

EFFECTS OF OXYGEN INHALATION ON COLD PRESSOR RESPONSES OF MAN

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Summary: The effect of 100% oxygen inhalation and change in the results by cold pressor test during oxygen inhalation were studied in 30 male subjects. The results showed that under basal conditions, systolic pressures, diastolic pressures and pulse rates were reduced by oxygen breathing. However, during cold pressor test exaggerated effects of increase in pressures and pulse rates were observed.

Key words: cold pressor responses effects of oxygen inhalation

INTRODUCTION

The cardiovascular effects of inhalation of 100% oxygen at one atmosphere for a few hrs are generally considered to be negligible. The only constant observation appears to be a slight decrease in heart rate. We have in this work tried to investigate altered response of cardiovascular system to the external stimulus of the cold pressor test on inhalation of 100% oxygen at atmospheric pressure.

MATERIALS AND METHODS

Blood pressures and pulse rate were determined on 30 healthy adults (19—26 years old) male subjects before, during and after immersion of the right hand in cold (4°C.) water for 1 min. Subjects were selected from staff and students of B. J. Medical College and Government Dental College, Ahmedabad.

The subjects reported to the laboratory at 9-00 a.m. in a postabsorptive state. They then reclined quietly for 30 minutes prior to insertion of the rubber mouthpiece and attachment of the nose clip. Air or 100% oxygen was inspired through a Benedict-Roth apparatus. A special three-way inlet valve and large orifice reduction valve permitted filling of the reservoir with oxygen or air without the subject knowing which gas he was breathing.

Control determinations of blood pressure and pulse rate commenced 10 minutes after connection to the Benedict-Roth apparatus and were repeated every 5 min until consistent readings were obtained. Following assessment of basal blood pressure and pulse rate, the subject's right hand was immersed in cold (4°C.) water for one min. Blood pressures and pulse rates were determined during the last 20 seconds of the cold stimulation and at one min intervals after removal of the hand from the cold bath.

RESULTS

The results obtained during air inhalation experiments are summarized in Table I. Systolic and diastolic pressures were elevated by the cold stimulus, while pulse rates tended to increase. One minute after removal of the hand from the cold bath, systolic pressures remained higher than control values, while diastolic pressure and pulse rates approximated basal levels. Observations at subsequent one minute intervals showed no consistent deviations from control values.

Table I : Changes in blood pressure and pulse rate during cold pressor test after oxygen breathing.

	Control	Increase on exposure to cold	One recovery
<i>Breathing room air</i>			
Systolic pressure (mm Hg)	118.10 ± 7.79	± 2.60 + 1.56	+ 2.60 + 1.39
Diastolic pressure (mm Hg)	76.90 ± 1.84	± 7.00 + 1.89	+ 2.80 + 1.69
Pulse rate (cpm)	78.70 ± 1.45	± 5.00 + 1.72	+ 0.20 + 1.56
<i>Breathing oxygen</i>			
Systolic pressure (mm Hg)	114.50 ± 1.56	+ 12.20 + 1.58	+ 4.70 + 1.70
Diastolic pressure (mm Hg)	67.50 ± 1.95	+ 24.50 + 2.08	+ 12.30 + 2.12
Pulse rate (cpm)	75.90 ± 1.76	+ 11.20 + 1.96	+ 1.60 + 2.00

*All values are means ± S.E.

Inhalation of 100% oxygen produced decrease in the basal diastolic and systolic pressure and pulse rate in all the 30 subjects. Greater increase in all three parameters attended the cold stimulation when oxygen was inhaled. One min after removal of the cold bath, systolic and diastolic pressures remained above the basal values by an average of 4.7 and 15.1 mm Hg respectively. However, pulse rates approximated control values at this time.

DISCUSSION

This study shows that under basal conditions, oxygen breathing lowered the diastolic pressure and slowed the heart. It was also observed that responses due to cold pressor test were augmented by oxygen inhalation.

Decrease in pulse rate in oxygen inhalation has been already observed (3, 6, 7). Froese (4) reported that breathing oxygen reduced the oxygen consumption of human beings during exposure to cold. Maccanon (5) also observed low diastolic pressure due to oxygen breathing and increased cold pressor responses due to oxygen inhalation. Barrat-Boyes *et al* (1) noted increase in systemic pressures and decreased heart rates due to oxygen breathing. Bean (2) was unable

to report clearly about changes taking place due to oxygen inhalation. It has been suggested that the reflexes initiated in lower respiratory tract by the irritant effects of oxygen or elevated pressure oxygen in the medullary centres may be responsible for the augmentation of cold-pressor response on oxygen inhalation (5).

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