SHORT COMMUNICATION

Sexual intercourse and respiratory failure

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Summary
Sexual activity is an important component of quality of life in patients suffering from chronic illnesses. To our knowledge, the effects of sexual activity on gas exchange in patients with respiratory failure have not been yet studied. To such an extent, we evaluated the oxygen saturation (SaO2), by a pulse oxymeter, during three different sexual performances in a 63-yr-old patient affected by chronic obstructive pulmonary disease (COPD) on long-term oxygen therapy (LTOT). The sexual performances were divided in four periods: basal, sex, 10 min after sex and relax. In each performance during sex, we observed a significant increase of either heart rate (HR) or SaO2, with the highest value of the latter achieved within the 10 min of the post-sex period. SaO2 returned to basal value (pre-sex) by the end of the relax period. We conclude that the observed improvement of SaO2 during sexual activity might be due to a better ventilation/perfusion ratio (V/Q) obtained for either an increase of ventilation (hyperventilation) and perfusion (tachycardia), without significant muscle expenditure.

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Introduction
Sexual activity is an important component of quality of life in patients with chronic illnesses, especially in those suffering from chronic respiratory disease. A reduction of sexuality was reported in patients with chronic obstructive pulmonary disease (COPD), cystic fibrosis and respiratory failure on non-invasive mechanical ventilation. These reports were generally obtained through administration of questionnaires. The problem could be also greater than expected in patients affected by COPD in long-term oxygen therapy. Few data are available in the literature, mainly expert opinions with some suggestions based upon intuitive prediction regarding the effects of sexual performances. To our knowledge, no reports with objective measurements during sexual activity have been yet published.

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Several reasons have typically lead to such an underestimation of this aspect, first of all the reluctance to address the problem, either by patients or doctors. Owing to that, we studied the oximetry during sex in a patient with COPD on long-term oxygen therapy (LTOT).

Case report

We evaluated a 63-yr-old man, affected by severe (stage GOLD IV) stable COPD, treated with LTOT for 2 years. Pulmonary function parameters were as follows: FEV1 1.18 L (38.9% pred), FVC 2.44 L (61.9% pred), FEV1/FVC 48.5%, RV 5.51 L (218% pred), TLC 7.89 L (116% pred), DLCO: 6.56 mmol/min/kPa (74% pred); arterial gas analysis (room air): $P_aO_2$ 53.9 mmHg, $P_aCO_2$ 59.6 mmHg, pH 7.395. Functional evaluation included also a 6-min walking test (WT) without supplemental O2, which revealed a sudden and deep fall of $S_aO_2$ immediately after the beginning of test (Figure 1—top); and a WT performed with O2 supplementation of 2 L/min (Figure 1—bottom). During rest and sleep a supplement of 1 and 1.5 L/min were, respectively, identified as necessary to prevent desaturation in these two types of conditions.

The sexual evaluation was performed during a period of stable conditions with the patient breathing room air, without any modification in treatment schedule, which was based on association of inhaled corticosteroid (fluticasone 250 mcg b.i.d.) and bronchodilators (oxitropium, 200 mcg t.i.d.) and short acting beta2 agonist (albuterol 100 mcg/puff) as needed.

Informed consent was obtained, and all procedures were approved by the Local Ethical Committee of the Cava de\' Tirreni Hospital. During the study measurements the patient was monitored with a finger probe Pulsox-3i oxygen saturation device (Minolta) attached to arm by wrist band (Figure 2), while he performed sex in his preferred environment. The patient was instructed on how to apply the oxymeter and to switch on it 5 min before sex (basal assessment). He was also asked to record the timing of the sexual act. The overall registration was divided in four periods: Period I, basal (pre-sex); Period II, sexual performance (of variable duration, from excitement—i.e. onset of

![Figure 1](image-url) Trend of $S_aO_2$ (red) and heart rate (blue) during 6-min walking test (6MWT). Top: basal conditions (without oxygen supplement). The two gray vertical bars show the start and the end of 6-min walking test. Bottom: with 2 L/min supplemental oxygen. The first gray box, at rest, identifies the start of oxygen delivery; the second gray box shows the 6MWT; and the third gray box identifies the period after the end of 6-min walking test with the patient still breathing supplemental oxygen.
sexual feelings—to ejaculation); Period III, after sex (including the 10 min immediately after sex); and Period IV, relax (not less than 10 min after Period III). In order to investigate the possible effect of body position during sexual activity, the patient was asked to take note of the sexual position.

The time course of these functional parameters was examined during three different sexual performances, completed once a week, in 3 consecutive weeks and in the evening hours, without oxygen supplement.

Results

The basal SaO₂ value (Period I) ranged between 86 and 90, 83 and 91 and 83 and 91, in the three different performances, respectively. The duration of the three sexual performances (Period II) was 2 min 50 s, 7 min 55 s and 2 min 25 s, respectively. As we suggested, in order to better explore possible effects of body position, according to his respiratory impairment the patient used the more comfortable sexual positions (standing or woman-on-top). No differences in time course of gas exchange and HR with body positions were observed (Figure 3A–C). In all recordings, a sharp and constant increase of heart rate (HR) as well as slower but progressive increase of SaO₂ was detected during Period II. At the same time, all the performances were characterized, during the 10-min of Period III, by a progressive drop of HR, which returned to the basal value by the end of Period III. Interestingly, the same was not observed with regard to SaO₂, which still remained higher even by the end of Period III. It reached the highest value within the first 2 or 3 min of Period III, and was constantly high approximately until the end of the same period. Figure 4 shows the mean trend of SaO₂ during the three performances, as it changed during the four periods. The improvement in SaO₂ was associated with a 20% increase in mean HR (from a mean value of 100.9 ± 9.2 bpm in Period I to 120.9 ± 8.2 bpm in Period II). However, it is worth mentioning that in Period I HR was higher than in normal environmental conditions (e.g., some days before the patient performed the study) when his impairment was assessed, and this is due likely to twin psycho-emotional components: experimental ambience and sexual feeling.

Discussion

Despite a significant increase of dyspnea sensation, sexual performances in our patient were not associated with oxygen desaturation but, on the contrary, with an increase of SaO₂. The type of sexual performance (i.e., sexual position) did not affect the time course of gas exchange. The improvement in SaO₂ was associated with a 20% increase in mean heart frequency (from a mean value of 100.9 ± 9.2 bpm in period I to 120.9 ± 8.2 bpm in period II), and presumably (even if not measured) of the ventilation. However, it is worth mentioning that in Period I the HR was significantly higher than in normal conditions, due likely to twin psycho-emotional components: experimental ambience and sexual feeling. On the other hand, we speculate that SaO₂ improvement recognize two main components: a decreased VA/Q mismatching (due to either ventilation and perfusion increase) and the little oxygen consumption by the muscles involved during sex, as compared to “normal” exercise activity. All the sexual cycle (from excitement to orgasm) does not involve significantly the muscles, and the eventual gain in oxygen storing is not wasted by the working organ. We also know that in COPD patients during strenuous exercise (i.e., when ventilatory requirement reaches the level at which severe expiratory flow limitation occurs) to support the respiratory muscles metabolic requirements, the O₂ cost of breathing may approach 15% of total O₂ consumption; in these conditions, blood flow is reduced at the level of locomotor muscles because of sympathetically mediated peripheral vasoconstriction. During exercise at O₂ max, the estimated distribution of total cardiac output to respiratory and to leg muscles is of 16% and 77%, respectively, with the remaining 7% to other metabolically active tissues. The awareness and perception of respiratory muscle effort could be influenced by the relative contribution of the diaphragm as well as other accessory respiratory muscles, as they support the effort by an adequate blood flow and, in last analysis, by the working locomotor muscles. The main difference between the results of our evaluation and any other kind of effort is that, during sex, the increase in ventilation and blood flow (by increase of HR) to support the sexual performance, is obtained with significant reduced muscle involvement. In real life, a similar increase (without muscle involvement) could be achieved only by psycho-emotional circumstances but, in these cases, with a considerably lower magnitude. The overall final effect of the increase of ventilation and perfusion during sex, probably is a lower VA/Q mismatching with a greater support of the metabolic requirements of respiratory muscles which, as we underlined, occurs in absence of significant muscle expenditure.

The dyspnea during sex claimed by COPD patients could be to many factors, that may be worsened during hyperventilation. Nonetheless, it is not possible to exclude also a psycho-emotional component. As easily one might argue, the difficult conditions of research, especially in patients with severe breathing limitation, associated with
the experimental environment and subsequent psycho-emotional feeling, do not allow us to have more details and to reach a definitive statement, as we can only suggest some hypothesis. Our data are, understandably, very simple and we have no idea what really happened to ventilation, $V_O^2$, or cardiac output, such that all of our speculations on mechanisms can only be hypothesized. Furthermore, we cannot exclude different results in patients with different pathophysiological conditions: type and degree of parenchymal involvement, degree of $VA/Q$ mismatching, ability to increase ventilation and HR (i.e due to intensity of sexual stimuli and to sex-related perceptions and feelings), which likely account for our results. Finally, it is also possible that

**Figure 3** Trend of $S_aO_2$ (top) and heart rate (blue, bottom) during the three sex performances (A, B and C, respectively): gray boxes identify Period II of sexual performance (see text for more details).

**Figure 4** Mean trend of $SpO_2$ (with standard deviation), according to the four periods of recording, in the three sex performances.
"heavier" sexual positions (i.e. in which significant greater limbs involvement is likely to happen), if experienced could have wasted the beneficial respiratory effects of sex we think to have demonstrated. The reports relating emotional stress and danger for sexual activity in patients suffering from COPD are largely anecdotal. Analogously, occurrence of sudden death during or following sexual activity is infrequent, and largely due to cardiovascular events.12,13

Conclusion
To our knowledge this is the first report in literature about the effect of sexual activity on gas exchange in patients with respiratory failure. In our COPD patient in LTOT, sexual activity was not detrimental to gas exchange. We hypothesize that such an improvement might be due to VA/Q matching in absence of muscle expenditure.

Conflict of interest statement
None of the authors has a conflict of interest to declare in relation to the contents of this paper.

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