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On the Receiving End—II. Linear Analogue Self-assessment (LASA) in Evaluation of Aspects of the Quality of Life of Cancer Patients Receiving Therapy

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Abstract—*Linear analogue self-assessment (LASA) scales were used to measure general well-being and specific factors (mood, pain, nausea and vomiting, appetite, breathlessness, physical activity) in patients receiving therapy for malignant melanoma, small cell bronchogenic carcinoma (SCBC) or ovarian cancer. Among the patients with SCBC and melanoma, high correlations were observed between LASA scores for general well-being, mood and appetite. There was a significant relationship between performance status and LASA scores for general well-being, pain and appetite. Among patients with ovarian cancer, there was a significant association between performance status and LASA scores for general well-being, breathlessness and physical activity. Objective response category was related to change in LASA scores for pain. Changes in LASA scores during treatment reflected increased morbidity during radiotherapy in patients also receiving chemotherapy for SCBC. The LASA technique provides a convenient method for the assessment of quality of life in patients receiving cancer therapy, and potentially allows comparison of patient perception of treatment-related morbidities.*

INTRODUCTION

DEFINITION of the quality of life is essentially a philosophical problem. Scales designed to measure quality of life are therefore hard to validate. Such scales would be useful when deciding whether a toxic palliative treatment is worthwhile; for this purpose a relative rather than an absolute measure of quality of life is adequate, and the scale need not be interpreted identically by each patient, since comparisons may be made within individual cases. Several such scales have been described. Priestman and Baum [1] used linear analogue self-assessment (LASA) scales, a standard technique in psychological testing, to measure 10 arbitrarily chosen aspects of the quality of life of patients with cancer, and found that the scores correlated with objective response to therapy. They later expanded the technique to examine 25 variables in patients receiving either hormonal or cytotoxic therapy for breast cancer [2]. Spitzer *et al.* [3] devised a questionnaire style 'Quality of Life Index' (QLI), attempting an overall description of quality of life based on a set of predefined contributing factors equally weighted. The anamnestic comparative self-appraisal (ASCA) scale of Bernheim [4] is similar to the LASA technique, though it places a valuable stress on the change of status rather than an absolute score. A complaint questionnaire has also been developed by van Dam *et al.* at the Netherlands Cancer Institute [5].

We have previously investigated patient perception of the side-effects of cancer chemotherapy [6]. The techniques used were designed to list problems and rank them in order of severity, but the magnitude of the differences in severity was not measured. We therefore applied a subset of the

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LASA scales used by Priestman and Baum [1] to evaluate general well-being and the severity of certain specific problems perceived by patients receiving therapy for malignant melanoma, small cell anaplastic bronchogenic carcinoma (SCBC) and ovarian cancer to seek correlations between LASA scores and objective measures such as performance status and response to therapy.

MATERIALS AND METHODS

Thirty patients with metastatic malignant melanoma receiving phase II chemotherapy with the investigational agents mitolactol, mitoxantrone or bisantrene, 42 patients with SCBC receiving radiotherapy and combination chemotherapy with vincristine, cyclophosphamide and doxorubicin and 39 patients with ovarian cancer receiving either oral chlorambucil or intravenous cisplatin, with or without oral chlorambucil, consented to participate in this study. LASA forms used consisted of a series of lines each 10 cm long and labelled with the name of a variable. For patients with melanoma and SCBC the five lines were labelled 'general well-being', 'mood', 'pain', 'nausea and vomiting' and 'appetite'. For the patients with ovarian cancer, as part of a multicentred clinical trial, a 4-line LASA form was used, measuring general well-being, pain, breathlessness and physical activity. The ends of the lines were marked with adjectives describing extremes of the variable, the adjective at the left end of the line describing the 'better' extreme. The patient was asked to mark each line to indicate the average level of that variable over the period since the last assessment. A LASA form was completed before treatment and at intervals thereafter, usually in the clinic just before each cycle of chemotherapy. Performance status and response category were recorded at each assessment using the WHO-recommended criteria [7]. Sequential assessment of the impact of treatment was examined by calculating the difference between initial and follow-up LASA scores for each LASA variable on each patient: a negative change represented improvement and a positive change deterioration. Similarly, changes in ECOG performance status were recorded. Standard linear least-squares techniques were used for correlation and regression, even though some of the response variables were grouped into a small number of categories [8].

RESULTS

Altogether, 506 LASA forms were completed by 110 patients, 30 with melanoma, 41 with SCBC and 39 with ovarian cancer.

Table 1. *Correlation coefficients between LASA scores*

Melanoma and SCBC: all follow-ups ($n = 240$)				
Mood	.65			
Pain	.28	.21		
N & V*	.35	.22	.11	
Appetite	.60	.42	.14	.38
	General well-being	Mood	Pain	N & V
Melanoma and SCBC: patient averages ($n = 71$)				
Mood	.71			
Pain	.50	.47		
N & V	.18	.04	.07	
Appetite	.55	.38	.23	.34
	General well-being	Mood	Pain	N & V
Ovarian cancer: all follow-ups ($n = 266$)				
Pain	.51			
Breathlessness	.49	.37		
Physical activity	.72	.49	.46	
	General well-being	Pain	Breathlessness	
Ovarian cancer: patient averages ($n = 39$)				
Pain	.41			
Breathlessness	.39	.59		
Physical activity	.76	.52	.45	
	General well-being	Pain	Breathlessness	

*Nausea and vomiting.

Correlations between LASA scores

For the patients with melanoma and SCBC, LASA scores for general well-being, mood and appetite were closely related to each other, but scores for pain and nausea/vomiting were largely independent. For the patients with ovarian cancer, all four LASA scores were correlated to approximately the same extent with each other, the largest correlation coefficient being between scores for general well-being and physical activity (Table 1). Similar correlations were observed whether all follow-up values were included or whether the analysis was confined to the average LASA score for each patient, indicating that the correlations were not due to 'within-patient' effects (Table 1).

Relation between ECOG status and LASA scores

For the melanoma and SCBC patients, there were 190 cases for which both ECOG performance status and LASA scores were measured on the same patient at the same time. ECOG performance status was best predicted by an almost equally weighted average of LASA scores for general well-being, pain and appetite, which accounts for about one-third of the variance. The equation was:

$$\text{ECOG} = 0.087\ L1(\text{well-being}) + 0.081\ L3(\text{pain}) + 0.070\ L5(\text{appetite})$$
$$(r^2 = 0.31,\ t1 = 3.5,\ t3 = 4.0,\ t5 = 3.1,\ 185\ \text{d.f.}).$$

For the ovarian cancer patients, LASA scores for general well-being, breathlessness and physical activity, but not for pain, enter into the equation for predicting ECOG, accounting for over half of the variance, as follows:

$$\text{ECOG} = 0.103\ L1(\text{well-being}) - 0.089\ L3(\text{breathlessness}) + 0.230\ L4(\text{physical activity})$$
$$(r^2 = 0.53,\ t1 = 4.7,\ t3 = -3.2,\ t4 = 8.1,\ 254\ \text{d.f.}).$$

When the data for all patients were pooled using only the two common LASA measures (general well-being and pain), there was still a significant relationship, accounting for over one-third of the variance, with general well-being the dominant contributor:

$$\text{ECOG} = 0.173\ L1(\text{well-being}) + 0.055\ L2(\text{pain})$$
$$(r^2 = 0.34,\ t1 = 14,\ t2 = 3.4,\ 443\ \text{d.f.}).$$

Response, ECOG performance status and LASA scores

In order to explore the relationship between objective tumour response category and LASA scores, a series of summary measures was calculated for each patient (Table 2). Stepwise regression was performed to see whether best response category could be predicted from these variables. For all patients, the relation was as follows:

$$\text{best response} = 2.34 + 0.341(x6) + 0.094(x4 - x2)$$
$$r^2 = 0.10$$

The relationship to change in LASA pain score ($x4 - x2$) was highly significant ($P < 0.01$), while that for ECOG status ($x6$) was less significant ($0.05 < P < 0.10$).

For patients with melanoma, the relation was:

$$\text{best response} = 3.15 - 0.146(x6) + 0.184(x4 - x2)$$
$$r^2 = 0.22.$$

However, the relationship for ECOG ($x6$) was not significant ($P > 0.10$) and that for change in LASA pain score was significant only at the $P < 0.05$ level.

For patients with SCBC or ovarian cancer, inclusion of the additional variables (Table 2) yielded the following relation:

$$\text{best response} = 1.76 + 0.660(x6) + 0.085(x4 - x2) + 0.161(x9 - x8)$$
$$r^2 = 0.20.$$

All coefficients were significant at the $P < 0.05$ level.

That is, weight loss ($x9$-$x8$) was associated with

Table 2. Summary measures used in regression analysis

For all patients:	
$x1$	Initial LASA score for general well-being
$x2$	Initial LASA score for pain
$x3$	Value of LASA score for general well-being having greatest departure from initial value
$x4$	Value of LASA score for pain having greatest departure from initial value
$x5$	Baseline ECOG status
$x6$	Minimum ECOG status
For patients with SCBC or ovarian cancer:	
$x7$	Maximum recorded toxicity score for nausea and vomiting
$x8$	Baseline weight
$x9$	Maximum weight

worse response category, but change in LASA pain score and minimum ECOG score remained significant.

Descriptive application of LASA scores

Sequential values of LASA scores for well-being and ECOG status for patients with SCBC are plotted in Fig. 1. The treatment protocol involved radiotherapy to the mediastinum and brain, given during the third and fourth cycles of chemotherapy. Both the ECOG score and the LASA score for general well-being showed parallel and marked deterioration during the period of radiotherapy, with subsequent improvement (Fig. 1).

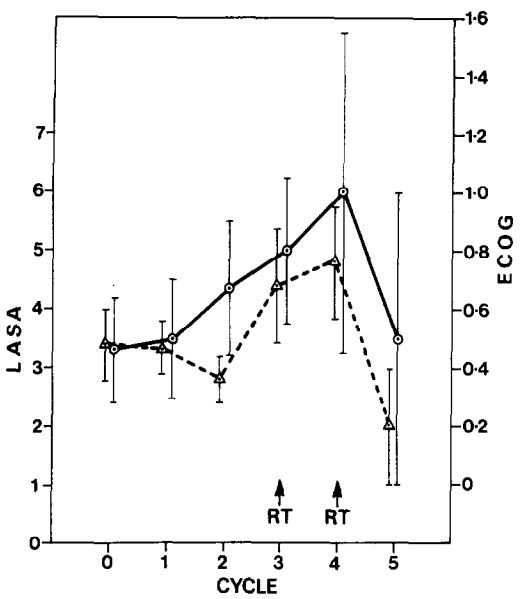

Fig. 1. Performance status (ECOG scale ○) and LASA score for general well-being (△), each expressed as mean ± 1 S.D., by treatment cycle number in patients with small cell bronchogenic carcinoma receiving chemotherapy with vincristine, cyclophosphamide and doxorubicin at 3-week intervals. RT denotes cycles including radiotherapy.

DISCUSSION

Assessment of quality of life of patients receiving cancer treatment is an essential part of the practice of clinical oncology, especially when the aim of treatment is palliative. Can this assessment be quantitated? If so, it might facilitate comparison of the subjective outcome of treatments in a clinical trial. Lack of philosophical agreement probably precludes the definition of any absolute unit of quality of life, but relative scales have been devised which allow comparison of some aspects of quality of life before, during and after treatment. The LASA technique was first applied to cancer patients by Priestman and Baum [1], and the ACSA scale of Bernheim [4] stresses sequential comparison. We have applied the LASA technique to groups of patients receiving therapy for malignant melanoma, SCBC and ovarian cancer.

We observed a significant association between LASA scores recorded by patients and an objective parameter, the ECOG performance status, which has prognostic significances both in the present study and others [9]; this association provides a contact with objective reality in an otherwise subjective area, and therefore lends support to the validity of the LASA scores.

The size and selection of the set of LASA variables (i.e. the names at the ends of the lines) which we measured was arbitrary. Whether one should aim at a single global index of quality of life or at a comprehensive set of separate measures of individual aspects depends on the use to which the answer will be put. If it is to guide the choice between two treatment alternatives an overall measure of the impact of each is required, whereas if a detailed exploration of side-effects is sought a larger number of questions would be preferred.

Among the LASA variables we measured, the strong correlation between scores for general well-being and those for mood and appetite (Table 1) supports the role of the general well-being score as a global scale, whereas the scores for pain and nausea and vomiting describe specific aspects of disease or treatment.

The value of the LASA scale for general well-being is illustrated in the example shown in Fig. 1. In patients with SCBC, the trend in LASA score was generally similar to that in ECOG performance status, except that in the first two cycles the doctor's assessment of physical performance showed slight deterioration while the patient's perception of general well-being, presumably including factors other than physical activity, showed steady improvement (i.e. decrease), interrupted only by the additional morbidity of radiotherapy.

The QLI uniscale described by Spitzer *et al.* [3] gives a simple global assessment of quality of life, but it is somewhat limited in its generality by the imposition of arbitrary definitions of what constitutes 'highest' and 'lowest' quality of life. We have previously shown that the relative importance attached to various side-effects of therapy is influenced by patient factors such as age, sex, marital status and domestic situation, as well as by diagnosis, treatment and response [6]. It seems reasonable to expect that other factors contributing to overall quality of life will be perceived in no less diverse a fashion. It may be better to allow the individual to weigh various factors according to personal preference. This could be done using a single LASA line, perhaps called 'overall quality of life', accompanied by

instructions explicitly stating that this will have a different meaning for different people, and inviting the patient to mark the line in accordance with an individual overall perception.

Detailed assessment of side-effects of therapy might be improved by a combination of the LASA technique with the approach used in our earlier study [6]. Patients could be invited to choose those side-effects which applied to them and then to express the severity of those side-effects using LASA scales relating only to the side-effects selected. LASA scores for individual side-effects would also be valuable in the application of decision theory to cancer treatment [10].

Further development of quantitative scales to measure specific and global aspects of quality of life will allow more precise evaluation of the cost-benefit balance inherent in the administration of any morbid therapy.

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