Thoracoscopy: influence of the procedure on some respiratory and cardiac values

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ABSTRACT In eight patients with pleural effusion arterial oxygen and carbon dioxide tensions (Pao2 and Paco2), pH, respiratory frequency, and cardiac rhythm and frequency were measured before, during, and after thoracoscopy. Four of the patients had a Pao2 below 70 mm Hg (9.3 kPa) before the procedure. During and after the procedure respiratory frequency increased and Paco2 fell, indicating hyperventilation, while the other indices remained unchanged. It is concluded that respiration and the circulation readily adapt to the changes produced by the pneumothorax and the manipulation during thoracoscopy.

Thoracoscopy is an important technique in the diagnosis of pleural effusions. The procedure is simple and well tolerated and has few complications.1,2 During thoracoscopy, however, there is considerable collapse of the lung being investigated. Little has been reported on the complications of thoracoscopy,2 and only one study has dealt with respiratory and cardiac observations.3 Diagnostic procedures and anxiety are known to provoke tachycardia and cardiac dysrhythmias.4-8 In addition to the rearrangement of pulmonary flow and ventilation during thoracoscopy the patients might suffer from anxiety as well as pain, and cardiac dysrhythmia and tachycardia could therefore be expected during the procedure.

The aim of the present study was to determine the influence of thoracoscopy on respiratory frequency, arterial oxygen and carbon dioxide tensions (Pao2 and Paco2), arterial pH, and the heart rhythm and rate.

Patients and methods

We studied eight patients admitted to the department because of pleural effusion. The age of the patients ranged from 21 to 76 years (mean 55 years); there were six men and two women. Before thoracoscopy 10-1500 ml (median 350 ml) of pleural fluid was evacuated by thoracentesis.

The causes of the pleurisy were: pleural metastases, mesothelioma, rheumatoid pleurisy, pneumonitis, and tuberculous pleurisy (one case each); in three cases the aetiology remained unknown.

Seven patients had a normal electrocardiogram (ECG) (one of these had intermittent atrial fibrillation), and one had right bundle branch block. Two patients were receiving treatment with digoxin, one with verapamil, and two with diuretics. None of the patients had signs of cardiac failure at the time of thoracoscopy.

All the patients were smokers. In addition to the disease leading to thoracoscopy two had chronic bronchitis. Spirometry was not performed in any of the patients.

Four patients had a Pao2 below 70 mm Hg (9.3 kPa) before the procedure; none had hypercapnia.

Methods

Thoracoscopy was performed under local anaesthesia with rigid thoracoscopes as previously described.1 Half an hour before the procedure 25 mg of levomepromazin was given intramuscularly. No oxygen was given during or after the procedure. Pleural drainage was not used. Arterial blood was drawn (1) in the resting state before the procedure; (2) after evacuation of pleural fluid and insufflation of air; (3) immediately after the trocar had been inserted and opened; (4) after the thoracoscopy had been started; (5) immediately after the incision had been closed after thoracoscopy; and (6) one hour after the procedure was finished. The blood was drawn from an indwelling catheter in the radial artery. Analysis for pH, Pao2, and Paco2 was per-
formed with an ABL-2 (Radiometer, Copenhagen). The respiratory frequency was counted (1) before the procedure; (2) after thoracocentesis with air insufflation; (3) during the thoracoscopy; and (4) one hour after the procedure. A single-lead ECG was recorded continuously from five minutes before the beginning of the procedure until five minutes after it was finished. The various stages of the procedure, including biopsies, were recorded on the ECG strip. The average duration was 15 minutes.

The Friedmann two-way analysis of variance in related samples has been used for statistical analysis.

Results

The median values of PaO₂, PaCO₂, pH, and respiratory and cardiac frequencies are shown in table 1. Values for PaO₂ and PaCO₂ and respiratory frequency for the individual patients are shown in table 2.

PaO₂ and pH showed no significant variation during the period of observation. The respiratory frequency increased significantly \((p < 0.05)\) and the PaCO₂ fell significantly \((p < 0.05)\), while the heart frequency increased insignificantly \((p < 0.5)\).

The ECG strip showed that less than 2% of all beats were supraventricular premature beats at any stage of the procedure. No ventricular premature beats or other arrhythmias were seen.

Discussion

During thoracoscopy the lung on the side being investigated is collapsed to get as good a view as possible. Often patients with decreased lung function are investigated and little is known of the consequences of the sudden changes in ventilation and perfusion during the procedure. Oldenburg and Newhouse \(^3\) studied 12 patients with initially normal arterial oxygen saturation who underwent thoracoscopy and they found insignificant changes in the oxygen saturation and cardiac rhythm during the procedure. Our study included patients with abnormally low values of PaO₂. A significant increase in respiratory frequency and a reduction in PaCO₂ were seen. No significant changes in PaO₂, pH, cardiac rhythm or cardiac frequency were seen.

Even patients with low PaO₂ were able to adapt ventilation and perfusion very quickly to the new conditions imposed by the thoracoscopy, and, to judge by the rate and rhythm, no undue strain was put on the heart by the new circulatory conditions. The psychological stress and the discomfort during the procedure, including the short pain inflicted by
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the biopsies done without local anaesthesia, provoked an insignificant number of premature beats and a very modest tachycardia compared with the changes produced by gastroscopy4 and, in house officers, grand rounds.5 The reason could be the effective premedication.4 The thorascopies and arterial cannulations were uncomplicated.

We conclude that thoracoscopy of 15 minutes' duration is well tolerated from the respiratory and circulatory point of view by patients with normal or decreased \( \text{Pao}_2 \) and without heart failure.

References

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