Extrinsic carcinoma of the larynx and other growths involving the pharynx are unsuitable for interstitial irradiation. Of eighteen cases that I have had treated by external irradiation all had glands, and in five the growth has disappeared comparatively quickly, but the glands are still palpable after two years. I have had poor success with post-cricoid carcinoma, my few patients all dying within six months.

X-ray and radium beam treatment are outside my province, but it is generally accepted that deep x rays are more satisfactory than the beam method, as they can be applied at a greater distance from the skin and for shorter time-doses than with the present small amounts of radium available for beam treatment. It must be remembered that irradiation renders a growth more resistant to its rays on a second occasion, and at the same time the normal tissues are also more sensitive; therefore a full carcinomacidal dose should be given at the first treatment.

As I have said, x rays are the best treatment for rapidly growing carcinomata, and they are the only treatment for extensive growths and serious gland involvements. Coutard gets good results with external irradiation of intrinsic carcinoma of the larynx, but I think the fenestration method is superior. The technique of treatment by irradiation is always being improved, with better results, and I expect still better results with an improvement in the facilities and in the condition of the patients.

HELIUM IN ANAESTHESIA

BY

W. STANLEY SYKES, M.B., D.A.

Anaesthetist to the General Infirmary, the Hospital for Women, and St. James' Hospital, Leeds, and to the Dewsbury Infirmary

AND

REGINALD C. LAWRENCE, M.B., Ch.B.

Resident Anaesthetic Officer, the General Infirmary at Leeds

Helium, like nitrogen, is a physiologically inert gas. But it is very much lighter. An artificial atmosphere of normal oxygen content (21 per cent.), but with 79 per cent. of helium replacing the normal nitrogen, is only one-third as heavy as ordinary air. It should require only one-third the amount of force to move it (force = mass $\times$ acceleration) and it should pass through narrow apertures twice as easily (the rate of diffusion of gases is inversely proportional to the square root of their densities).

Helium-oxygen mixtures have been suggested for deep-sea divers and caisson workers because of their rapid diffusibility (and low coefficient of solubility), which allows of quicker passage from the blood to the alveoli and consequently quicker decompression. Sayers and Yant (1926) found that small animals subjected to pressures of 10 atmospheres for one to five hours could be decompressed from helium-oxygen in one-third to one-quarter the time required for nitrogen-oxygen.

Lemmer and Rovenstine (1935) proposed putting this low solubility to practical use in anaesthesia. Their experiments on different gases (with the object of preventing post-operative atelectasis) showed that its actual absorption from the alveoli into the blood was the slowest of nine different gases tested. But it has another potential

use in anaesthesia—its facility in passing through narrow apertures. Barach and Eckman (1935) proved experimentally that 25 to 50 per cent. less pressure was required to move helium-oxygen mixtures. Eversole (1937), using the mixture clinically in seventy-two patients with respiratory obstruction, claimed nearly 90 per cent. of successful results. It has also been used in the treatment of bronchial asthma and in respiratory paralysis due to spinal anaesthesia.

The British Oxygen Company very generously presented one of us (W. S. S.) with a ten-cubic-foot cylinder of helium, which until recently was unobtainable except in the United States. The company can now supply it. This was tried in half a dozen cases during cyclopropane anaesthesia, but as the patients had no respiratory obstruction and were already breathing with the remarkable calmness and quiet typical of cyclopropane it had no apparent effect.

Personal Experiments

As no patients with respiratory difficulties were available personal experiments were carried out with artificial obstructions.

A Foregger-Waters soda-lime canister and rebreathing bag were used. The face-piece was replaced by an intratracheal adapter, to which was fitted a rubber mouth-piece which carried a screw clamp. This clamp was tightened until considerable constriction was caused. Actually a Magill tube of 5 mm. internal diameter was compressed until the lumen was about $\frac{1}{2}$ mm. wide and 8 mm. long. The subject then breathed in and out of the bag through the soda lime and through the constriction. A quarter of a litre of oxygen per minute was allowed to enter the bag through a flowmeter, while the expired carbon dioxide was of course removed by the soda lime.

In one series of experiments air only was used, in the other a helium-oxygen mixture of approximately similar percentage. In every case the subject breathed through the constriction until dyspnoea became intolerable. The times were taken by stop-watch.

In each experiment with helium the bag was emptied and refilled after the first half-dozen breaths in order to get rid of some of the residual nitrogen from the lungs. By refilling the bag several times it might be possible to improve upon our figures.

As we were using ourselves as subjects we disregarded Home Office regulations about killing the experimental animals at the close of the session. This led us into a trap which invalidated our first series of results. We tried to obtain many readings in one evening, and very soon found that the fatigue caused by semi-strangulation produced increasingly rapid intolerance to a repetition of the process.

The times given below were all taken after allowing a sufficient interval for complete recovery. The constriction caused by the screw clamp remained constant throughout.

Times Taken in Breathing to Exhaustion Point.

No. 1 subject, W. S. S. Aged 43, heavy smoker.

Nitrogen-oxygen (Ordinary Air, Regenerated)	Helium-oxygen, Regenerated
3 min. 15 sec.	6 min. 43 sec.
4 min. 13 sec.	7 min. 34 sec.
4 min. 47 sec.	7 min. 35 sec.
3 min. 50 sec.	8 min. 10 sec.
3 min. 59 sec.	7 min. 35 sec.
4 min. 30 sec.	7 min. 26 sec.
Average 4 min. 5 sec.	Average 7 min. 30 sec.

No. 2 subject, R. C. L. Aged 27, non-smoker.

Nitrogen-oxygen	Helium-oxygen
5 min. 23 sec.	9 min. 30 sec.
4 min. 40 sec.	9 min. 10 sec.
4 min. 10 sec.	10 min. 21 sec.
4 min. 36 sec.	8 min. 54 sec.
3 min. 58 sec.	8 min. 20 sec.

Average 4 min. 33 sec. Average 9 min. 15 sec.

Probably the slightly better times obtained by subject No. 2 are accounted for by difference in age and smoking habits. His fifth experiment, which was easily his worst, was done shortly after exercise. The results are on the whole very consistent.

Conclusion

An artificial atmosphere of helium and oxygen is theoretically and practically about twice as easy to breathe as ordinary air, and the mixture should be of great value in cases of respiratory obstruction or in cases in which it is essential to economize muscular effort. When obstruction is present its value is immediately apparent and can be measured by simple timing experiments. Even if there is no obstruction, in which case it has no visible effect, it might still be of value in reducing the amount of work done by the patient and in preventing post-operative collapse of the lung because of its low solubility.

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CARDIAZOL THERAPY IN STUPOR

BY

J. S. HARRIS, M.D., M.R.C.P., D.P.M.

Deputy Medical Superintendent, West Park Hospital,
 Epsom; Psychiatric Consultant, St. Stephen's
 Hospital and Westminster Institution,
 London

AND

C. R. BIRNIE, M.D., M.R.C.P., D.P.M.

First Assistant Medical Officer, West Park Hospital,
 Honorary Psychotherapist and Honorary Psycho-
 therapist to Speech Department, West End
 Hospital for Nervous Diseases,
 London

The treatment of schizophrenia by cardiazol has been practised on the Continent to an increasing extent in recent years, and the view is current that a favourable response is often met with in cases of stupor. In the present series eighteen cases of stupor were treated, and in their selection no special criteria were employed. Each case, however, was carefully examined to exclude organic disease. The stupor, although it varied in depth, was the outstanding clinical feature in each case.

Technique of Injection

The technique employed was that recommended by Meduna. A 10 per cent. solution of cardiazol buffered to pH 8 with 0.1 per cent. disodium hydrogen phosphate to prevent decomposition on sterilization was injected intravenously, beginning with 0.5 gramme in the case of men and as a rule 0.4 gramme in the case of women. Three injections were given weekly, and the dose was

increased by 0.1 gramme whenever it was found that a larger amount was required to produce a convulsion. It was never necessary to employ a higher dosage than 1 gramme. It was decided to produce in each case thirty convulsions unless some complication supervened. It is well known that thrombosis is one of the difficulties to be contended with, and therefore if only one or two veins be available (and this is not uncommon in women) treatment may have to be abandoned at an early stage. With a view to preventing this occurrence the solution of cardiazol employed was buffered, and in addition all traces of the drug were removed from the needle by rinsing in normal saline before insertion into the vein. Further, after the injection had been given any extravasation of blood into the tissues was prevented by firm pressure by means of a swab at the site of puncture, and this was maintained throughout the convulsion. As soon as the latter was over, a dry dressing was firmly applied. No attempt was made to thread the needle up the vein, as this appeared likely to increase the possibility of thrombosis.

Results

The total number of patients treated was eighteen, of whom eleven were males and seven females. In eleven cases thirty convulsions were produced, and this was held to constitute a full course of treatment. In the remaining seven cases, for one reason or another (see below) it was found necessary to discontinue treatment after the production of from three to nineteen convulsions. In the table below are set out particulars of the cases. It will be noted that Cases 1 to 11 received the full course of treatment, while in Cases 12 to 18 treatment was incomplete for the reasons assigned.

Table giving Particulars of Eighteen Cases of Stupor Treated by Cardiazol.

Case	Sex	Age	Duration of Illness	Duration of Stupor	Type of Stupor	Dose in grammes	No. of Convulsions	Result	Remarks
1	M.	40	Years 3	Years 1 ¹ / ₁₂	Non-resistive	0.5-0.7	30	Complete remission	
2	M.	28	1 ³ / ₁₂	1	Resistive	0.5-1	30	"	
3	F.	23	1 ³ / ₁₂	⁹ / ₁₂	"	0.4-0.7	30	"	
4	M.	23	⁴ / ₁₂	⁹ / ₁₂	Non-resistive	0.5-0.8	30	Partial remission	
5	F.	23	5	⁹ / ₁₂	Resistive	0.4-1	30	"	
6	F.	22	6	2 ³ / ₁₂	"	0.3-0.8	30	"	
7	F.	47	10	10	Non-resistive	0.3-0.8	30	"	
8	M.	44	4	⁹ / ₁₂	"	0.5-0.8	30	No change	
9	M.	28	5	3	"	0.5-1	30	"	
10	M.	30	3	3	"	0.5-1	30	"	
11	M.	32	7	2	Resistive	0.4-0.7	30	"	
12	M.	36	1 ⁴ / ₁₂	1 ³ / ₁₂	"	0.5-1	19	Partial remission	Marked hostility
13	F.	47	13	4	"	0.5-0.7	7	"	Treatment being continued
14	F.	31	3 ⁴ / ₁₂	3	"	0.5-0.6	4	"	Thrombosis of veins
15	M.	28	2	2	Non-resistive	0.5-0.7	9	No change	Activation of pulmonary tuberculosis
16	M.	27	3 ⁴ / ₁₂	3 ¹ / ₁₂	"	0.5-0.8	8	"	Thrombosis of veins
17	F.	30	3	⁴ / ₁₂	Resistive	0.4-0.6	4	"	"
18	M.	35	10 ¹ / ₁₂	10 ¹ / ₁₂	Non-resistive	0.5-0.6	3	"	Numerous after-convulsions

Reference to the table will show that of the eleven cases which received a full course of treatment three made a complete recovery, four showed some improvement, and the remaining four did not benefit. As is to be