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van Wilgen, C.P.; Dijkstra, Pieter U. ; van der Laan, Bernard F.A.M.; Plukker, John T.H.M.; Roodenburg, Johannes

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SHOULDER AND NECK MORBIDITY IN QUALITY OF LIFE AFTER SURGERY FOR HEAD AND NECK CANCER

C. P. van Wilgen, PT,[1,2] P. U. Dijkstra, PT, MT, PhD,[1,2] B. F. A. M. van der Laan, MD, PhD,[3] J. Th. Plukker, MD, PhD,[4] J. L. N. Roodenburg, DDS, PhD[1]

[1] Department of Oral and Maxillofacial Surgery, University Hospital Groningen, PO Box 30.001, 9700 RB Groningen, The Netherlands. E-mail: c.p.van.wilgen@rev.azg.nl
[2] Department of Rehabilitation, University Hospital Groningen, Groningen, The Netherlands
[3] Department of Otorhinolaryngology, Head & Neck Surgery, University Hospital Groningen, Groningen, The Netherlands
[4] Department of Surgical Oncology, University Hospital Groningen, Groningen, The Netherlands

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Abstract: *Background.* Quality of life has become a major issue in determining the outcome of treatment in head and neck surgery with curative intent. The aim of our study was to determine which factors in the postoperative care, especially shoulder and neck morbidity, are related to quality of life and how these outcomes compared between patients who had undergone surgery and a control group.

Methods. We analyzed physical symptoms, psychological symptoms, and social and functional well-being at least 1 year after surgery and evaluated the differences in quality of life between patients who had undergone head and neck surgery and a control group.

Results. Depression scores contributed significantly to all domains of quality of life. Reduced shoulder abduction, shoulder pain, and neck pain are related to several domains of quality of life. The patient group scored significantly worse for social functioning and limitations from physical problems but scored significantly better for bodily pain and health changes.

Conclusion. Depression and shoulder and neck morbidity are important factors in quality of life for patients who have undergone surgery for head and neck cancer. © 2004 Wiley Periodicals, Inc. *Head Neck* **26:** 839–844, 2004

Keywords: cancer; head and neck; quality of life; shoulder; neck; morbidity

Correspondence to: C. P. van Wilgen

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In the last decade, quality of life has become a major issue in determining the outcome of treatment in patients who have undergone head and neck surgery with curative intent.[1] Quality of life is a multidimensional construct with contributions from several domains.[2,3] Morton[3] stated that 10 domains can be assessed in investigating quality of life in patients with head and neck cancer. These domains include physical aspects; psychological aspects; social well-being; and even economic, occupational, and domestic/family aspects.[2] Because quality of life has no clear theoretical model, the outcome of research on this multidimensional construct depends on the assumptions made by the researchers and the assessment tools used. In head and neck cancer research, these assumptions often include out-

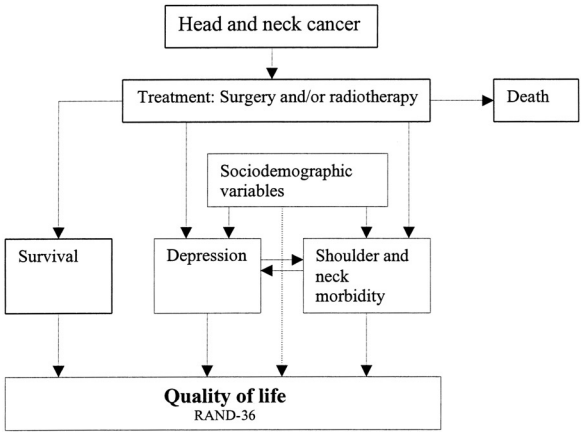

FIGURE 1. Model used to assess the influence of shoulder and neck morbidity and of depression on quality of life in patients with head and neck cancer.

come in the medical domains. Medical aspects that have been described as significant influences on quality of life are the following: site of tumor, TNM stage,[4] type of neck dissection,[5] resection or preservation of the spinal accessory nerve,[6] reconstruction through myocutaneous flaps, and postexcisional defects.[7]

In the long term after surgery, the medical domains are less important. In this phase, patients have to learn to cope with the consequences of the cancer treatment.[8] Some authors have described the following as consequences that have a significant influence on aspects of long-term quality of life: physical function, fatigue,[9] shoulder discomfort, neck tightness,[10] speech, eating,[11] and depression.[12] However, in none of these studies were the findings of a physical examination together with the findings of the assessment of emotional factors used to analyze long-term quality of life after head and neck surgery.

The purpose of this study was to explore the impact of shoulder and neck morbidity after head and neck cancer treatment, in addition to other domains, such as depression, education, and age, on quality of life (Figure 1). We analyzed physical symptoms, psychological symptoms, and social and functional well-being as a part of quality of life at least 1 year after surgery. Furthermore, we analyzed the differences in quality of life between patients who had undergone head and neck surgery and a control group.

PATIENTS AND METHODS

Patients with a history of neck dissection who had a standard appointment in the Department of Oral and Maxillofacial Surgery, Otorhinolaryngology Head & Neck Surgery, or the Department of Surgical Oncology were informed about the study by means of a letter. This letter was sent 1 week before the patients visited the outpatient department. During the appointment, patients were asked by the physician to participate in the study and to fill out an informed consent. All patients had undergone surgery in the period 1994 to 2000 by our multidisciplinary Head and Neck Oncology Group. Patients with recurrence of the tumor or patients unable to understand Dutch were excluded from the study. All patients were at least 1 year after neck dissection.

From the medical records of the participating patients and during a standardized interview, the following data were retrieved: sociodemographic

Table 1. Pearson's correlations between the domains of the RAND-36 and the significant outcome of the regression analyses.

	CES-D total	Shoulder abduction	Shoulder pain, surgical side	Shouler pain, nonsurgical side	Lateroflexion from surgical side	Neck pain, surgical side	Age	Follow-up	Sensibility
Physical functioning	−.38†	.55†	−.39†	−.17*	.29†	−.39†	−.20*	−.05	−.22†
Social functioning	−.63†	.09	−.18*	−.05	.07	−.26†	−.05	−.05	−.06
Limitations from physical problems	−.45†	.44†	−.42†	−.08	.28†	−.39†	−.02	−.01	−.23†
Role limitations from emotional problems	−.65†	.02	−.27†	−.10	−.07	−.31†	.11	.06	−.01
General mental health	−.74†	−.02	−.22†	−.07	−.02	−.27†	.01	−.01	−.09
Vitality	−.75†	.23†	−.26†	−.06	.06	−.45†	.12	.02	−.06
Bodily pain	−.46†	.45†	−.68†	−.36†	.29†	−.52†	.03	−.04	−.12
General health perception	−.51†	.26†	−.30†	.04	.10	−.29†	.05	.03	−.01
Health changes	−.19*	.03	.01	−.03	−.06	−.13	−.20*	−.19	.17*
CES−D total	—	−.15	.31†	.09	−.04	.38†	−.10	.01	.02

*$p < .05$.
†$p < .01$ (two-tailed).

data (sex, age, education, marital status, employment or social welfare, disability insurance) and follow-up. Patients were physically examined, and the range of motion of the shoulder on the surgical and nonsurgical sides (abduction, forward flexion) and of the neck (lateral-flexion toward and away from the surgical side) was measured. Range of motion of the shoulder and neck were measured with an inclinometer, in accordance with a standardized protocol. Sensibility was measured according to the anatomic levels at the lateral side of the head and neck, as described by Saffold et al.[13] Pain was assessed with use of a numbered visual analog scale (VAS). Patients were asked to indicate the mean pain intensity over the previous week for the head, neck (both sides), shoulders, and both arms. For patients who had undergone bilateral surgery, the (most) painful side was reported as surgical side, or, if no pain was present, the dominant side was determined to be surgical side.

Depression was assessed with the Centre for Epidemiological Studies Depression scale (CES-D); this instrument measures depression in a nonpsychiatric population.[14,15] The questionnaire consists of 20 items describing somatic and psychological symptoms of depression and is translated and validated for a Dutch population.[16] The CES-D is suitable for healthy populations and for patients with cancer.[17] A cutoff score of 16 or higher (range, 0–60) is used an indicator for possible clinical depression.[14]

Quality of life was assessed with the RAND-36 questionnaire[1,18]; this is the Dutch version of the

Table 2. Outcome of the regression analyses of the nine domains of the RAND-36.

RAND-36 domain	Variable	β	95% confidence interval for β	R^2
Physical functioning	Shoulder abduction	0.3	(0.2 to 0.3)	
	Depression	−0.7	(−1.0 to −0.3)	
	Neck pain	−9.3	(−16.6 to −2.1)	
	Age	−0.3	(−0.6 to −0.1)	
	Constant	70.8	(48.1 to 93.4)	0.44
Social functioning	Depression	−1.9	(−2.3 to −1.5)	
	Constant	95.0	(90.5 to 99.6)	0.39
Limitations from physical problems	Depression	−1.7	(−2.4 to −1.1)	
	Shoulder abduction	0.3	(0.2 to 0.5)	
	Shoulder pain	−14.9	(−28.0 to −2.0)	
	Constant	38.8	(14.7 to 62.8)	0.37
Role limitations from emotional problems	Depression	−2.3	(−2.8 to −1.9)	
	Constant	104.1	(98.7 to 109.5)	0.41
General mental health	Depression	−1.5	(−1.7 to −1.3)	
	Neck flexion to surgical side	−0.4	(−0.6 to −0.2)	
	Age	−0.2	(−0.4 to −0.0)	
	Constant	112.9	(99.0 to 126.9)	0.58
Vitality	Depression	−1.7	(−1.9 to −1.4)	
	Neck pain	−9.3	(−14.5 to −4.0)	
	Constant	83.3	(80.1 to 86.5)	0.59
Bodily pain	Shoulder pain	−19.2	(−25.2 to −13.3)	
	Depression	−0.6	(−0.9 to −0.3)	
	Shoulder pain*	−12.4	(−18.9 to −5.9)	
	Neck pain	−8.7	(−14.5 to −2.9)	
	Shoulder abduction	0.1	(0.0 to 0.2)	
	Constant	84.8	(74.2 to 95.4)	0.62
General health perception	Depression	−1.4	(−1.8 to −1.0)	
	Shoulder abduction	0.1	(0.0 to 0.2)	
	Social support	−7.8	(−15.4 to −0.3)	
	Constant	65.7	(52.0 to 81.4)	0.31
Health changes	Age	−0.4	(−7.2 to −0.1)	
	Depression	−0.6	(−1.0 to −0.2)	
	Sensibility	2.6	(0.6 to 4.6)	
	Follow-up	−2.7	(−4.8 to −0.5)	
	Constant	89.7	(69.2 to 110.2)	0.15

**All physical outcomes except shoulder pain as marked with an asterisk were on the surgical side.*
Note: Abduction is degrees (0–180); neck flexion, degrees (0–120); depression, CES-D (0–60), pain, visual analog scale (0–10); age, years; sensibility, areas with lost sensibility (0–6); follow-up, years; social support (martial status 0–1).

SF-36 extended with the domain health changes. The RAND-36 contains 36 items from which the following nine domains can be calculated: physical functioning, social functioning, role limitations because of physical problem, role limitations because of emotional problem, general mental health, vitality, bodily pain, general health perception, and health changes.[19] Responses are calculated as percentages, from 0% (poor health) to 100% (excellent health). Domains of the RAND-36 were calculated as described in the questionnaire's manual. Quality of life of our study population was compared with the data of a control group (age, 55–64) described in the manual.[18] The questionnaires were administered by the investigator.

Correlations were analyzed (with Pearson's correlation coefficient) between depression, shoulder abduction, shoulder pain (surgical and nonsurgical sides), lateroflexion of the neck away from the surgical side, neck pain, age, follow-up, sensibility, and the domains of the RAND-36.

The following items were entered (method stepwise forward) as independent variables into the linear regression: age, follow-up, sex (male/female), education (no education, elementary school/higher education), social support (living alone or married, living with somebody else), employment (working, housewife, volunteer/no employment), depression (CES-D), results of the VAS (0–10) for pain in the head, neck both sides, shoulders, and arms, range of motion of the neck and shoulders, and sensibility (number of areas, 0–6). The dependent variables were the RAND-36 domains.

Statistical analysis was performed with Social Package Social Science 10.0 (SPSS, Inc., Chicago, IL). Pearson's correlation (two-tailed) was used to analyze correlations between several variables and the RAND-36 domains. For the analyses of the two groups, an independent sample *t* test was used, and a 95% confidence interval of the differences was calculated.

RESULTS

A letter informing patients about the study was sent to 220 patients. One hundred fifty-five patients (70%) were included in the study. The mean age ± standard deviation (SD) was 61.3 ± 11.9 years. One patient did not understand several questions in the questionnaire, and therefore, only 154 questionnaires were included. One hundred four male and 51 female patients were assessed; the mean follow-up ± SD was 3.0 ± 1.7 years. The following types of neck dissection were performed: seven radical, 54 modified radical, 22 posterolateral, and 72 supraomohyoid neck dissections. Neck dissections were performed in 61 patients on the left side, 62 on the right side, and 32 bilaterally. One hundred seven patients received radiation therapy, 90 of them postoperatively.

The correlations between the RAND-36 domains and the postoperative outcomes are presented in Table 1. According to the calculations,

Table 3. Comparison of results between patients after neck dissection (mean age, 61.3) and the control group (age, 55–64). The mean differences and 95% confidence intervals are shown.

	Patients with head and neck cancer (n = 154)		Control group (n = 140)		Differences between groups	
RAND 36 domain	Mean	SD	Mean	SD	Mean difference*	95% confidence interval
Physical functioning	78.1	(24.4)	72.7	(24.4)	−5.4	−11.0 to 0.2
Social functioning	79.2	(26.8)	86.6	(21.4)	7.4†	1.8 to 13.0
Limitations from physical problems	63.0	(41.8)	76.5	(38.1)	13.5†	4.3 to 22.7
Role limitations from emotional problems	84.6	(32.4)	90.1	(24.5)	5.5	−1.1 to 12.1
General mental health	78.9	(18.5)	77.1	(18.7)	−1.8	−6.1 to 2.5
Vitality	66.5	(21.9)	67.0	(21.3)	0.5	−4.5 to 5.5
Bodily pain	80.8	(23.0)	74.7	(25.0)	−6.1†	−11.6 to −0.6
General health perception	65.1	(24.4)	64.4	(22.2)	−0.7	−6.1 to 4.7
Health changes	56.5	(23.9)	48.7	(15.4)	−7.8†	−12.5 to −3.1

Abbreviation: SD, standard deviation.
**A negative result indicates a better outcome for the neck dissection group.*
†Difference was statistically significant.

not only the depression scores but also shoulder and neck pain were significantly related to almost all domains for quality of life (Table 1).

Sixteen percent of the patients ($n = 25$) had a score of 16 or higher on the CES-D, which might indicate depression. The results of the multivariate linear regression of the domains of the RAND-36 are presented in Table 2. Depression scores contributed significantly to all domains in the physical domains and in the emotional domains. Furthermore, shoulder abduction, neck pain, shoulder pain, and age were significantly related to several domains of quality of life (Table 2).

The scores for patients after head and neck surgery were similar to those of the control group in five domains. Social functioning and limitations because of physical problems scored significantly lower in the patient group, but the patient group scored significantly better for bodily pain and health changes (Table 3).

DISCUSSION

Scores on the CES-D were related to all domains of long-term quality of life after head and neck surgery. Head and neck morbidity (decreased shoulder abduction, pain in neck and shoulder) and age were also related to several domains of quality of life. Patients, at least 1 year after head and neck surgery, differed little from a control group with respect to their quality of life. They scored significantly worse for social functioning and limitations because of physical problems but significantly better for bodily pain and health changes.

In published reports of patients after head and neck surgery, several postoperative factors have been described that interfere with postoperative quality of life: depression,[12] physical function, fatigue,[9] shoulder discomfort, neck tightness,[10] speech, and eating.[11] Most findings are similar to the findings in our study, although we did not include fatigue, speech, and eating in our regression analyses.

The 16% with symptoms of depression are almost similar to the percentages described by de Leeuw et al,[20] who also used the CES-D and described a prevalence of 21% 1 year after treatment. The effect of the factors reflected by the CES-D scores on patients with head and neck cancer may be discussed. Disturbances in eating and speaking, and fatigue are symptoms that may indicate depression; however, these disturbances are also direct consequences of cancer treatment. For instance, patients with a tracheostoma do have more problems with speaking, and after radiotherapy, patients may have more eating problems because of reduced saliva production. Thus, patients with scores of 16 or higher on the CES-D, indicating depression, may have a high score because of a depressed mood but may as well have a high score because of physical sequelae related to the cancer treatment. In this view, it can be discussed whether the cutoff scores for depression in patients with head and neck cancer should be higher or whether the depressed mood items and the somatic items should be presented separately.[21] In addition, this view may have consequences for postoperative care. Perhaps patients with mainly somatic items on the CES-D benefit more from a physical rehabilitation program, and patients with a high score on the basis of a depressed mood may be more suited to a psychosocial intervention.

Furthermore, the psychometric constructions of the RAND-36 and the CES-D have strong correlations, especially for mental health and vitality.[14] Despite this discussion, it is clear that depression is strongly related to quality of life in many patients, and, therefore, physicians should pay attention to signs of a depressed mood in the postoperative care.

Reduction in shoulder abduction and shoulder pain were significantly related to the outcome of four domains (physical functioning, limitations because of physical problems, bodily pain, general health perception) of the RAND-36. Shoulder morbidity is a well-known morbidity, especially after neck dissection in cases in which the spinal accessory nerve is involved.[22,23] In the standard postoperative care, range of motion of the shoulder and pain must be evaluated, and, when indicated, a specific rehabilitation program may be prescribed.[24]

The significantly worse outcome for limitations because of physical problems in the patient group compared with the control group shows that physical rehabilitation may be important; but the reduced social functioning and importance of depression show that, in addition to training of physical skills, psychosocial rehabilitation should also be addressed.[25]

Notable was the significantly better outcome in the pain domain for the patients compared with the control group. Although approximately 35% of the patients had pain related to the surgery, pain seemed to have less impact in the patient group. Perhaps patients with head and neck cancer more easily accept pain after treatment as

a side effect of a life-saving therapy. The better result on health changes in the head and neck cancer group can be expected after surgery and possible radiotherapy. Follow-up has a negative effect on health changes, because health changes decrease when the follow-up gets longer. Recovery of sensibility has a significant influence on health changes. This is often noticed by patients (eg, recovery of numbness in the earlobe).

We performed a cross-sectional study more than 1 year after surgery. A prospective study would have been preferable to identify possible preoperative morbidity. The results of our study, however, give a good indication of the relationships between quality of life and physical, emotional, and social aspects after head and neck surgery. Furthermore, the results show long-term consequences that may need attention in the postoperative care.

We chose to analyze quality of life with the consequences of the cancer treatment. It is known that variables related to surgery (such as TNM status, place of primary tumor, and type of neck dissection) are important to quality of life outcome. These variables, however, cannot be influenced by a rehabilitation program. We chose in our view the most important variables, besides shoulder and neck morbidity, that could interfere with quality of life. But in a multidimensional construct like quality of life, it can be discussed which variables should be added to regression analyses and which should not.

In conclusion, the physician should pay attention to not only the medical domains but also nonmedical factors in the long-term after surgery. Shoulder and neck morbidity and a depressed mood are important outcomes in quality of life. Outcomes on physical problems and social functioning were significantly lower for patients with head and neck tumors after treatment than for the control group.

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