Health-related quality of life in patients under long-term oxygen therapy: a home-based descriptive study

J-P. JANSSENS*, T. ROCHAT, J-G. FREY, N. DOUSSE, C. PICHARD and J-M. TSCHOOP

Original Articles


Introduction

Approximately 6% of the general population suffer from chronic obstructive pulmonary disease (COPD). Fifty percent of these patients have a limited activity related to their respiratory impairment (1,2). Of these, 0-3% suffer from chronic hypoxaemia (estimated prevalence: 15–20 per 100 000 inhabitants); they have a poor prognosis with a 2-yr survival of approximately 50% (3). Long-term oxygen therapy (LTOT) was shown to clearly improve survival (3,4), pulmonary haemodynamics (5,6) and exercise capacity of these patients (7). Long-term oxygen therapy has thus become a standard and widely accepted treatment for stable hypoxic (<55 mmHg or 7.3 kPa) patients with chronic respiratory insufficiency (COPD and mixed or restrictive disorders). However, LTOT does not seem to diminish the average number or length of hospitalizations of hypoxic COPD patients; indeed, the Medical Research Council study (3) shows that number of days spent in hospital does not differ between patients under LTOT, and a control...
group. This is an important issue since frequency and length of hospitalizations are most probably contributive to impaired quality of life.

Furthermore, several authors suggest that, in contrast with a clear benefit on survival, and physiological parameters, LTOT causes only modest improvements in neuropsychological functioning — impaired in chronic hypoxic respiratory disease — and does not seem to bring any appreciable change in emotional status or general life quality (8,9). This is also a most important issue, since available studies describe a high level of emotional and mood disturbances in hypoxic COPD and generic scores of quality of life show a severe impairment for these patients in most domain tested (8,10–12).

The aim of the present study is to describe the health-related quality of the life (HRQL) of patients under LTOT directly assessed at home, to determine the prevalence of emotional disturbances in this group of patients, to identify parameters possibly relevant to HRQL through the use of disease-specific HRQL instruments, and to analyse the changes in these items over a 1-yr observation period.

Patients and Methods

This study was conducted in the Canton of Valais, an area in the Swiss Alps with a population of 270,000 inhabitants. All patients under LTOT in this area have been evaluated by a referral centre (Centre Valaisan de Pneumologie, Crans-Montana) and have received a 2-day training regarding LTOT (13); they were all hypoxaemic under room air (PaO₂ <55 mmHg or 7.3 kPa) when LTOT was started; specialized nurses visited the patients at home, for clinical assessment and monitoring of compliance, at approximately 3-monthly intervals.

PATIENTS (DATA EXPRESSED AS MEAN ± SD)

This study began on 1 March 1994; at that date, 123 patients were under LTOT. Seventy-nine patients (52 men, 77 women, aged 68 ± 11 years, range: 15–86) agreed to participate to the present study. These patients had been under LTOT for 34 ± 24 months (median: 24 range: 2–106), for 15 ± 4.5 h day⁻¹. Diagnoses are listed in Table 1. None of these patients had received antibiotics or been hospitalized for exacerbation of respiratory symptoms within 1 month before evaluation. Forty-one patients (54%) had been hospitalized within the past year (mean length of stay for these patients, 51 ± 33 days, n=41). Thirteen patients (16%) were active smokers, 42 ex-smokers (54%) and 24 non-smokers (30%). (Active smoking is considered as a contra-indication to LTOT: patients currently smoking had resumed their habit after initiation of LTOT.) Average body-mass index was: 24.4 ± 5.2 kg m⁻². 25% of patients were malnourished (weight <90% of ideal body weight) (14).

Of the initial 123 patients, 35 men (60 ± 21 years of age) and nine women (74 ± 8 years of age) were not included. Thirty-four patients declined to enter the present study (27%); eight patients (6%) died before evaluation could be performed, and two stopped LTOT.

PULMONARY FUNCTION TESTING

Spirometric measurements were performed with a Vitalograph C® (Compact spirometer, Maids Moreton House, Buckinghamshire, U.K.), according to the recommendations of the American Thoracic Society (15). The best of at least three consecutive measurements were recorded. The spirometer was recalibrated with a calibration syringe (Model M20, Gould, Dayton, U.S.A.) before performing measurements for every new patient. Forced expiratory volume in 1 s (FEV₁), forced vital capacity (FVC), and FEV₁/FVC are expressed as a percentage of predicted values.

Maximal inspiratory and expiratory pressures were measured with a Mouth Pressure Meter® (Precision Medical Ltd, Thornton Rd. Ind. Est., Pickering U.K.), recently validated by Hamnegard et al. (16). Peak inspiratory pressures (PI max) were measured at residual volume, and peak expiratory mouth pressures (PE max) were measured at total lung capacity. Three to six manoeuvres were done with the goal of the highest two matching within 10%. Data
were discarded if the pressure was held less than 1 s (the Mouth Pressure Meter® has an integrated software which auto-calibrates, and eliminates short samples) (17).

Blood oxygen saturation was measured with a portable pulse oximeter (BCI 3301®, Rockwood Drive, Waukesha, WI, U.S.A.). Measurements were recorded under room air conditions, after at least 15 min of resting, and under prescribed flow of oxygen, after 15 min.

MEASUREMENT OF AVERAGE DAILY DISTANCE WALKED

Each patient received a podometer (Kilometerzahler®, K & R, Freiburg, Germany), and was asked to wear it attached to his waist for 7 consecutive days. The podometer records the oscillations caused by each step, and transcribes them into metres walked. Individual calibration was performed by having patients walk 20 m, calculating the mean length of step, and reporting this value on a scale on the podometer.

ASSESSMENT OF DYSPNOEA (FIGS 1 AND 2)

Resting dyspnoea was scored using a modified Borg scale. Data are expressed on a 0–10 scale (0=minimal dyspnoea, 10=maximal dyspnoea) (18,19).

An oxygen-cost diagram was used to quantify the effort above which patients thought their breathlessness would not allow them to go; results are also expressed in millimetres (0=maximal impairment, 100=no impairment) (20).

HEALTH-RELATED QUALITY OF LIFE INSTRUMENTS

The 'Hospital Anxiety and Depression' questionnaire (HAD) was used to score for anxiety or depressive disorders: it contains 14 multiple choice-type questions; seven questions are oriented towards detection of anxiety disorders and seven towards detection of depression. HAD has been validated in French (21). Answers are scored for ‘anxiety’ (HAD A) and ‘depression’ (HAD D), with scores ranging from 0 to 21 for each category. Zigmond et al. (22) describe scoring as follows: 0–8, no evidence for depressive or anxiety disorders; 8–10, borderline values suggestive of depression or anxiety; above 10, abnormal values with a high specificity for anxiety or depressive disorders. HAD scores ≥8 have a sensitivity and a specificity of 76% for diagnosing depressive disorders. Scores ≥11 have a sensitivity of only 52%, but a specificity of 94%. For the present study, a cut-off value of ≥11 was used to define patients suffering from anxiety or depressive disorders.

The St George Respiratory Questionnaire (SGRQ) was used for HRQL measurement at follow-up visit. (A validated version in French was not available at the beginning of this study). The SGRQ is a disease-specific HRQL measurement instrument which contains 76 items divided into three sections: ‘Symptoms’ relates to respiratory symptoms, their frequency and severity; ‘Activity’ relates to activities that cause or are limited by breathlessness; and ‘Impacts’ covers social functioning and psychological disturbances resulting from respiratory disease. A score is calculated for each section, as well as a total score. A database of SGRQ scores for normal subjects without any history of respiratory disease (n=74, mean age: 46, range: 17–80, FEV1, 95% predicted) is supplied by the authors of the SGRQ. Reference values for normal subjects are 12 (range: 9–15) for ‘Symptoms’ score, 9 (range: 7–12) for ‘Activity’ score, 2 (range: 1–3) for ‘Impacts’ score, and 6 (range: 5–7) for total score. Higher scores are related to increasing

![Fig. 1. Left: Borg scale used for measuring resting dyspnoea; Right: Values obtained in 79 patients. Horizontal bar indicates median value for Borg scale scores.](image-url)
HEALTH-RELATED QUALITY OF LIFE IN PATIENTS UNDER LONG-TERM OXYGEN THERAPY

Brisk walking uphill
Medium walking uphill
Slow walking uphill
Bedmaking
Washing yourself
Sitting
Sleeping

Fig. 2. Left: Oxygen-cost diagram: the oxygen-cost diagram quantifies the maximum effort a patient can sustain without being limited by dyspnoea. Right: Results for 79 patients: horizontal bar indicates median value.

impairment or severity of symptoms (range 0–100) (23,24). The SGRQ has been recently validated in French by Briançon et al. (25).

Attending physicians were asked to quantify the quality of life of their patients by using a simple validated index [QL-index, Spitzer et al. (26)] which was sent to all attending physicians. This score consists of a visual analogue scale, with scores recorded between 0 (very poor) and 100 (excellent).

RECORDING OF COMPLIANCE TO LTOT

Visiting nurses kept 3-monthly records of oxygen extractor meters totaling number of hours of effective use. This allowed for calculation of average daily use, and estimation of compliance to treatment. Since all patients had been informed of the necessity of taking oxygen at least 15 h day$^{-1}$ during a short 48-h hospitalization (13), compliance to treatment was defined as the percentage of patients using their oxygen extractors ≥15 h day$^{-1}$.

INITIAL EVALUATION

All patients willing to participate in the present study were visited by the investigating physician and a registered nurse. Clinical assessment and all measurements were performed at the patient’s home.

The initial examination covered: relevant medical history, physical examination, pulmonary function testing, assessment of dyspnoea, anthropometric measurements (body weight and height), average daily distance walked, health-related quality of life, and compliance to LTOT.

FOLLOW-UP STUDY

Approximately 1 yr after the initial evaluation, the investigating physician returned for a follow-up visit. The following parameters were measured during this second visit: FEV$_1$, CVF, $S_{O_2}$ under room air and oxygen, body weight, average daily distance walked, dyspnoea ratings, Hospital Anxiety and Depression scores (HAD), and the St George Respiratory Questionnaire (SGRQ).

STATISTICAL METHODS

Results are expressed as mean ± SD for parametric data or median with range as appropriate. Parameters measured initially and after follow-up period were compared by paired t-tests (parametric data),
or Wilcoxon's signed rank test (non-parametric or ordinal data). For comparisons between groups of different individuals, the authors used unpaired t-tests for parametric data, Chi-squared analysis of contingency tables (expressed as $\chi^2$) for nominal data (or Fisher's test when indicated) and Mann–Whitney rank-sum test for ordinal data. Association between variables was tested by calculating Pearson's product-moment correlation coefficient (expressed as $r$) for parametric data, and by computing Spearman's Rank correlations for ordinal data (expressed as rho) (27).

The present study was approved by the Medical Ethics Committee of the University Hospital of Geneva, Switzerland.

Results

**INITIAL EVALUATION**

*Dyspnoea scores (median, range) (Figs 1 and 2)*

Results for dyspnoea scores were: 2 (range: 0–7) for resting dyspnoea (Borg scale) and 45 (range: 21–71 mm) for exertional dyspnoea (oxygen-cost diagram).

**Pulmonary function testing (PFT) and average daily distance walked (Fig. 3; Table 2)**

Pulmonary function testing values are given in Table 2. Average daily distance walked was: 1202 ± 1139 m (median: 836, range: 30–4600); 19 patients (27%) walked less than 300 m day$^{-1}$; 36 patients (46%) walked less than 600 m day$^{-1}$.

**HRQL scores (median, range)**

Median value for QL-index scores, reported by attending physicians was: 48 (range: 6–95). The rate of response by physicians was 84%.

Hospital Anxiety and Depression (HAD) scores were: 6.5 (range: 0–18) for anxiety and 6 (range: 1–17) for depression. This suggests a prevalence of anxiety disorders of 21% ($n=16$) and of depressive disorders of 27% ($n=21$). Prevalence of HAD scores $\geq$ 11 did not differ between COPD and non-COPD patients.

**Compliance to treatment**

Patients were under oxygen for $15 \pm 4$ h day$^{-1}$ (median $\pm$ sd). Twenty-eight patients (35%) did not

<table>
<thead>
<tr>
<th>Table 2. Pulmonary function tests and average daily distance walked</th>
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<tbody>
<tr>
<td><strong>n=79</strong></td>
</tr>
<tr>
<td><strong>Mean ± sd</strong></td>
</tr>
<tr>
<td><strong>Range</strong></td>
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<tr>
<td>-----</td>
</tr>
<tr>
<td>FEV$_1$ (l)</td>
</tr>
<tr>
<td>FEV$_1$ (% of predicted)</td>
</tr>
<tr>
<td>CVF (l)</td>
</tr>
<tr>
<td>CVF (% of predicted)</td>
</tr>
<tr>
<td>FEV$_1$/CVF (% of predicted)</td>
</tr>
<tr>
<td>$\Pi$ max (cm H$_2$O)$^*$</td>
</tr>
<tr>
<td>$\Pi$ max (cm H$_2$O)$^\dagger$</td>
</tr>
<tr>
<td>$\text{SaO}_2$% (room air)</td>
</tr>
<tr>
<td>$\text{SaO}_2$% (oxygen as prescribed)</td>
</tr>
<tr>
<td>Average daily distance walked (meters)</td>
</tr>
</tbody>
</table>

$^*$Maximal inspiratory pressure; $^\dagger$maximal expiratory pressure.
follow the recommended prescription of at least 15 h day\(^{-1}\). Overall compliance to treatment, as previously defined, was therefore 65%. There was an inverse correlation between average daily distance walked and number of hours under oxygen therapy (\(r=0.372, P=0.002\)).

**FOLLOW-UP EVALUATION**

Of the initial 79 patients, 24 (30.5%) had died during the follow-up period, three had stopped using oxygen (4%), 13 (16%) declined to participate to the second part of the study, five (6%) were clinically unstable, and two patients could not be reached. One-year survival was 69%.

None of the parameters tested had a predictive value in terms of mortality; no significant differences were found between survivors and patients deceased in terms of sex, age, initial PFT, average daily distance walked, body-mass index, dyspnoea, HAD scores and QL-index scores. Thirty-two patients were re-assessed approximately 1 yr after the initial evaluation (385 \(\pm\) 84 days).

No significant change had occurred in any of the parameters measured. Prevalence of anxiety and depressive disorders was unchanged in the 32 patients re-assessed, and did not differ with that observed for the initial 79 patients (\(\chi^2\)).

**RELATIONSHIP BETWEEN DYSPNOEA SCORES AND PFT**

*Resting dyspnoea (Borg scale)*

No significant relationship was found between resting dyspnoea ratings and PFTs, \(\text{SaO}_2\), average daily distance walked, or compliance to treatment.

*Exertional dyspnoea (oxygen-cost diagram)*

The oxygen-cost diagram gives a subjective rating of the maximal effort that a patient can sustain without being limited by dyspnoea. Scores were significantly correlated with average daily distance walked (\(r=0.45, P=0.0003\)); there was a weaker correlation between oxygen-cost diagram and FEV\(_1\) (\(r=0.27, P=0.02\)) or FEV\(_1\)/CVF (\(r=0.23, P=0.05\)).

**RELATIONSHIP BETWEEN HRQL SCORES AND PFT**

*HAD scores for anxiety (HAD A)*

HAD A scores showed a weak correlation with \(\text{SaO}_2\) (\(r=0.27, P=0.002\)), but no other significant relation with other PFTs, average daily distance walked, or dyspnoea scores. Age and gender were not related to anxiety scores; however, time spent in hospital was (\(r=0.32, P=0.002\)).

*HAD scores for depression (HAD D): Table 3*

HAD D scores were not related to age nor gender. Nor were they related to FEV\(_1\), \(\text{SaO}_2\), or dyspnoea scores. However, there was a significant relationship between presence of a depressive disorder (HAD D \(\geq 11\)), and number of days spent in hospital over the preceding year (\(r=0.34, P=0.004\)). There was also an inverse relationship between average daily distance walked and presence of a depressive disorder (\(r=0.44, P=0.0004\)).

*QL-index*

Estimation of quality of life by attending physician (QL-index) was significantly related only to HAD

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**Table 3. Relationships between HAD scores for depression and relevant parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Odds ratio</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (&gt;70 vs. (\leq 70))*</td>
<td>2.9</td>
<td>0.92-9.17</td>
</tr>
<tr>
<td>Gender (male vs. female)</td>
<td>1.98</td>
<td>0.58-6.81</td>
</tr>
<tr>
<td>FEV(_1%) (&lt;35% vs. &gt;35% of predicted)*</td>
<td>0.96</td>
<td>0.32-9.98</td>
</tr>
<tr>
<td>Dyspnoea scores</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Borg score (&lt;2 vs. &gt;2/10)*</td>
<td>0.96</td>
<td>0.17-1.7</td>
</tr>
<tr>
<td>Oxygen-cost diagram (&lt;45 vs. (\geq 45))*</td>
<td>0.34</td>
<td>0.13-1.13</td>
</tr>
<tr>
<td>Average daily distance walked (&lt;840 vs. (\geq 840) m day(^{-1}))*</td>
<td>4.67</td>
<td>1.39-15.4</td>
</tr>
<tr>
<td>Number of days spent in hospital within past year &gt; 15 vs. (\leq 15) days per year*</td>
<td>5.3</td>
<td>1.7-16.3</td>
</tr>
</tbody>
</table>

*Cut-off values are median values; \(\dagger P<0.05\).
Table 4. Correlations between the St George Respiratory Questionnaire (SGRQ) and relevant parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symptoms n=32</th>
<th>Activity n=32</th>
<th>Impact n=32</th>
<th>Total n=32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.23</td>
<td>0.44*</td>
<td>0.31</td>
<td>0.4*</td>
</tr>
<tr>
<td>FEV₁ (% of predicted)</td>
<td>0.18</td>
<td>0.03</td>
<td>( - )0.06</td>
<td>( - )0.01</td>
</tr>
<tr>
<td>Average daily distance walked</td>
<td>( - )0.27</td>
<td>( - )0.59*</td>
<td>( - )0.21*</td>
<td>( - )0.55*</td>
</tr>
<tr>
<td>SaO₂ (room air)</td>
<td>0.11</td>
<td>( - )0.08</td>
<td>( - )0.02</td>
<td>( - )0.02</td>
</tr>
<tr>
<td>Borg (resting dyspnoea)</td>
<td>0.3</td>
<td>0.43*</td>
<td>0.65†</td>
<td>0.58†</td>
</tr>
<tr>
<td>Oxygen-cost diagram</td>
<td>( - )0.46*</td>
<td>( - )0.67‡</td>
<td>( - )0.77‡</td>
<td>( - )0.78‡</td>
</tr>
<tr>
<td>HAD scores for anxiety</td>
<td>0.21</td>
<td>0.36*</td>
<td>0.46*</td>
<td>0.44*</td>
</tr>
<tr>
<td>HAD scores for depression</td>
<td>0.47†</td>
<td>0.62‡</td>
<td>0.63‡</td>
<td>0.68‡</td>
</tr>
<tr>
<td>Number of days spent in hospital within past year</td>
<td>0.61‡</td>
<td>0.29</td>
<td>0.51†</td>
<td>0.50†</td>
</tr>
</tbody>
</table>

Spearman's rank correlations: *P<0.05; †P<0.01; ‡P<0.001.

scores for depression [OR=5.87, 95% CI: (1.6–21.5)], and to average daily distance walked [OR=14.5, 95% CI: (3.44–60.8)]. QL-index did not show any significant relationship with dyspnoea scores or HAD anxiety scores.

St George’s Respiratory Questionnaire (median values and range) (Table 4)

SGRQ was performed in 32 of the initial 79 patients; as previously mentioned, these patients did not show any significant difference with the initial cohort in terms of severity of impairment, or prevalence of anxiety and depression, and were considered representative of the initial group. SGRQ score for ‘symptoms’ was 52 (range: 20–76). The ‘symptom’ score relates mainly to daily cough and sputum production and wheezing; it was not significantly related to age, FEV₁%, average daily distance walked, or SaO₂. It showed the weakest correlations with dyspnoea and HAD scores.

SGRQ score for ‘activity’ gave very high values (79; range: 36–100), meaning strong limitation of activity. This item correlated well with age, average daily distance walked, and oxygen-cost diagram (exertional dyspnoea). It was also strongly related to HAD scores for depression, and showed a weaker relationship to HAD scores for anxiety and resting dyspnoea.

SGRQ score for ‘impact’ was 50 (range: 4–88). The only physiological parameter significantly related to this item was average daily distance walked. Dyspnoea and HAD scores were more strongly related to the ‘impact’ score than to any of the other SGRQ items. Total SGRQ score was 59 (range: 19–88).

Parameters significantly related to number of days spent in hospital

No functional parameter other than average daily distance walked (rho = -0.31; P=0.002) was significantly correlated with the number of days spent in hospital within the past year. This was also the case for age and gender. However, time spent in hospital was significantly correlated with HAD scores for anxiety and depression, and with SGRQ scores for ‘Symptoms’ and ‘Impact’ (Tables 3 and 4).

Discussion

The present study describes physiological parameters and health-related quality of life (HRQL) of 79 patients under LTOT, and their evolution over a 1-yr period.

Patients studied showed major physical impairment related to their respiratory illness: 46% of patients walked less than 600 m day⁻¹ (Fig. 3); 22% suffered from moderate to strong resting dyspnoea (Fig. 1); hospitalizations were frequent (54% within the past year, with an average of 51 ± 53 days spent in hospital per patient per year). HAD scores suggested a high prevalence of depressive and anxiety disorders (21 and 27%, respectively). After 1 yr, survival rate was 69%. Prevalence of emotional disturbance, physical impairment and resting dyspnoea remained unchanged.

These data suggest that the HRQL of patients under LTOT is poor; evaluation of quality of life by attending physicians corroborates this observation: average QL-index scores were low, 33% of patients had scores <50/100. Interestingly, the average daily
distance walked, as an index of physical impairment, and the number of days per patient spent in hospital were the only items consistently related with HRQL scores and particularly with the presence of depressive disorders (Tables 3 and 4).

Long-term oxygen therapy is a significant public health issue: in Western Europe, prevalence of patients under LTOT is between 20 and 50 per 100,000 inhabitants, and up to 360 per 100,000 inhabitants in the U.S.A. (28-32). Estimations of annual cost of LTOT per patient range from U.S.$1500 to 7300, depending on the type of source used for oxygen delivery (30,32,33). Such a cost seems justified by the clearly established benefit on survival for these patients. However, the quality of life of these patients – at least as much as their survival – should also be of some concern.

LTOT: NO EFFECT ON QUALITY OF LIFE?
The present study aimed to describe the quality of life of patients under LTOT: it was not designed to quantify possible changes in quality of life induced by LTOT. Indeed, few studies have addressed the specific question of HRQL in patients under LTOT. Heaton et al. (8) studied 150 COPD patients of the Nocturnal Oxygen Therapy Trial: the initial evaluation showed major emotional distress and impaired quality of life prior to the initiation of oxygen treatment. After 12 months, under continuous or nocturnal oxygen therapy, no group did significantly better on quality of life measures when compared to matched controls. McSweeny et al. (11) studied 203 patients of the Nocturnal Oxygen Therapy Trial: the Sickness Impact Profile scores (a generic HRQL instrument) showed severe impairment in all domains tested; recreational activities, home management and quality of sleep were the most severely affected. Interestingly, relationships between Sickness Impact Profile scores and pulmonary function tests or PaO2 did not reach statistical significance. Ström et al., also using the Sickness Impact Profile in 41 patients under LTOT, found their quality of life severely impaired; most patients furthermore felt restricted by the oxygen treatment (29).

The Medical Research Council study (3) showed no significant differences in the number of days spent in hospital between the treated and control groups. This is an important point since the present study suggests that the number of days spent in hospital is a relevant parameter for assessing quality of life, and is significantly related to the presence of depressive disorders.

To date, therefore, although it is clearly established that LTOT improves survival, no study has clearly demonstrated a benefit of LTOT in terms of HRQL in hypoxic patients suffering either from COPD, or restrictive disorders. Furthermore, available data suggest a strong HRQL impairment in these patients. Minor improvements in neuropsychological functions, however, can be expected (8).

ANXIETY AND DEPRESSION: HIGH PREVALENCE IN PATIENTS WITH RESPIRATORY IMPAIRMENT
As previously mentioned, 21% of patients in the present study suffered from depressive disorders and 21% from anxiety disorders. Others have reported depression rates of 28-74%, and disabling anxiety in up to 96% of patients (11,34,35). The prevalence of emotional disorders is most probably underestimated in the present study because of the cut-off value chosen for determining cases and non-cases (≥11) (21). When compared to the general population, these results – and those of others – suggest a strong association between hypoxic COPD and anxiety or depression (36). Indeed, the 6-month prevalence of anxiety disorders is approximately 19% in the >65 age group, in the general population, and somewhat lower for middle-aged (45-64) adults (37). As for depression, studies have estimated that major depression occurs in 2-4% of persons in the community, 5-10% of primary care patients, and 10-14% of medical inpatients (38). Most studies give point prevalence rates of depression for the adult population between 3 and 4% (39). Depression in COPD appears, therefore, much more frequently than in the general population. The authors do not know if any studies addressing this issue in non-COPD hypoxic patients under LTOT. In the present study, prevalence of anxiety or depressive disorders did not differ between COPD and non-COPD patients.

Scores for depression were significantly related to physical mobility: indeed, patients with the most severe physical impairment had the highest proportion of depressive disorders. We cannot establish if the restriction in motility is a reflection of depression, or if depression is reactive to physical impairment. However, recent publications suggest a benefit on quality of life of home rehabilitation programmes (40,41), and a relationship between HRQL scores and gain in exercise tolerance (40). Rehabilitation on an outpatient basis might have a beneficial effect on selected patients, although expectations as to major changes in exercise tolerance achievable in hypoxic COPD patients are modest. Oxygen for ambulation may also prove to be contributive to improve HRQL in selected patients.
Sixty-five percent of the patients studied complied to the initial prescription (≥15 h day⁻¹). This compliance rate is higher than that reported by other European studies: 25–62% (33, 42, 45); it is also higher than previously reported by the authors’ group in the same area (13), suggesting a positive effect of the 48-h training given to all patients under LTOT.

SPECIFIC CONTRIBUTION OF HRQL INSTRUMENTS

In the present study, the Borg scale, the oxygen-cost diagram, the Hospital anxiety and Depression scale (HAD), and the St George Respiratory Questionnaire (SGRQ) were used as HRQL instruments. The Borg scale, the oxygen-cost diagram and the SGRQ are considered disease-specific HRQL instruments (12). HAD, although being a tool for quantifying mood disorders rather than quality of life, would be considered a generic instrument.

Resting dyspnoea (Borg scale) showed no significant relationship with PFTs, PI or PE max, average daily distance walked or SaO₂. Clearly, measuring resting dyspnoea gave information that could not be extrapolated from traditional measures. Interestingly, no significant relationship was found between resting dyspnoea scores and anxiety, exertional dyspnoea (oxygen-cost diagram), or compliance to treatment.

The oxygen-cost diagram (20) gave a reliable evaluation of subjective exercise tolerance: it was very significantly correlated with average daily distance walked (rho=0.45, P=0.0003). McCaivan et al. had previously noted very significant correlations between 12-min walking tests and the oxygen-cost diagram in patients with COPD or ILD (20). Subjective exercise tolerance, as assessed by the oxygen-cost diagram, could not be extrapolated from resting dyspnoea measurements.

The SGRQ score is a disease-specific HRQL instrument considered to be reproducible, valid and responsive (12). It quantifies symptoms related to airway disease, and impact of respiratory disease on daily activities and social functioning. Jones et al. excluded questions explicitly designed to assess anxiety and depression. Correlation with PFTs is known to be low; correlation with 6-min walk tests and with dyspnoea scores is expected to be the highest with the ‘Activity’ and ‘Impact’ scores (23, 24, 46). The present data are in agreement with these observations: daily distance walked was the only functional parameter significantly related to SGRQ scores (Table 4); the SGRQ stressed the importance of physical mobility on health-related quality of life in this group of patients, and the lack of significance of FEV₁ or SaO₂ as to quantifying HRQL. Furthermore, the strong correlation between the number of days spent in hospital and SGRQ scores corroborates the correlation previously described with the presence of depression, or QL-index ratings.

Conclusion

The data presented suggest that hypoxic patients under LTOT have on average a poor quality of life: their morbidity and mortality is high, they suffer from high rates of emotional disturbances, and diminished physical mobility. In order to enhance the possible benefit of LTOT on quality of life or general well-being, emphasis should be placed on outpatient long-term pulmonary rehabilitation programmes and use of portable oxygen devices to maintain or increase physical mobility, and on appropriate support and treatment for emotional disturbances in patients under LTOT.

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