Constant Pressure in the Non-Dependent Lung for Lung Decortication Surgery

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Summary

In this trial, a modified technique of general anaesthesia using a constant pressure of 3.99 kPa (30 mm mercury or 40.5 cm H_2O) in the non-dependent lung, has been used in eighteen patients requiring Lung Decortication. The haemodynamic response to anaesthesia and surgery was studied.

No significant alteration from the preoperative values of Arterial Blood Pressure (BP), Heart Rate (HR) and Central Venous Pressure (CVP) were noticed.

The surgical technique has been considerably improved by use of this technique with a significant decrease in operating time.

Introduction

Lung Decortication is a very common procedure in thoracic surgery, and has been performed for many years with the aim to re-expand collapsed lungs and re-establish normal respiration. This technique is aimed at attaining better conditions for this type of thoracic surgery and, at the same time, to be a safe anaesthetic for these patients.

Patients and methods

Eighteen consecutive patients were admitted to the trial. Etiological factors were a post-traumatic empyema in eight and post tuberculosis empyema in ten. Their ages ranged between 15 and 41 years (mean 30.2 years). Three were females and fifteen males. (Table 1).

Premedication of all 18 patients was Droperidol 5 mg IV (0.05-0.08 mg/kg), 10 minutes prior to induction.

Induction of anaesthesia consisted of Fentanyl 5 micrograms/kg and Thiopentone 3.5 mg/kg.

For intubation (double lumen tube) Suxamethonium Chloride 1.5 mg/kg was used.

Pancuronium Bromide 0.08-0.1 mg/kg was used later and to maintain anaesthesia a mixture of $N_2O:O_2$ 50:50 and Ethrane 0.8% was given.

A standard postero-lateral thoracotomy was performed with the 6th rib being resected. Once the chest was open the pathological lung was connected to a second anaesthetic machine (Picture 1) with constant pressure of 3.99 kPa (30 mm Mercury or 40.5 cm H_2O).

Oxygen flow of 4 L/min was given and pressure was controlled by the expiration valve (Picture 2).

To measure the constant pressure the following apparatus were used:

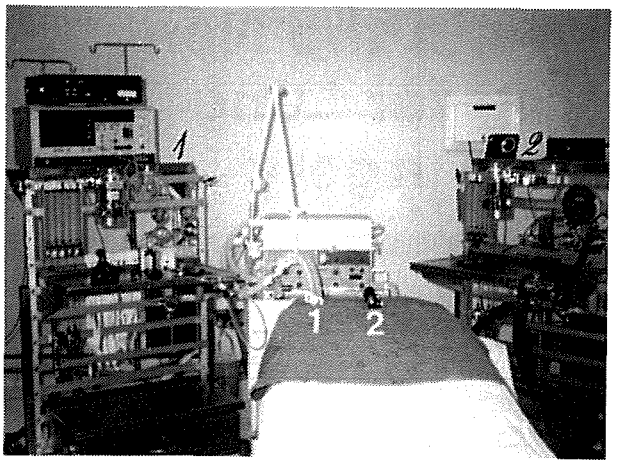
- Aneroid Sphygmomanometer
- An Ohmeda respiration pressure monitor.

The dependent lung was ventilated at a rate of 20 to 25 per minute. Constant pressure was maintained in the non-dependent lung to enable a firm surface to work on as the fibrous tissue was peeled off the lung. The patient's Blood Pressure (BP), Heart Rate (HR) and Central Venous Pressure (CVP) were monitored. Arterial blood gases were checked at 10 minute intervals, but Oxygen saturation was monitored constantly by an Ohmeda Pulse Oximeter. (Figure 1).

Discussion

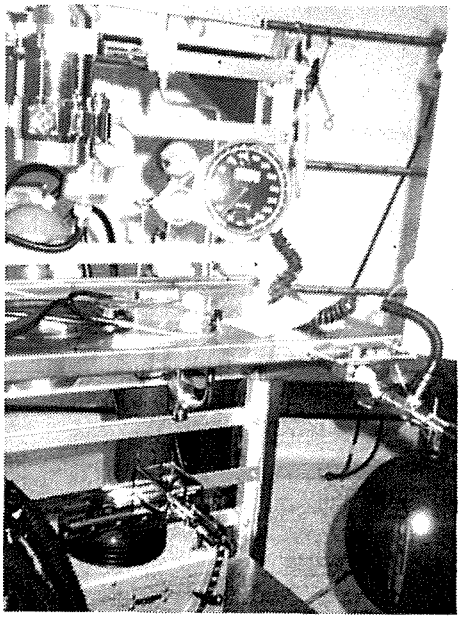
Prior to the use of this modified anaesthetic technique of constant pressure in the non-dependent lung, we performed our standard decortication with a single endotracheal tube.

It was found that it was easier to perform the operation with the lung under some tension. This required the anaesthetist to manually destend lung, while the operation was being performed. It was found that after 3 to 5 minutes of not ventilating, the patient and tension in the dependent lung causes haemodynamic instability, thus necessitating the anaesthetist to initiate ventilation once again.



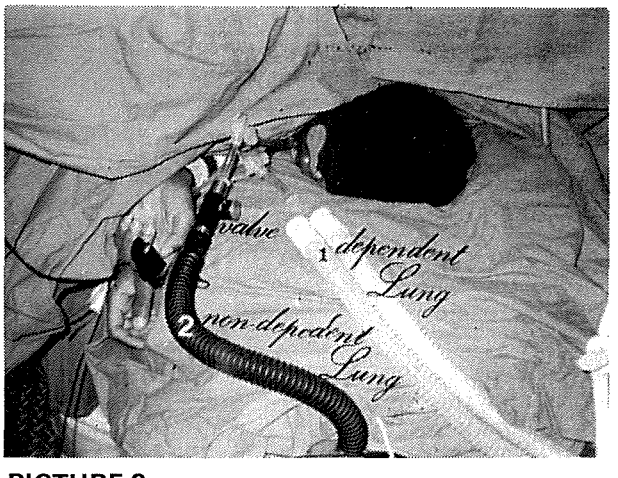
PICTURE 1

Anaesthetic machine 1, supplies ventilator for the dependent lung with N_2O:O_2 50:50% and Ethrane 0.8% Ventilation 20-25 per minute.
Anaesthetic machine 2, supplies non-dependent lung with Oxygen 100%, with constant pressure 3.99 kPa.



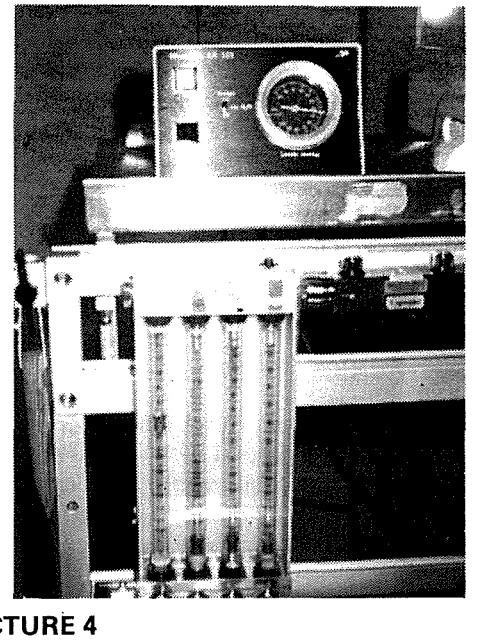
PICTURE 2

Constant pressure in the non-dependent lung 3.99 kPa (30 mm Mercury).



PICTURE 3

Regulation of constant pressure in the non-dependent lung by respiration valve.
1 - Connection for the dependent lung on ventilation.
2 - Connection for the non-dependent lung at the constant pressure of 3.99 kPa regulated by a Heidenbrink valve.



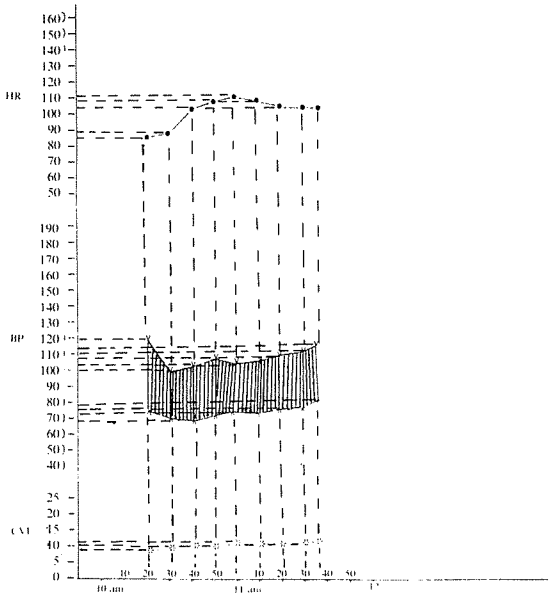
PICTURE 4
Monitoring of constant pressure in the non-dependent lung by an Ohmeda respiration monitor. 40.5 cm H_2O.

TABLE 1

CLASSIFICATION OF PATIENT ACCORDING TO AGES AND SEX			
AGES OF PATIENTS	**MALE**	**FEMALE**	**TOTAL**
15-20	3	0	3
21-25	2	0	2
26-30	6	1	6
31-35	2	1	3
36-40	2	1	3
41-45	1	0	1
TOTAL	15	3	18

FIG 1

MONITORING THE PATIENT DURING SURGERY



Time	pH	pCO_2	pO_2	Tot.CO_2	HCO_3	BXS	Sat.O_2
10:50	7.431	36.3	91.3	22.4	21.3	-0.03	96.2
11:00	7.440	35.0	97.9	24.9	25.3	-0.02	97.9
11:10	7.438	34.2	97.8	24.8	24.0	-0.02	97.4
11:20	7.441	30.4	97.9	22.9	23.1	-0.02	97.8
11:30	7.443	29.8	116.7	20.1	21.0	-0.02	98.0

In cases where there was an airleak from the lung, the distending pressure caused the release of anaesthetic gases into the operative field. This was found not to be a problem, but theoretically could be determental to the surgical staff.

Haemodynamic stability using this technique was observed.

It was also possible to shorten the operative time as the lung could be kept distended until the completion of the procedure.

Less damage was caused to the lung by working on a distended lung kept under constant pressure.

In our hands the use of the technique CONSTANT PRESSURE IN THE NON-DEPENDENT LUNG has resulted in an operation that is easier, with less blood loss, requires less operative time and is safe for the patients.

The constant pressure of 3.99 kPa (30 mm Mercury or 40.5 cm H_2O) in the lung is not as high as during a cough when the pressure rises up to 13.3 kPa (100 mm Mercury or 135 cm H_2O) or more.

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