 8 mean scores at 24 months were higher compared with the preoperative score implying improvement of symptoms. Friedman tests of the groups showed statistical significance for RP and BP, \( p=0.02 \) and \( p=0.04 \), respectively. The Wilcoxon rank analysis showed statistical significance for RP, on \( t_6 \) and \( t_{24} \) after surgery \( (p=0.05 \) and \( p=0.048 \), respectively). Remarkably \( t_{12} \) showed a decline and was not significant. The analysis of BP showed a significant difference on \( t_6 \) and \( t_{12} \), \( p=0.015 \) and \( p=0.018 \), respectively. However, on \( t_{24} \) the \( p \) value did not reach significance. RE showed an extensive improvement at 24 months. However, the Friedman test for the complete group of all the time points was not significant \( (p=0.2) \); therefore, the Wilcoxon test could not be performed for the individual time points. The sum scores for PH and MH were stable and did not improve noticeably after radical surgery. Compared with scores of the healthy Dutch population, all of the 8 subdomains remained significantly lower postoperatively.
Table 1
Preoperative and postoperative scores

<table>
<thead>
<tr>
<th>SF 36 health survey</th>
<th>Domain mean (standard deviation)</th>
<th></th>
<th></th>
<th></th>
<th>P Friedman</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Preoperative</td>
<td>t6</td>
<td>t12</td>
<td>t24</td>
<td></td>
</tr>
<tr>
<td>Physical functioning (PH)</td>
<td>53.7 (26.9)</td>
<td>60.0 (24.2)</td>
<td>52.4 (25.7)</td>
<td>57.6 (23.2)</td>
<td>ns</td>
</tr>
<tr>
<td>Role physical (RP)</td>
<td>18.5 (33.0)</td>
<td>30.0 (40.2)</td>
<td>15.8 (32.5)</td>
<td>30.9 (41.0)</td>
<td>0.02</td>
</tr>
<tr>
<td>Bodily pain (BP)</td>
<td>41.0 (21.6)</td>
<td>57.1 (33.3)</td>
<td>54.7 (33.4)</td>
<td>49.6 (29.2)</td>
<td>0.04</td>
</tr>
<tr>
<td>General health (GH)</td>
<td>36.9 (19.8)</td>
<td>41.1 (19.7)</td>
<td>34.5 (18.9)</td>
<td>37.4 (24.1)</td>
<td>ns</td>
</tr>
<tr>
<td>Vitality (VT)</td>
<td>37.4 (17.2)</td>
<td>47.5 (19.1)</td>
<td>40.3 (18.3)</td>
<td>44.4 (18.9)</td>
<td>ns</td>
</tr>
<tr>
<td>Social functioning (SF)</td>
<td>52.2 (28.1)</td>
<td>60.0 (30.8)</td>
<td>50.7 (26.5)</td>
<td>58.8 (26.4)</td>
<td>ns</td>
</tr>
<tr>
<td>Role emotional (RE)</td>
<td>46.0 (47.7)</td>
<td>45.0 (47.5)</td>
<td>49.1 (45.0)</td>
<td>62.5 (46.9)</td>
<td>ns</td>
</tr>
<tr>
<td>Mental health (MH)</td>
<td>64.9 (19.1)</td>
<td>67.2 (19.2)</td>
<td>62.5 (14.9)</td>
<td>64.0 (20.9)</td>
<td>ns</td>
</tr>
<tr>
<td>Physical health</td>
<td>33.4 (9.0)</td>
<td>38.3 (10.7)</td>
<td>34.1 (11.8)</td>
<td>33.4 (9.8)</td>
<td>ns</td>
</tr>
<tr>
<td>Mental health</td>
<td>41.0 (12.0)</td>
<td>41.8 (12.6)</td>
<td>41.4 (10.9)</td>
<td>44.0 (12.4)</td>
<td>ns</td>
</tr>
</tbody>
</table>

Figure 1. Health domain scores of 23 refractory CRS patients before and after radical sinus surgery.

Comparison of our SF-36 data with patient groups with other chronic diseases (head and neck cancer, hypertension, angina pectoris, migraine, and COPD; see Figure 2), demonstrated that our subjects exhibit the most severe symptom burden comparable with COPD.
Pain results
In the analysis of the MPQ, pain rating index (PRI) scores contain the most information. PRI scores of the 3 different dimensions (PRI-S, PRI-A, PRI-E) were calculated as well as the number of words chosen (NWC-S, NWC-A, NWC-E) and the total scores. Table 2 represents the mean score and standard deviation of these computed variables. The calculated postoperative scores were compared with the preoperative situation. Results of the PRI show a lower score after surgery compared with the preoperative score in all the subscores, implying less pain. This decrease in postoperative scores was consistent at all the postoperative time points and showed a significant difference at 24 months after surgery compared with the baseline situation for PRI-S and PRI-T. A strong tendency to significance was found for PRI-A. The NWC scores were all significantly different. For the MPQ, no reference values for the general Dutch population were available. To measure internal consistency, we calculated the Cronbach’s $\alpha$ and correlation coefficients. Cronbach’s $\alpha$ varied from an acceptable 0.79 to 0.90. The correlation coefficients were also sufficient throughout these data.

Subgroup analysis on asthma, aspirin intolerance, atopic constitution, and nasal polyps did not show any significant differences between the groups with or without the comorbidity.
Table 2
Mean score of the indexes of MPQ-DLV in 23 patients before and after surgery

<table>
<thead>
<tr>
<th></th>
<th>Mean score (standard deviation)</th>
<th>Preoperative</th>
<th>t₀</th>
<th>t₁₂</th>
<th>t₂₄</th>
<th>P_friedman</th>
<th>P_wilcoxon 12/24</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRI-S</td>
<td>6.7 (5.4)</td>
<td>4.0 (4.5)</td>
<td>4.7 (6.0)</td>
<td>3.7 (4.3)</td>
<td>0.002</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>PRI-A</td>
<td>4.2 (2.9)</td>
<td>2.1 (2.8)</td>
<td>2.3 (2.3)</td>
<td>2.9 (3.2)</td>
<td>0.008</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>PRI-E</td>
<td>4.6 (2.6)</td>
<td>2.6 (2.9)</td>
<td>3.0 (2.8)</td>
<td>3.2 (3.5)</td>
<td>0.02</td>
<td>0.11</td>
<td></td>
</tr>
<tr>
<td>PRI-T</td>
<td>15.6 (9.4)</td>
<td>8.7 (8.8)</td>
<td>10 (9.6)</td>
<td>9.8 (9.5)</td>
<td>0.009</td>
<td>0.04</td>
<td></td>
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<tr>
<td>NWC-S</td>
<td>4.2 (2.8)</td>
<td>2.6 (2.5)</td>
<td>2.7 (3.0)</td>
<td>2.5 (2.5)</td>
<td>0.023</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>NWC-A</td>
<td>2.7 (1.6)</td>
<td>1.2 (1.5)</td>
<td>1.4 (1.2)</td>
<td>1.8 (1.9)</td>
<td>0.004</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>NWC-E</td>
<td>2.2 (0.9)</td>
<td>1.3 (1.3)</td>
<td>1.5 (1.3)</td>
<td>1.4 (1.3)</td>
<td>0.023</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>NWC-T</td>
<td>9 (4.4)</td>
<td>5.1 (4.6)</td>
<td>5.5 (5.0)</td>
<td>5.7 (5.2)</td>
<td>0.007</td>
<td>0.02</td>
<td></td>
</tr>
</tbody>
</table>

PRI, pain rating intensity; PRI-S, PRI sensory; PRI-A, PRI affective; PRI-E, PRI evaluative; PRI-T, PRI total; NWC, number of words chosen; NWC-S, NWC sensory; NWC-A, NWC affective; NWC-E, NWC evaluative; NWC-T, NWC total.

DISCUSSION

There is still debate whether radical sinus surgery is a feasible last treatment option in cases of therapy resistant chronic rhinosinusitis to achieve improvement of quality of life and reduction of symptoms. This discussion is in contrast to chronic frontal sinusitis, where radical surgery according to Draf (Draf III procedure) already has been accepted as an effective last therapeutic option to improve frontal drainage and relieve disabling frontal headache.¹⁸ There is little literature on the impact on QoL of Draf III procedure. Schulze et al.¹⁹ reported improved symptoms and decreased medication requirements in the majority of patients.

Recently, there has been a trend in research on chronic rhinosinusitis, to fill in the gaps between all the objective assessments of CRS/NP with subjective outcome measures like general quality of life measures and disease specific questionnaires. Several different instruments have been developed, tested, and used. In this study, we used the SF-36 and the McGill pain questionnaire. A major advantage of the SF-36 questionnaire is that it translates symptoms into broader concerns important to patients. Second, it allows comparison across diagnosis and puts the investigated disease into perspective with other illnesses. Pain as an important symptom in CRS/NP is often difficult to rate. It not only changes in magnitude, but it can also manifest itself in different forms and unique qualities. A benefit of the MPQ list is that it evaluates different dimensions of pain.

The main findings of our study are 1) radical surgery with the Denker procedure improves RP and pain; and 2) patients with CRS/NP have significantly worse QoL compared with other chronic conditions. The outcome of the SF-36 showed improvement after surgery in 7 of the 8 domains. After statistical analysis improvement in RP appeared to be significant 2 years after radical surgery. This should be interpreted that patients have less impairment in work or other daily activities as a result of physical health problems. Analysis of the subgroup BP showed statistical significance up to 12 months postsurgery. In other words, patients experience less pain or limitations caused by pain. Although the reduction of BP noted in the SF-36 questionnaire was not significant on t₂₄, the reduction in pain after radical surgery with the Denker procedure was clearly indicated by the MPQ questionnaire.
The reduction of pain, found in these 2 questionnaires, was confirmed by a disease specific questionnaire also completed in this study cohort and published recently. We found that the symptoms of facial pain and headache improved on a scale from 0 to 10. The preoperative facial pain score of 7 was reduced to 4 (p = 0.09), headache from 7 to 5 (p = 0.6). Sixty-one percent of these patients reported a reduction of facial pain, and headache improved in 52% of the patients. These results were not statistically significant most likely because of the small sample size.

To put the severity and the impact of CRS/NP on QoL in perspective, we compared the SF-36 results of our population to other groups of CRS patients. Our population had the lowest score preoperatively for all the 8 health domains compared with the other studies. An example is shown in Figure 3 where the results of Khalid et al. are compared with our data. The improvement in the study cohort of Khalid et al. showed a nearly significant improvement after FESS (80% revision procedures) at 3 years follow-up. The scores in the Khalid et al. population were better than the scores of the Denker population implying the more severe type of CRS/NP in the last group. The population most comparable in severity to ours was the population in the study of v. Agthoven et al. Subjects were treated with filgastrim (G-CSF) or placebo and QoL data of the CRS/NP subjects were compared with other chronic diseases. We did not find data on lower SF-36 results for CRS/NP than the data in our study cohort.

Figure 3. Comparison population Khalid vs Videler

One step further is to put the severity of the CRS/NP subjects into perspective with other chronic disorders. Comparison of our SF-36 data with patient groups with other diseases demonstrated that our subjects exhibit the most severe symptom burden (see Figure 2). The scores of the CRS/NP populations and thus the impact on QoL of the disease were mostly comparable with the symptom burden of chronic obstructive pulmonary disease. These findings match with other published data and allow us to put the relative symptom burden of CRS/NP in perspective.
Some remarks have to be made to the results of this investigation. Our study cohort represents a statistically small sample from a single institution. The small number of patients with this kind of severe disease warrants multi-centre studies to investigate the option of radical surgery for refractory CRS/NP in more detail.

Another limitation that should be noted is that the SF-36 and MPQ-DVL are not specifically designed for CRS/NP. However, these nonspecific parameters do serve to give a good impression of the level of disability caused by CRS/NP and provide possibilities to compare between other patient groups. Because the SF-36 has been validated, widely accepted, and has normative values for the rhinosinusitis population, it has been recommended as a general health status instrument. MPQ is not widely used in CRS/NP research. In this investigation, however, it appears to be of substantial value to assess pain as an important symptom in CRS/NP. In further studies, a combination of subjective QoL data should be completed with objective outcomes of endoscopic findings and computed tomography (CT scan).

A third comment is the remarkable decline of the SF-36 RP result on t12. We found that 3 patients with reasonable high scores on t6 and t24 showed unexplainable low scores on t12. The influence of these 3 patients seems to have an overrated effect on the results due to a relative small sample size. A clear answer for this observation was not found. Influence of season could not explain this phenomenon because subjects enrolled in the study in different seasons of the year. Difference in rinsing regimen could be one of the confounders but further research in larger groups of patients is needed to be more specific.

A last comment could be the possible downside effects of a radical surgical procedure like Denker’s procedure. Before Denker's procedure, in all the patients, there was extensive scarring and very serious mucosal pathoses, reducing the chance of functional recovery to a minimum. Known problems after radical surgery mentioned in literature are excessive scarring and crusting, damage to the nasolacrimal duct causing epiphora, and the empty nose syndrome. None of these items were indicated as a problem in this study population. Excessive crusting was prevented mainly because of the intensive nasal rinsing regimen. Patients should be informed about the lifelong nasal irrigation regimen upfront. Epiphora caused by iatrogenic damage to the nasolacrimal duct, adhesions, or crust has not been noticed in this group. A possibility to prevent epiphora could be a procedure where silicon drains are applied into the nasolacrimal duct. This is not routinely done in our clinic.

CONCLUSION

This study was developed to gain more insight in the effectiveness of radical surgery to improve QoL in patients with therapy resistant CRS/NP. The present study demonstrates that radical surgery has led to improvement in the physical burden of CRS/NP and pain experience. Moreover, it is demonstrated that this study cohort had a significantly worse QoL than most other chronic conditions.
CHAPTER 4.2

REFERENCE LIST