THE HALOXAIR APPARATUS

Experience with 100 Cases

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SUMMARY: This paper describes experience with 100 cases using the Haloxair apparatus. The apparatus was found to be convenient, flexible and reliable. A low incidence of post-operative nausea and vomiting was a particularly encouraging feature.

The Haloxair apparatus is designed for the administration of halothane as anaesthetic agent in air as vehicle. It was developed partly to meet the requirements of the Armed Forces, and Stephens (1965) described it in detail. It is essentially a draw-over inhaler, but can be used for controlled respiration.

Merrifield, Hill and Smith (1967) calculated the total work rate, at a minute volume of 8 litres, as 22 kg/minute, a figure comparable with that found for a circle absorber. It is by several fold within the acceptable maximum suggested by Cooper (1961). The same authors showed minor changes in concentration under circumstances of high ambient temperature and humidity, but felt that these were acceptable.

Marshall and Grange (1966) and others have demonstrated that oxygen saturation in patients anaesthetised with air as the vehicle is only marginally permissible. On this basis an oxygen increment seems wise, and it is the author's practice to maintain a supplemental flow of 2 litres/minute.

In this series there were 60 male and 40 female patients, varying in age between 4 and 59 years, with a mean of 25 years. Weight varied between 24 and 233 pounds, with a mean for males of 141 and for females of 121 pounds. All patients breathed spontaneously.

Table I shows the type of operation and Table II the duration. Seventy-two per

Table I
Nature of operation and sex distribution

Operation	Male	Female
Minor Gynaecological	—	18
Genito-urinary	13	—
Peripheral orthopaedic	22	4
Lower abdominal	—	1
ENT/Ophthalmic	4	1
Dental	18	10
Miscellaneous	3	6
Totals	60	40

Table II
Duration of operation

Minutes	0—29	30—49	60—89	90—119
Numbers	61	29	8	2

*Manufactured by Cyprane Ltd., Keighley, Yorks

cent of patients were recorded at the time of induction as having been adequately sedated by their premedication, the remainder as overtly anxious to a greater or lesser extent.

Induction was by 2 per cent thiopentone via a $\frac{5}{8}$ inch 25 gauge needle, leading of necessity to a slower induction. The mean dose per pound was 2.0 mg for men and 1.6 for women, but the range was wide.

Table III shows the mean concentration of halothane at each minute from the

Table III
Mean concentration of halothane at each minute

Time in minutes	1	2	3	4	5	6	7	8	9	10
Mean per cent halothane	2.7	3.9	4.5	4.4	3.3	2.3	1.7	1.4	1.3	1.2

start of thiopentone induction. By ten minutes the mean concentration was nearer 1 than 1.5 per cent, and in fact 11 patients were by then receiving less than 1 per cent.

The mean final concentration of halothane achieved in the first 25 patients anaesthetised was 1.4 per cent, falling to 1.0 per cent in the second 25, 0.9 per cent in the third and 0.8 per cent in the fourth, showing that increased familiarity permitted lower mean concentrations towards the end of the series.

Table IV shows the effect of inadequate premedication on the subsequent anaes-

Table IV
Relation of premedication effect to gradation of anaesthetics

Grade	Adequately premedicated per cent	Inadequately premedicated per cent
1	79	21
2a and 2b	50	50

thetic progress. Dundee, Moore and Nicholl (1962) divided progress into grade 1 (uneventful), grade 2a (slight upset not interfering with anaesthesia), grade 2b (moderate upset interfering with anaesthesia) and grade 3 (patient unmanageable or other severe side effects). On this basis 8 patients were graded 2a and 16 were graded 2b. Table IV indicates the probable cause for many of the upsets—namely inadequate premedication.

Table V compares the incidence of vomiting (taken to include nausea) in this series

Table V
Per cent incidence of vomiting in this series and a parallel one

Method	Male	Female	Overall
Halothane in air	15	25	19
Halothane in nitrous oxide/oxygen	19	37	28

with that in a series of comparable size taken at random from the author's records where the vehicle for the halothane was nitrous oxide/oxygen. Dent, Ramachandra and Stephen (1955) produced from a large series of varying anaesthetic techniques an

incidence of emesis of 27.2 per cent, while Burtles and Peckett (1957) gave a figure of 32 per cent from a series of similar size. Knapp and Beecher (1956) found an incidence of over 80 per cent using ether in nitrous oxide/oxygen, while Holmes (1965) found one of 35 per cent using ether in air. The latter author, among others, incriminated nitrous oxide and the results of Table V point to the same conclusion.

Conclusion

The Haloxair apparatus is easy to use and has a wide application in surgery of relatively short duration, the incidence of upset during the anaesthetic being largely determined by the adequacy of premedication. Vomiting and nausea have a low incidence compared with other forms of anaesthesia.

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