Impaired quality of life after pneumonectomy: Who is at risk?

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Objective: After pneumonectomy, quality of life may be impaired in a proportion of patients because of the presence of symptoms causing severe limitations in daily activities. This is a prospective study on patients who have undergone pneumonectomy for cancer, assessing quality of life modifications 6 months after surgery.

Methods: Beginning in August 2006, candidates for pneumonectomy had their quality of life assessed by the European Organization for Research and Treatment of Cancer questionnaire (QLQ-C30+LC13) preoperatively and at 1, 3, and 6 months after surgery. Poor quality of life at 6 months was defined as global health values 10% or more below baseline values. The impact of several clinical variables was tested to discover predictors of poor postoperative quality of life.

Results: Forty-one of the 50 patients enrolled in the study had a complete quality of life follow-up by January 2008, representing the population of the study. Six months after pneumonectomy, global health showed a minimal impairment in the whole population (baseline 60.4 ± 26.5 , at 6 months 56.3 ± 24.2 , $P = .15$). Ten patients (24.4%) were identified as having poor quality of life at 6 months. Age of 70 years or more was identified as a significant risk factor for poor 6-month quality of life using multivariate analysis (odds ratio, 1.13; 95% confidence interval, 1–1.26). The baseline global health score was the strongest predictor of postoperative global health quality of life (odds ratio, 0.16; 95% confidence interval, 0.02–0.46; $P = .0086$).

Conclusion: The overall quality of life after pneumonectomy was impaired in 25% of surviving patients at 6 months after surgery; thus, this aspect of recovery should be routinely discussed with patients before pneumonectomy. Patients aged 70 years or more and those with low preoperative quality of life seem to be at risk for unsatisfactory quality of life after surgery. (*J Thorac Cardiovasc Surg* 2010;139:49-52)

Quality of life (QoL) is an important issue in oncology,^{1,2} not only defining the absence of disease but also measuring physical, mental, and social well-being.³ Lung cancer surgery may affect QoL,^{4,5} particularly when pneumonectomy is required to obtain a radical resection.⁶ Apart from early postoperative mortality,⁷⁻¹⁰ pneumonectomy has been reported as being extremely detrimental in terms of QoL because of a greater incidence of dyspnea and a decrease in physical functions, compared with patients undergoing less dramatic resections.⁵ The impact of this impairment remains controversial, and little information is present in the literature. This study was designed to prospectively monitor QoL after pneumonectomy, with the aim of defining the potential risk factors of poor postoperative QoL.

MATERIALS AND METHODS

A prospective observational study was designed to assess QoL modifications during the first 6 months after surgery in a series of 50 consecutive patients undergoing pneumonectomy for lung cancer at the Thoracic Surgery Department of the European Institute of Oncology. During the considered period, a postoperative predicted forced expiratory volume in 1 second less than 30% was considered a contraindication to pneumonectomy.

All patients for whom a pneumonectomy was planned were considered eligible for the study, thereafter excluding those patients who underwent lesser resections. QoL was assessed at admission and 6 months after surgery by the administration of the Italian version of the European Organization for Research and Treatment of Cancer questionnaire QLQ-C30 and the specific lung module LC13. Raw scores were then standardized by linear transformation (range, 0–100). This questionnaire, widely used in thoracic oncology, was chosen because of its focus on psycho-social aspects and typical symptoms of patients treated by multimodality protocols, commonly used in our practice.

The QLQ-C30 assessment focused on global QoL (global health [GH]), functional domains (physical, role, emotional, cognitive, and social) and 8 symptoms (fatigue, nausea and vomiting, pain, dyspnea, insomnia, appetite loss, constipation, and diarrhea). High scores for the functional and overall QoL scales indicate a higher/healthier level. High scores for the symptom scales represent a higher level of symptoms/problems. Missing data were managed following European Organization for Research and Treatment of Cancer Quality of Life Group guidelines.^{2,11} If at least half of the items from the scale were answered, it was assumed that the missing items had values equal to the average of those items that were present for that respondent. Otherwise, the score was set to missing.

Comparison of QoL scores at baseline and at 6 months was performed by the use of a *t* test for paired values. Impaired QoL at 6 months was defined as a decrease in the GH status score of at least 10% from the baseline, because lower differences are usually perceived by patients as minimal.¹² Impaired

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Abbreviation and Acronym

QoL = quality of life

QoL at 6 months was considered as an outcome variable in a logistic regression model, using 10 covariates (age, sex, smoking status, American Society of Anesthesiologists score, postoperative predicted forced expiratory volume in 1 second, neoadjuvant treatment, side of pneumonectomy, type of pneumonectomy, postoperative complications, and adjuvant treatment). The risk ratio and corresponding 95% confidence intervals were reported for covariates considered clinically relevant or statistically significant at the .05 significance level (Wald chi-square test) and then included in the final multivariate model.

RESULTS

During a period of 13 months, 240 lung cancer resections were performed, including 56 patients considered eligible for pneumonectomy, 6 of whom underwent bronchoplasty procedures and were thus excluded from the study. Three patients died postoperatively, and 2 additional patients died within 3 months of surgery. Items expressing GH status remained missing for 4 patients and were excluded from the analysis. The final study population comprised 41 patients. Their clinical characteristics are expressed in Table 1.

Six months after pneumonectomy, GH showed no significant impairment in terms of the population as a whole (baseline 60.4 ± 26.5 , at 6 months 56.3 ± 24.2 , $P = .15$, Figure 1). An increased negative effect was recorded in the social functioning item (81.7 ± 29.7 vs 71.9 ± 31 , $P = .002$, Table 2), the dyspnea score, the pain score, and the nausea and vomiting score. Most patients also reported increased financial difficulties after surgery ($P = .005$). On the other hand, patients' emotional functioning (76.3 ± 18.3 vs 88 ± 18.2 , $P < .0001$) and cognitive functioning (87.8 ± 19 vs 95.1 ± 13.6 , $P = .008$) were reported as improved.

Ten patients (24.4%) were defined as having impaired QoL at 6 months. Of the 4 factors identified at univariate analysis (age, induction treatment, postoperative complications, and adjuvant treatment), only the factor of age 70 years or more was identified as a risk factor for the occurrence of 6-month impaired QoL (odds ratio 1.13; 95% confidence interval, 1.1–2.6).

Analysis of the correlation between preoperative and 6-month GH scores revealed a linear relationship for patients with low QoL at baseline. The baseline GH score was the strongest predictor of postoperative QoL (odds ratio, 0.16; 95% confidence interval, 0.02–0.46; $P = .0086$). The corresponding receiver operating characteristic curve expresses a notably high area under the curve estimate (0.92).

DISCUSSION

QoL should be routinely assessed when major surgery is required in cancer treatment. This is particularly true in the

TABLE 1. Patient characteristics in the study population

Demographics	N	Mean $\pm$ SD	Median	Min-Max
Age (y)	41	60 ± 9	61	36–77
Respiratory functions				
FEV ₁ (%)	40	83.1 ± 15.9	84.1	53–136
DLCO/Va (%)	40	91.2 ± 16.4	89.7	59–126
Perfusion (%) of the removed lung	39	35.2 ± 10.1	35.0	6–56
	Counts		(%)	
Gender	Female	9	22.0%	
	Male	32	78.0%	
Neoadjuvant treatment	21		53.8%	
Surgical details				
Right pneumonectomy	14		34.1%	
Left pneumonectomy	27		65.8%	
Extended procedure	8		19.5%	
Postoperative complications				
Reoperation	6		14.6%	
ARDS	1		2.4%	
Bronchial fistula	1		2.4%	

SD, Standard deviation; ARDS, acute respiratory distress syndrome; FEV₁, forced expiratory volume in 1 second; DLCO/Va, diffusion capacity for carbon monoxide adjusted for alveolar volume.

case of pneumonectomy, which is often performed after neoadjuvant treatment (in cases of T4 tumors or minimal N2 disease responding to chemotherapy at the European Institute of Oncology) or before adjuvant therapy, when the detrimental effects of a treatment on QoL have a cumulative effect on subsequent treatments.

This series reported only minimal overall QoL impairment after pneumonectomy, probably because of the balance between the worsening of symptoms and the improvement of psychologic well-being, due to the positive expectation of having their cancer definitively cured by surgical intervention.

Nevertheless, 1 of 4 patients registered a significant QoL decrease. The cause of that decrease may be represented

FIGURE 1. Six months after pneumonectomy, GH showed a minimal impairment in the whole population (baseline 60.4 ± 26.5 , at 6 months 56.3 ± 24.2 , $P = .15$).

TABLE 2. Comparison of preoperative and postoperative scores from the European Organization for Research and Treatment of Cancer QLQ-C30 and LC-13 questionnaires

Questionnaire	Before pneumonectomy		Six months after pneumonectomy		P value
EORTC QLQ-C30	Mean	SD	Mean	SD	
GH status/QoL					
GH status QL2	60.4	26.5	56.3	24.2	.15
Functional scales					
Physical functioning PF2	76.3	25.9	71.1	25.6	.82
Role functioning RF2	77.8	30.7	74.4	32.9	.09
Emotional functioning EF	76.3	18.3	88	18.2	<.001
Cognitive functioning CF	87.8	19	95.1	13.6	.008
Social functioning SF	81.7	29.7	71.9	31	.002
Symptom scales/items					
Fatigue FA	25.3	24.8	29.5	24.7	.08
Nausea and vomiting NV	4.5	11.2	11	16.9	.02
Pain PA	18.7	31.4	29.7	31.5	<.001
Dyspnea DY	26	29.3	35.8	28.3	.38
Insomnia SL	18.3	30.1	14.6	26.9	.43
Appetite loss AP	13	20.9	18.7	23.6	.15
Constipation CO	17.1	22.5	11.4	19.2	.11
Diarrhea DI	4.9	14.1	4.1	11	.11
Financial difficulties FI	12.5	22.2	5.8	16.7	.005
EORTC LC13					
Symptom scales/items					
Dyspnea LCDY	20.2	20.6	32.5	20.2	<.001
Coughing LCCO	30	22.4	28.4	20.5	.80
Sore mouth LCSM	3.3	10.1	4.2	13.5	1
Dysphagia LCDS	5.8	16.7	10	18.8	.12
Peripheral neuropathy LCPN	7.5	14.1	5	14.2	.54
Alopecia LCHR	6.7	17.2	12.2	28.6	.24
Pain in chest LCPC	6.7	15.5	8.5	19.8	.56
Pain in arm or shoulder LCPA	7.5	20.6	15	26.1	.09
Pain in other parts LCPO	21.6	34.7	23.9	31.5	.84

EORTC, European Organization for Research and Treatment of Cancer; GH, global health; QoL, quality of life.

by cardiopulmonary response to surgery, because that figure is extremely close to the percentage of patients who failed to increase their cardiac index after pneumonectomy (20%).¹³ It is reasonable to assume that impaired cardiac response may translate into impaired QoL; thus, treating the first would consequently improve the second. Unfortunately, this interpretation remains speculative, as to date, no existing evidence confirms this hypothesis.

As previously reported,¹⁴ no clinical parameter apart from age was identified as a risk factor for QoL impairment 6 months after pneumonectomy. Analysis of score distribution suggested that, in patients with low preoperative QoL, postoperative QoL was not affected by pneumonectomy. Patients with high QoL levels at baseline however, were more likely to exhibit QoL impairments of unpredictable nature.

An additional QoL issue is how to consider patients who died within 6 months of pneumonectomy. These patients were not included in our analysis and were registered as having a QoL score of 0 because QoL cannot be expressed without patients' judgment. Nevertheless, these deaths are

usually the final event in a rapid and progressive decline in QoL, which usually remains unreported, constituting an additional risk of which patients should be informed.

CONCLUSIONS

The overall QoL after pneumonectomy was impaired in 25% of cases, an aspect that should be routinely discussed with patients before surgery. Patients aged 70 years or more and those with low preoperative QoL seem to be at highest risk for reduced QoL after surgery.

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