Observational Study

Medicine®

OPEN

Influence of depression, catastrophizing, anxiety, and resilience on postoperative pain at the first day after otolaryngological surgery

A prospective single center cohort observational study

Alexander Suffeda[a], Winfried Meissner, MD[b], Jenny Rosendahl, PhD[c], Orlando Guntinas-Lichius, MD[a,*]

Abstract

The aim was to assess the association between objectified preoperative psychological factors and postoperative pain at the first day after otolaryngological surgery in accordance with other predictors of postoperative pain. Eighty-two (82) patients (59% male, median age 56 years) were included between January and May 2015. The psychological assessment the day before surgery included the Patient Health Questionnaire (PHQ-9), pain catastrophizing scale (PCS), State-Trait Operation Anxiety (STOA) inventory, and the resilience scale (RS-13). On first postoperative day, patients were rated their pain using the questionnaires of the German-wide project Quality Improvement in Postoperative Pain Treatment (QUIPS) including a numeric rating scale (NRS, 0–10) for determination of patient's maximal pain. QUIPS allowed standardized assessment of patients' characteristics, pain parameters, and outcome. The influence of preoperative and postoperative parameters on patients' maximal postoperative pain was estimated by univariate and multivariate statistical analysis. The mean maximal pain was 3.2 ± 2.9. In univariate analysis, higher PHQ-9 score more than 4 (P = 0.010), higher STOA trait anxiety (P = 0.044), and higher STOA total score (P = 0.043) were associated to more postoperative pain. In multivariate analysis higher PHQ-9 score remained an independent predictor for severe pain (beta = 0.302; 95% confidence interval [CI]: 0.054–0.473; P = 0.014). When all parameters were included into multivariate analysis, 2 of all somatic, psychological, and treatment factors were associated with severe maximal pain: more depression (PHQ-9; beta = 0.256; 95% CI: 0.042–0.404; P = 0.017), and use of opioids in the recovery room (beta = 0.371; 95% CI: 0.108–0.481; P = 0.002). Otolaryngological surgery covers the spectrum from low to severe postoperative pain and is therefore a good model for pain management studies. A set of somatic and psychological parameters seems to allow the identification of patients with higher risk for more postoperative pain. This should help to individualize and improve the perioperative pain management.

Abbreviations: ASA = American Society of Anesthesiologists, CI = confidence interval, NRS = numeric rating scale, PCS = pain catastrophizing scale, PHQ-9 = Patient Health Questionnaire, QUIPS = Quality Improvement in Postoperative Pain Treatment, RS-13 = resilience scale, STOA = State-Trait Operation Anxiety.

Keywords: analgesia, anxiety, depression, otolaryngological surgery, postoperative care, postoperative pain, quality management, resilience

Editor: Kazuo Hanaoka.

OG-L wrote the first draft of the manuscript. No honorarium, grant, or other form of payment was given to anyone to produce the manuscript. Each author listed on the manuscript has seen and approved the submission of this version of the manuscript and takes full responsibility for the manuscript.

The authors have no conflicts of interest to declare.

The authors have no financial interest to declare in relation to the content of this article.

Supplemental Digital Content is available for this article.

[a] Department of Otorhinolaryngology, [b] Department of Anesthesiology and Intensive Care Medicine, [c] Institute of Psychosocial Medicine and Psychotherapy, Jena University Hospital, Germany.

[*] Correspondence: Orlando Guntinas-Lichius, Department of Otorhinolaryngology, Jena University Hospital, Lessingstrasse 2, D-07740 Jena, Germany (e-mail: orlando.guntinas@med.uni-jena.de).

Medicine (2016) 95:28(e4256)

Received: 24 May 2016 / Received in final form: 16 June 2016 / Accepted: 21 June 2016

http://dx.doi.org/10.1097/MD.0000000000004256

1. Introduction

Otolaryngological surgery covers a broad spectrum from interventions with normally low postoperative pain, for example, middle ear surgery, to interventions with severe postoperative pain, for example, any pharyngeal surgery.[1] Even compared to other surgical specialties, tonsillectomy is one of the most painful surgeries at all.[2] Nevertheless, as in other surgical disciplines, the experienced pain levels of children and adults who underwent otolaryngological surgery still seem to be underestimated and undertreated in many cases in daily routine.[1,3] To improve postoperative pain management, it is necessary to standardize pain management, that is, by clinical practice guidelines and to already preoperatively identify patient groups who are at risk of developing unacceptably high levels of postoperative pain.[3,4]

So far, the search of predictors for severe postoperative pain after otolaryngological surgery in prospective trials has mainly focused on somatic factors. Using the prospective web-based Quality Improvement in Postoperative Pain Treatment (QUIPS) registry, which allows a standardized assessment of patients' characteristics, pain parameters, outcome, and process parameters, it has been shown that beyond the type of surgery also female gender, younger age, chronic pain, or absence of preoperative pain counseling seem to be related to more

postoperative pain in adult otolaryngological surgery.[1,5–7] In contrast, we only could identify 1 prospective study analyzing preoperative psychological factors in patients who undergo otolaryngological surgery: In the study from Sommer et al pain catastrophizing was beyond some somatic factors an independent predictor for more postoperative pain.[3] Beyond otolaryngological surgery, it has been shown in general that preoperative psychological distress, anxiety, or pain catastrophizing is a predictor for more postoperative pain and analgesic consumption.[8–10] Nevertheless, most studies have focused on 1 psychological dimension, but comprehensive analyses covering several psychological measures are lacking.

A detailed and comprehensive analysis combining a standardized assessment of all relevant preoperative and perioperative predictors in patients who underwent adult otolaryngological surgery has not yet been performed. Otolaryngological surgery could serve as an optimal model because it covers a wide spectrum of experienced postoperative pain intensity. Hence, the present prospective clinical study used a validated set of preoperative psychological assessment together with QUIPS data to analyze preoperative somatic and psychological factors, postoperative pain within the first 24 hours in adults after otolaryngological surgery, its pain management, and associated parameters.

2. Material and methods

QUIPS is registered at the German Clinical Trials Register (DRKS-ID: DRKS00006153). Institutional review board approval was obtained before study initiation by the Ethics Committee of the Jena University Hospital, Thuringia, Germany (No. 4290–12/14). The patients gave their written informed consent. All questionnaires including the informed consent were recorded.

2.1. Subjects

Inclusion criteria were as follows: 18 years or more of age, middle ear surgery or transoral laryngopharyngeal surgery (microlaryngoscopy, panendoscopy, tonsillectomy, and pharyngeal surgery of benign tumors), inpatient treatment, surgery under general anesthesia, sufficient knowledge of the German language to fill in the questionnaires, and availability of the patients at the first postoperative day. Exclusion criteria were as follows: patients on intensive care unit on first postoperative day, cognitive impairment, or dementia. All participating patients were included between January 2015 and May 2015 (Supplemental Digital Content Figure S1, http://links.lww.com/MD/B126).

2.2. Preoperative psychological assessments

The assessment started with a questionnaire the day before surgery. The questionnaire was filled out by the patient without help of the research personnel. The patient was asked for his name, gender, age, highest school qualification. The patient estimated her/his pain at the moment and expected pain after surgery on two 11-point numeric rating scales (NRS; 0 = no pain; 10 = maximal pain). The validated self-administered 9-item Patient Health Questionnaire (PHQ-9) was used to measure the depression severity.[11] The PHQ-9 scores, ranging from 0 to 27, indicate the presence and severity of depression, with scores of 5, 10, 15, and 20 being the cut-points for mild, moderate, moderately severe, and severe depression, respectively. In the present study, internal consistency was good with Cronbach alpha = 0.84. The validated 13-item pain catastrophizing scale (PCS) was applied to measure the catastrophizing level.[12] Various thoughts and feelings associated with pain are rated on a 4-point scale ranging from 0 (not at all) to 3 (very much). Cronbach alpha was 0.96 in our study. Surgery-related anxiety was assessed by the 30-item State-Trait Operation Anxiety (STOA) inventory.[13] The first subscale of STOA measures the level of state anxiety (10 items) with values ranging from 0 to 30; the second subscale captures trait anxiety (20 items) with values ranging from 0 to 60. Higher values reflect higher anxiety as well as higher information requirement. Internal consistency of both subscales was good, with Cronbach alpha = 0.93 and 0.91, respectively. Finally, the German version of the validated 13-item resilience scale (RS-13) was used to measure resilience.[14,15] RS-13 scores range from 13 (low resilience) to 91 (high resilience). Patients with a RS-13 score less than 72 are defined as patients with low resilience and patients with a score of 72 or more have a high resilience. In the present study, Cronbach alpha for this scale was 0.87.

2.3. Postoperative pain and pain management measures

The present study was also part of the German-wide QUIPS registry. The QUIPS questionnaire is presented in detail elsewhere.[5,16] The QUIPS questionnaire consisted of 2 parts for each patient: This first part is covering the outcome parameters of the questionnaire, whereas the second part, which is filled by the investigator.

The patients received a validated 15-item QUIPS questionnaire at the first postoperative day. The patients filled out the questionnaire at the afternoon of the first postoperative day, that is, 24–30 hours after surgery. QUIPS used 11-point NRS to estimate the patient's pain during movement, maximal pain, and pain at rest. Generally, higher numbers are indicating more pain (0 = no pain; 10 = maximal pain). Furthermore, the patient was asked by dichotomized (yes/no) questions about pain-related impairments (mobility, breathing, sleep, and mood), side effects of pain treatment (drowsiness, nausea, and vomiting), and satisfaction with the pain management. The patients were also asked about the preoperative pain counseling in 3 categories (yes, in general; yes, specific; no). General pain counseling meant that education about postoperative pain and its management in general was part of the presurgical interview with the patients. Specific pain counseling assumed that it was talked about specific pain related to the surgical procedure the patient underwent.

The second part of both questionnaires, which is filled by the investigator, was covering the relevant demographic and clinical parameters (baseline parameters) like type of surgery, anesthesia, and pain management. Additionally, the Charlson comorbidity index and the American Society of Anesthesiologists (ASA) status were assessed.[17,18] All QUIPS data were made anonymous and transferred via internet (http://www.quips-projekt.de/) to the external database for the benchmark project of QUIPS allowing an anonymous comparison to the results of other participating hospitals (not shown).

2.4. Study size calculation

Primary outcome parameter was maximal pain. Secondary outcome parameters were minimal pain, pain during movement, pain-related interferes, and side effects of pain treatment. Baseline parameters, the psychological assessments, and the pain

management measures were considered as potential predictors. Sample size calculation was based on multiple linear regression analysis with 12 predictors. To detect large effect sizes as revealed in a comparable study with similar predictors and outcomes,[19] that is, effects of $R^2 = 0.24$, while setting $P = 0.05$, a sample size of 81 patients would be necessary to achieve a power of 1-ß = 0.90.

2.5. Statistical analysis

Patients' characteristics, questionnaire data, and QUIPS variables were analyzed with IBM SPSS statistics software (Version 23.0.0.0, IBM Corporation, Armonk, New York, United States) for medical statistics. Data are presented as mean ± standard deviation (SD) if not otherwise indicated. The main outcome parameter was maximal pain. Clinical and outcome parameters of all patients were summarized descriptively (Tables 1 and 2, Supplemental Digital Content Table 1, http://links.lww.com/MD/B126). The Kolmogorov–Smirnov test was used to test if the continuous variables were normally distributed. Logarithmic transformations were used on all non-normally distributed variables (duration of surgery, pain the day before surgery, PHQ-9, and PCS) to reduce skewness and improve normality, linearity, and homoscedasticity of the residuals.[20] Associations among patients' characteristics and maximal pain were examined via Pearson correlation (Supplemental Digital Content Table 2, http://links.lww.com/MD/B126). Five multivariate linear regression models with stepwise entry were generated for the outcome parameter maximal pain (NRS 0–10; Table 3). Variables that were associated with postoperative pain in the univariate analyses ($P < 0.05$) were included in multivariable stepwise regression analyses. Intraoperative pain management was identical for all patients and was therefore not included in the regression analysis. Process parameters related to pain treatment were not included as these measures were performed in response to patient's pain. Using a $P < 0.001$ criterion for Mahalanobis distance, no outliers among the cases were identified. Two cases had missing data for depression (PHQ-9); therefore, the correlation and regression analyses including PHQ were based on 80 patients. No other data were missing. All other statistics were based on all 82 patients. In general, nominal p values of 2-tailed tests are reported. The significance level was set at $P < 0.05$.

3. Results

3.1. Subjects and preoperative psychological assessments

During the study recruitment interval, 82 patients (59% male, median age 55.5 years) could be included. Details on the patients' baseline characteristics are listed in Table 1. The majority had no relevant comorbidity (ASA 1/2: 77%, Charlson comorbidity 0: 61%). Nine patients reported chronic pain. According to the PHQ-9 44 patients (53%) of the patients showed symptoms of depression (median PHQ-9 score: 4). Median pain at the moment of the preoperative assessment was 0 (NRS; range: 0–9). Median expected pain after surgery was 4 (NRS; range 0–10). Median value on the PCS was 7.5 (range: 0–43). Median STOA scores for state operation anxiety and trait operation anxiety were 10 (range 0–29) and 17 (range: 2–4), respectively (median total score: 26; range: 4–67). Median resilience score on the RS-13 was 65 (range: 29–78). The psychological parameters were highly correlated to each other: The PHQ-9 score was correlated to the PCS score (r = 0.659, $P < 0.0001$) and to the STOA sum score (r = 0.652, $P < 0.0001$). The PCS score was also correlated to the STOA sum score (r = 0.565, $P < 0.0001$). In contrast, the RS-13 was negatively correlated to the PHQ-9 score (r = −0.562, $P < 0.0001$), and the STOA sum score (r = −0.387, $P < 0.0001$), but not as strong to the PCS score (r = −0.282, $P = 0.010$).

Table 1

Patients' characteristics and preoperative psychological assessments (n = 82).

Measure	Absolute (relative)
Gender	
Male	48 (58.5%)
Female	34 (41.5%)
Graduation	
<high school	56 (68.3%)
High school	24 (29.3%)
Unknown	2 (2.4%)
ASA status	
1	16 (19.5%)
2	47 (57.3%)
3	19 (23.2%)
Charlson Comorbidity Index	
0	50 (61.0%)
1	12 (14.6%)
2	13 (15.9%)
≥3	7 (8.4%)
PHQ-9	
No depression (0–4)	37 (45.1%)
Mild depression (5–9)	27 (32.9%)
Moderate depression (10–14)	13 (15.9%)
Moderately severe depression (15–19)	3 (3.7%)
Severe depression (≥20)	0
Unknown	2 (2.4%)
RS-13	
Low resilience (<72)	17 (20.7%)
High resilience (≥72)	65 (79.3%)
Pain therapy before surgery	
No	73 (89.0%)
Yes	9 (11.0%)
Type of surgery	
Middle ear surgery	41 (50.0%)
Panendoscopy or microlaryngoscopy	25 (30.5%)
Tonsillectomy	10 (12.2%)
Transoral pharyngeal tumor surgery	6 (7.3%)
Perioperative complications	
No	68 (82.9%)
Yes	14 (17.1%)
	Mean ± SD (median, range)
Age, mean ± SD, y	54.8 ± 17.1 (55.5, 18–84)
Duration of surgery, mean ± SD, min	45.5 ± 35.2 (35, 9–216)
Pain at the moment (NRS)	1.1 ± 1.9 (0, 0–9)
Expected postoperative pain (NRS)	3.7 ± 2.8 (4, 0–10)
PHQ-9	5.4 ± 4.8 (4, 0–19)
PCS	10.6 ± 11.5 (7.5, 0–43)
STOA	
State anxiety	11.4 ± 7.3 (10, 0–29)
Trait anxiety	17.2 ± 10.5 (16, 2–49)
Total score	28.5 ± 16.0 (27, 4–67)
RS-13	62.1 ± 11.0 (65, 29–78)

ASA = American Society of Anesthesiologists, NRS = numeric rating scale, PCS = pain catastrophizing scale, PHQ-9 = Patient Health Questionnaire, RS-13 = resilience scale, STOA = State-Trait Operation Anxiety.
*NRS from 0 (no pain) to 10 (maximal pain).

3.2. QUIPS: Process parameter

Supplemental Digital Content Table 1, http://links.lww.com/MD/B126 gives an overview about the perioperative and

Table 2

Pain outcome parameters (n = 82).

Measure	Absolute number of patients or mean ± SD	Relative number of patients or median, range
Postoperative pain		
Pain during movement, NRS*	2.4 ± 2.4	2, 0–8
Maximum pain intensity, NRS*	3.2 ± 2.9	2.5, 0–10
Minimum pain intensity, NRS*	1.3 ± 1.5	1, 0–6
Satisfaction with pain therapy, NRS†	12.7 ± 3.1	14, 0–15
Maximal pain intensity, dichotomized		
NRS 0–3	54	65.9%
NRS 4–10	28	34.1%
Pain counseling		
Pain counseling		
Yes, in general	55	67.1%
Yes, specific	18	22.0%
No	9	11.0%
Pain-related interferes		
Impaired mobility		
Yes	17	20.7%
No	65	79.3%
Impaired breathing/coughing		
Yes	24	29.3%
No	58	70.7%
Impaired sleep		
Yes	29	35.4%
No	53	64.6%
Impaired mood		
Yes	18	22.0%
No	64	78.0%
Pain therapy related side effects		
Tiredness/drowsiness		
Yes	30	36.6%
No	52	63.4%
Nausea		
Yes	12	14.6%
No	70	85.4%
Vomiting		
Yes	9	11.0%
No	73	89.0%
Vertigo		
Yes	9	11.0%
No	73	89.0%
Desire for pain medication		
Desire for pain medication		
Yes	7	20.9%
No	75	77.7%

NRS = numeric rating scale.
* NRS from 0 (no pain) to 10 (maximal pain).
† NRS from 0 (not satisfied) to 10 (very satisfied).

postoperative measures applied as prevention or treatment of postoperative pain. Analgesic and coanalgesic drugs were given in standard dosages. The sedative for premedication was midazolam in about 3 of 4 patients. All 82 patients received the same total intravenous anesthesia with propofol. Nearly all patients received nonopioids in the recovery room (78 patients; 95%) and about a quarter opioids (18 patients). Nonopioids and/or opioids were given to 80 patients (98%) and 24 patients (30%), respectively, of the patients back on the ward. Only a minority received perioperative antibiotics (23 patients; 29%), a cold pack on ward (15 patients), and/or had an individual pain therapy instruction plan (18 patients). In the majority of patients, pain intensity was documented at least once in the medical records (56 patients; 68%).

3.3. QUIPS: Outcome parameter

All results of QUIPS questionnaire concerning patient-reported outcome parameters on the first postoperative day after surgery are presented in Table 2. Overall, the mean pain during movements, maximal pain, and minimal pain were 2.4 ± 2.4, 3.2 ± 2.9, 1.3 ± 1.5 (NRS), respectively. About one third of the patients had maximal pain scores at the first postoperative day of NRS more than 3, that is, a pain score necessarily needing a pain therapy (Fig. 1). Nevertheless, satisfaction with the pain therapy was high (median 14, range: 0–15). About 73 patients (89%) reported to have received at least a general preoperative counseling about postoperative pain (specific counseling in 18 patients). The predominant pain-related impairment was impaired sleep (29 patients, 35%). The most frequent pain drug therapy side effect was drowsiness (30 patients; 37%). The 3 pain parameters were highly correlated to each other. Pain during movement was correlated to maximal pain ($r = 0.845$, $P < 0.0001$) and minimal pain ($r = 0.660$, $P < 0.0001$). Maximal pain was also correlated to minimal pain ($r = 0.732$, $P < 0.0001$).

3.4. Factors associated with more maximal postoperative pain

By univariate analysis, several factors were significantly ($P < 0.05$) associated with maximal postoperative pain (Supplemental Digital Content Table 2, http://links.lww.com/MD/B126). Younger age ($P = 0.001$), tonsillectomy ($P < 0.0001$), longer duration of surgery ($P = 0.020$), and patients with surgical complications ($P = 0.019$) were associated with more maximal pain. Patients with higher depression score (higher PHQ-9 depression score; $P = 0.010$; Fig. 2), higher STOA trait anxiety ($P = 0.044$) and higher STOA sum score ($P = 0.033$) also had significantly more maximal pain. Results of the PCS ($P = 0.121$) and RS-13 ($P = 0.713$) did not have any significant influence on postoperative pain. From the parameters, perioperative use of antibiotics ($P < 0.0001$), individual pain instructions ($P = 0.0001$), the desire for more pain medication ($P < 0.0001$), and lower satisfaction ($P < 0.0001$) were also associated to more postsurgical pain. Patients with more postoperative pain had received more frequently opioids in the recovery room ($P < 0.0001$), nonopioids on ward ($P = 0.017$), opioids on ward ($P = 0.0001$), and a cold pack ($P < 0.0001$). All measured pain-related interference: impaired mobility, impaired breathing, impaired sleep, impaired mood were associated to more maximal postoperative pain (all $P < 0.0001$). In addition, the pain therapy related side-effects drowsiness ($P < 0.0001$) and nausea ($P = 0.006$) were more frequent in patients with more pain.

Five different multivariate models were calculated (Table 3). Three models were calculated to evaluate preoperative predictors for severe postoperative pain, 1 model including the baseline parameters (model 1), including the psychological parameters (model 2) and 1 model covering baseline, psychological factors, and process parameters (model 3). One analysis was performed concerning the pain-related interferes (model 4) and 1 analysis related to the pain therapy related side effects (model 5). The multivariate analysis on the association of baseline factors on maximal pain revealed that younger age (beta = −0.277; 95% confidence interval [CI]: −0.010 to −0.001; $P = 0.0.10$ and longer duration of surgery (beta = 0.288; 95% CI: 0.116–0.570;

Table 3

Linear regression models predicting for more postoperative maximal pain.

Measure	B	SEB	Beta	95% CI lower	95% CI upper	*P* value
Model 1: Baseline parameters ($R^2=0.331$; F (9,390); $P<0.0001$)						
Age, y	−0.006	0.002	−0.277	−0.010	−0.001	0.010
Duration of surgery, min (log)	0.343	0.114	0.288	0.116	0.570	0.003
Complications (0 = no; 1 = yes)	0.122	0.089	0.135	−0.055	0.299	0.173
Tonsillectomy (0 = no; 1 = yes)	0.252	0.111	0.243	0.030	0.474	0.026
Model 2: Preoperative psychological assessment ($R^2=0.167$; F (5,018); $P<0.003$)						
PHQ-9 (log)	0.263	0.105	0.302	0.054	0.473	0.014
STOA, trait anxiety	−0.027	0.083	−0.040	−0.193	0.138	0.742
Model 3: Baseline, psychological assessment and process parameters ($R^2=0.519$; F (5,846); $P<0.0001$)						
PHQ-9 (log)	0.223	0.091	0.256	0.042	0.404	0.017
STOA, trait anxiety	0.013	0.069	0.018	−0.126	0.151	0.855
Age, y	−0.003	0.002	−0.139	−0.007	0.002	0.212
Duration of surgery, min (log)	0.035	0.131	0.030	−0.227	0.297	0.790
Complications (0 = no; 1 = yes)	0.025	0.088	0.027	−0.151	0.201	0.779
Tonsillectomy (0 = no; 1 = yes)	−0.055	0.184	−0.053	−0.422	0.312	0.765
Antibiotics (0 = no; 1 = yes)	0.178	0.097	0.231	−0.016	0.372	0.072
Pain therapy instruction 0 = no; 1 = yes)	−0.058	0.159	−0.071	−0.376	0.259	0.716
Recovery room, opioid 0 = no; 1 = yes)	0.294	0.093	0.371	0.108	0.481	0.002
Ward, nonopioid (0 = no; 1 = yes)	0.148	0.109	0.136	−0.070	0.366	0.179
Ward, opioid (0 = no; 1 = yes)	−0.038	0.126	−0.049	−0.290	0.215	0.766
Ward, cold pack (0 = no; 1 = yes)	0.157	0.163	0.174	−0.168	0.482	0.337
Model 4: Pain-related interferes ($R^2=0.739$; F (23,213); $P<0.0001$)						
Impaired mobility (0 = no; 1 = yes)	0.088	0.082	0.104	−0.076	0.252	0.291
Impaired breathing (0 = no; 1 = yes)	0.227	0.071	0.303	0.086	0.367	0.002
Impaired sleep (0 = no; 1 = yes)	0.265	0.070	0.373	0.125	0.405	<0.0001
Impaired mood (0 = no; 1 = yes)	0.150	0.085	0.183	−0.019	0.319	0.080
Model 5: Pain therapy related side effects ($R^2=0.534$; F (15,725); $P<0.0001$)						
Drowsiness (0 = no; 1 = yes)	0.371	0.080	0.525	0.211	0.530	<0.0001
Nausea (0 = no; 1 = yes)	0.015	0.109	0.015	−0.203	0.232	0.892

B = regression coefficient, CI confidence interval, SEB = standard error of B.

$P=0.003$) were associated to more pain. The multivariate analysis on the association of preoperative psychological factors on maximal pain revealed that only a higher PHQ-9 score was associated to more pain (beta = 0.302; 95% CI: 10.054–0.473; $P=0.014$). The comprehensive multivariate analysis on the association of baseline parameters, preoperative psychological factors and preoperatively or perioperatively influencing process parameters on maximal pain on the first postoperative day revealed that more depression (beta = 0.256; 95% CI: 0.042–0.404; $P=0.017$), and use of opioids in the recovery

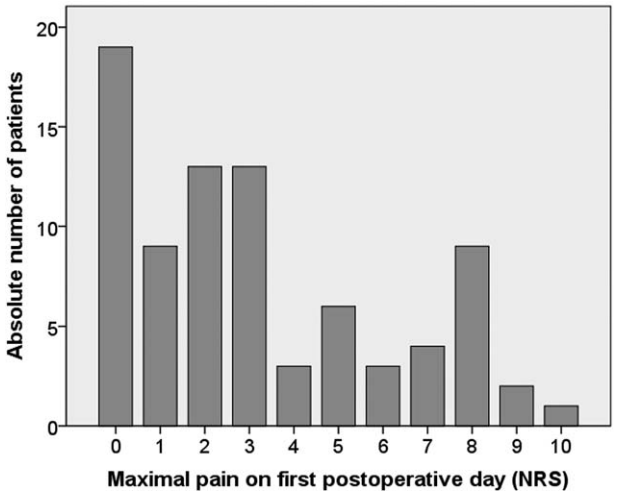

Figure 1. Distribution of the maximal pain scores for all 82 patients. A relevant amount reported pain scores NRS more than 3, that is, needing more pain therapy.

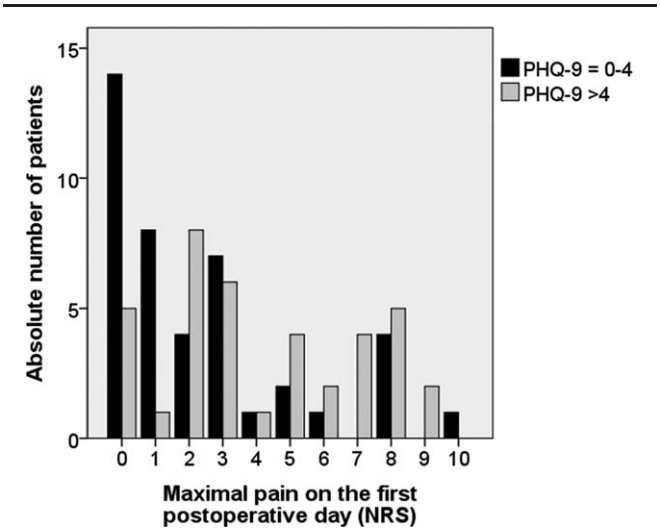

Figure 2. Distribution of the maximal pain scores for all 82 patients in relation to the results of the Patient Health Questionnaire (PHQ-9); no depression (PHQ-9: 0–4) versus depression (PHQ-9: >4).

room (beta = 0.371; 95% CI: 0.108–0.481; $P = 0.002$) were independent predictors for more maximal pain. The multivariate analysis on the association of pain-related interference on maximal postoperative pain showed that impaired breathing (beta = 0.303; 95% CI: 0.086–0.367; $P = 0.002$), and impaired sleep (beta = 0.373; 95% CI: 0.125–0.405; $P < 0.0001$) were related to more pain. The multivariate analysis on the association of pain therapy related side effects interferes on maximal postoperative pain indicated that only drowsiness (beta = 0.525; 95% CI: 0.211–0.530; $P < 0.0001$) was an independent pain therapy related side effect related to more maximal postoperative pain.

4. Discussion

To our knowledge, the presented analysis is beyond the Dutch study by Sommer et al[3] so far the only prospective cohort study analyzing the role of preoperative somatic and psychological factors on postoperative pain in otolaryngological surgery worldwide. Furthermore, a comprehensive preoperative assessment of psychological factor including, depression, catastrophizing, anxiety, and resilience has not been performed before. The main finding is that.

The methodology used is not without limitations. First, a limitation was that perioperative pain and pain management related parameters were assessed only once and within the first 24 hours after surgery. Depending on the type of otorhinolaryngologic surgery, significant pain peaks at day 1 or 2 after surgery, but some patients experience pain even throughout 1 week after surgery.[3] Second, only patients in Germany were measured. Therefore, conclusions on cross-cultural influences on pain perception cannot be made. Patients with more maximal pain received significantly more nonopioids and/or opioids in the recovery room and on the ward than the group of patients with lower maximal pain. QUIPS does only allow to analyze for associate relationships, but not necessarily causative relationships of the recorded parameters. Furthermore, QUIPS does not allow to differentiate if the patient received the pain drug due to a fixed regime or on demand because the patient still complained of postsurgical pain. As the patients received the pain drugs before the pain assessment, we interpret the result in such a way that the patients with higher postoperative pain were undertreated with analgesics in the perioperative and early postoperative phase.

Compared to recent prospective studies also using QUIPS for the pain assessment after otolaryngological surgery, baseline characteristics of the patients and the range of postoperative pain are comparable, that is, the present study sample seems to represent a representative cohort of patients after ear or pharyngeal surgery.[1] Although most of patients with unacceptable pain levels (NRS > 3) received nonopioids and/or opioids in the recovery room and on ward, 34% had maximal pain more than 3 (NRS; 27% after ear surgery and 42% after pharyngeal surgery). In the already cited Dutch study using a fixed pain-management regime with nonopioids and opioids for all patients, about 15% of the patients after ear surgery and 45% after oropharyngeal surgery had unacceptable pain levels (VAS >40 mm). This is confirming older data that patients reporting relevant postoperative pain levels seem to be undertreated with adequate pain therapy.[1,3,21]

In the study of Sommer et al,[3] surgical site, younger age, female gender, more preoperative pain, more expected pain, more short-term fear, and pain catastrophizing were related to more postoperative pain in univariate analysis. In the multivariate analysis only preoperative pain, pain catastrophizing, and anatomical site of operation remained independent predictors for more postoperative pain on the first postoperative days (and also on second until forth postoperative day). In the present study age, and lower comorbidity were preoperative nonpsychological factors (and longer surgery time as an intraoperative parameter) related to more postoperative pain. The somatic factors related to more pain which are most often found in more recent studies are: surgical subsite (oropharyngeal surgery), younger age, female gender, chronic pain, and lack of preoperative pain counseling.[1,5–7,21,22] From the psychological assessments, higher expected pain intensity, higher depression score, and higher anxiety (but not pain catastrophizing: only a trend was seen) were significantly related to more pain in univariate analysis. Other studies with psychological assessments for comparisons specifically for otolaryngological surgery are not available. Of even more interest is the comparison of the multivariate analysis and here only the Dutch and the present study can be compared.

Three parameters that were not addressed in the Dutch study were revealed as independent predictors for more postoperative pain: less comorbidity (which might be a better surrogate marker for the health status than just the biological age), more preoperative depression, and use of perioperative antibiotics. As it has been shown for instance for tonsillectomy, the administration of antibiotics seem not to reduce postoperative pain.[23] Perioperative antibiotics are mainly given in cases of surgery because of chronic inflammatory diseases or patients with acute inflammatory exacerbation. We take this to mean that postoperative pain is probably independently form the type of surgery higher after otolaryngological interventions related to acute/chronic inflammation because pain is also a clinical sign of inflammation. In the present study, depression, anxiety, and pain catastrophizing were highly correlated to each other. This confirms the concept that these 3 factors together with beliefs about pain have a combined effect on the pain experience after surgery.[10] Depression played the dominant role from these 3 factors in the present study. As the present study combined for the first time a psychological assessment with the postoperative QUIPS assessment, the results should be validated with other patient collectives. What is the role of preoperative psychological factors in other types of surgery? Meta-analyses suggest that these factors play a major role for the development of higher acute and chronic pain experience after abdominal, gynecological, and orthopedic surgery.[10,24,25] The detected predictors for more postoperative pain did not show specific aspects only related to otolaryngological surgery. Therefore, otolaryngological surgery might serve as an optimal model for research on postoperative pain, because it covers a wide spectrum of experienced postoperative pain intensity.

Preoperative identification of depressive, anxious, catastrophizing, and less-resilient patients may help to optimize patient care. More aggressive analgesia as well as psychological interventions for such patients might be an option.[10] In case of elective surgery, preoperative cognitive behavioral therapy can lead to less postoperative pain and also to decrease the risk to develop chronic postoperative pain.[24] Even a short-term perioperative psychological intervention might help to reduce postoperative pain.[26] Ideally, patients at risk would be accompanied by a transitional pain service team optimizing perioperative analgesics but also offering psychological interventions.[27]

In conclusion, a combined analysis of a large set of psychological and somatic factors in together with a standardized self-assessment of patient's pain was performed in a prospective cohort study of 82 patients undergoing otolaryngological surgery

as a model of surgery with a spectrum of low to severe postoperative pain. The results of the study show that in daily routine of otolaryngological procedures a significant proportion of patients show psychological alterations with influence on postoperative pain 24 hours after surgery. Depression seems to be the most important psychological predictor for severe postoperative pain. This implicates that better pain management including preoperative counseling of the patients and may be psychological intervention is needed.

References

[1] Guntinas-Lichius O, Volk GF, Zaslansky R, et al. The first postoperative day: prospective evaluation of pain in adult otorhinolaryngologic surgery. Clin J Pain 2014;30:978–86.

[2] Gerbershagen HJ, Aduckathil S, van Wijck AJ, et al. Pain intensity on the first day after surgery: a prospective cohort study comparing 179 surgical procedures. Anesthesiology 2013;118:934–44.

[3] Sommer M, Geurts JW, Stessel B, et al. Prevalence and predictors of postoperative pain after ear, nose, and throat surgery. Arch Otolaryngol Head Neck Surg 2009;135:124–30.

[4] Savoia G, Alampi D, Amantea B, et al. Postoperative pain treatment SIAARTI Recommendations 2010. Short version. Minerva Anestesiol 2010;76:657–67.

[5] Finkensieper M, Poller K, Wittekindt C, et al. Postoperative pain assessment after functional endoscopic sinus surgery (FESS) for chronic pansinusitis. Eur Arch Otorhinolaryngol 2013;270:157–66.

[6] Gerbershagen HJ, Pogatzki-Zahn E, Aduckathil S, et al. Procedure-specific risk factor analysis for the development of severe postoperative pain. Anesthesiology 2014;120:1237–45.

[7] Inhestern J, Schuerer J, Illge C, et al. Pain on the first postoperative day after head and neck cancer surgery. Eur Arch Otorhinolaryngol 2015;272:3401–9.

[8] Munafo MR, Stevenson J. Anxiety and surgical recovery. Reinterpreting the literature. J Psychosom Res 2001;51:589–96.

[9] Ip HY, Abrishami A, Peng PW, et al. Predictors of postoperative pain and analgesic consumption: a qualitative systematic review. Anesthesiology 2009;111:657–77.

[10] Khan RS, Ahmed K, Blakeway E, et al. Catastrophizing: a predictive factor for postoperative pain. Am J Surg 2011;201:122–31.

[11] Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med 2001;16:606–13.

[12] Sullivan M, Bishop S, Pivic J. The Pain Catastrophizing Scale: development and validation. Psychol Assess 1995;7:524–32.

[13] Krohne HW, Schmukle SC, de Bruin J. The Inventory "State-Trait Operation Anxiety" (STOA): construction and empirical findings. Psychother Psychosom Med Psychol 2005;55:209–20.

[14] Wagnild GM, Young HM. Development and psychometric evaluation of the Resilience Scale. J Nurs Meas 1993;1:165–78.

[15] Mautner E, Stern C, Deutsch M, et al. The impact of resilience on psychological outcomes in women after preeclampsia: an observational cohort study. Health Qual Life Outcomes 2013;11:194.

[16] Meissner W, Mescha S, Rothaug J, et al. Quality improvement in postoperative pain management: results from the QUIPS project. Dtsch Arztebl Int 2008;105:865–70.

[17] Saklad M. Grading of patients for surgical procedures. Anesthesiology 1941;2:281–4.

[18] Charlson ME, Pompei P, Ales KL, et al. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chronic Dis 1987;40:373–83.

[19] Pinto PR, McIntyre T, Almeida A, et al. The mediating role of pain catastrophizing in the relationship between presurgical anxiety and acute postsurgical pain after hysterectomy. Pain 2012;153:218–26.

[20] Tabachnik BG, Fidell LS. Using multivariate statistics. Pearson Education, Boston 2007.

[21] Poller K, Volk G F, Wittekindt C, et al. Estimation of postoperative pain after tonsillectomy in adults using QUIPS: an instrument to improve postoperative pain management. Laryngorhinootologie 2011;90:82–9.

[22] Wittekindt D, Wittekindt C, Schneider G, et al. Postoperative pain assessment after septorhinoplasty. Eur Arch Otorhinolaryngol 2012;269:1613–21.

[23] Dhiwakar M, Clement WA, Supriya M, et al. Antibiotics to reduce post-tonsillectomy morbidity. Cochrane Database Syst Rev 2012;12: CD005607.

[24] Burns JW, Moric M. Psychosocial factors appear to predict postoperative pain: interesting, but how can such information be used to reduce risk? Tech Reg Anesth Pain Management 2011;15:90–9.

[25] Theunissen M, Peters ML, Bruce J, et al. Preoperative anxiety and catastrophizing: a systematic review and meta-analysis of the association with chronic postsurgical pain. Clin J Pain 2012;28:819–41.

[26] Reichart R, Vogel I, Weiss T, et al. Short psychological intervention as a perioperative pain reduction treatment in spinal neurosurgery. J Neurol Surg A Cent Eur Neurosurg 2011;Epub ahead of print.

[27] Katz J, Weinrib A, Fashler SR, et al. The Toronto General Hospital Transitional Pain Service: development and implementation of a multidisciplinary program to prevent chronic postsurgical pain. J Pain Res 2015;8:695–702.