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President's Address.

DR. GILBERT TROUP (Perth) took as the subject for his presidential address "The Present Status of Anæsthesia and Anæsthetists in Australia". He began by stating that the honour of being president of the section having fallen to a Western Australian anæsthetist, Dr. M. K. Moss, had been rightfully chosen. It was to be regretted that private reasons caused him to resign. Dr. Moss was the doyen of modern anæsthesia in Western Australia, and no one better fitted could have been selected for the task. His address was to have been somewhat of an historical survey of anæsthesia as he had seen it evolve in his medical lifetime. Dr. Troup said that he could not hope to emulate Dr. Moss in such; but he did feel that occasionally, and perhaps at a time such as the present, they should call a halt and try to review the present position of anæsthesia, what they had achieved or failed to achieve, whither they drifted and generally what they could do about it, if anything.

Those who had been in active anæsthetic practice in the last decade or so had seen a mental metamorphosis in the anæsthetist's breadwinners, the surgeons. From being requested to keep a patient more or less unconscious whilst the surgeon did his work, anæsthetists were now often asked to examine beforehand, to order the necessary pre-anæsthetic treatment, to choose and give the anæsthetic of choice, and generally to see to the after-comfort and safety of the patient so far as the anæsthetic was concerned.

Modern types and techniques of anæsthesia were being more frequently demanded. An example of this was the anæsthesia in thoracic surgery. The advent of various gases efficiently given, with or without endotracheal and endobronchial techniques, had revolutionized and made possible many of the surgical procedures in this branch performed today. All of which was a flattering indication that the anæsthetist's advances had achieved a wider scope for the operator and a post-operative period more free of complications for the patient.

This position had to a certain extent been brought about by the evolution of the anæsthetic specialist. Those present probably disliked this term as much as Dr. Troup did, but the fact remained that they had no other to describe one who either in whole or part time devoted himself or herself to the administration of certain types and techniques of anæsthesia demanded by the exigencies of modern surgery, or to the piloting of the "poor-risk case" through a surgical adventure.

For the most part this specialized branch had evolved from the experience gained in the routine anæsthesia of general practice. In other words, the majority who were called upon to give these special types of anæsthetics had been and some still were general practitioners. The anæsthetic specialist could not restrict himself to highly technical anæsthetics only, but must encroach on the routine field to a certain extent. The reason was partly economic, at any rate in this country. It was also due to the fact that clinical anæsthesia was essentially a practical subject, and unless the anæsthetist kept his hand in, so to speak, with the routine case his clinical judgement would be lacking when he was called on for the comparatively rare special case.

That special anæsthesia had attained its present eminence in Australia was largely due to the high standard of the routine anæsthetic work of the general practitioner. Dr. Troup was sure that those who had seen men at work in other parts of the world would agree with this statement. One still heard that anyone could efficiently give a routine anæsthetic. Likewise, the most recent and raw medical graduate could, of course, remove an appendix, deliver a baby, or even see a pneumonia patient through his trouble, but care, thought and experience improved the safety of such procedures and the comfort of the patient; even so with anæsthesia, and it was largely the recognition of these factors that had raised the anæsthetic standard to its present satisfactory plane in the Commonwealth.

The thoughts of the lay public lagged behind, retarded by the occasional news item, beloved by the man in the street, of the seafaring appendiceal abscess that had been drained by the travelling surgeon, "the anæsthetic being administered by the chief engineer or the first mate". (They at least paid anæsthetists the compliment of high rank in their *locum tenens*.) In all humility, Dr. Troup suggested that the patient's immediate and future condition, in such circumstances, might have been better served if the surgeon (especially if at one stage of his career he had been a general practitioner) had administered the anæsthetic himself and instructed from the head end of the operating table the trembling hands of his temporary understudy.

That the special anæsthetist justified his existence was exemplified by the alacrity with which the routine anæsthetist would hand over to the former with joy in his heart and a merry twinkle in his eye his bad risk case, or the one which required a complicated technique.

A review such as he was making, if it was to be honest, could not all be metaphorical back scratching, and Dr. Troup therefore wished to finish with some criticisms, not altogether destructive he hoped.

Anæsthetic education, theoretical and practical, of the Australian medical student, as in most parts of the world, left much to be desired. On this education foundation was built the standard of the future routine anæsthetist and the seeds were sown from which would blossom the special anæsthetist. That such was appreciated was shown by the excellent teaching syllabus outlined by the present Lecturer in Anæsthesia at the University of Melbourne. No ideals could be too high to aim at in this regard. Post-graduate committees in the Commonwealth were realizing the importance of special anæsthetic courses for the man established in practice, and this, Dr. Troup felt sure, would go a long way in stimulating those bitten by the "bug" with the enthusiasm necessary to aspire to the Diploma of Anæsthesia, which must be the hallmark for British anæsthetists for some time to come.

Research, original work and publications in anæsthesia were painful subjects, but their comparative and lamentable absence from Australia could not be glossed over. The reasons could be assumed to be partly financial and partly due to lack of opportunity, but an element of mental sluggishness must also be admitted. That there was the ability in Australia to cope with the situation was shown by that excellent treatise, "Practical Anæsthesia", which emanated from the Alfred Hospital in Melbourne, and which was lauded as the best *résumé* of modern anæsthesia by all with whom Dr. Troup came in contact on a recent visit to America. The internationally known and quoted work of Geoffrey Kaye on anæsthetic fatalities and the various publications of Gilbert Brown were other examples of what could be done. But with it all, Dr. Troup did not think they could honestly say that anæsthetists were pulling their weight to the best of their ability in the advance of anæsthesia. To see a centre like the anæsthetic service at Wisconsin under that outstanding personality, Ralph Waters, and that in a community of only 50,000, was to realize what was possible. In that place clinical, physiological, pathological and other aids were enlisted to

achieve results which were profoundly affecting anæsthesia through the world; and there was no insurmountable reason why similar attempts should not be made in Australia. It was to the various anæsthetic societies, State and Commonwealth, that they had mainly to look for results in these fields.

Whilst the larger cities had become or were becoming efficiently catered for in special anæsthesia, the same could not be said of the country, especially in the sparsely populated State of Western Australia. Northam in Western Australia was a notable exception, and had set the example to the rest of the State. There was definite propaganda work to be done in getting a modern efficient anæsthetic unit functioning in all the larger country towns where several men were practising. There was always one in the team who could make it his hobby and perfect himself in the use of gas and the various techniques, so that he could efficiently deal with the special case when it arose.

The value of much clinical anæsthetic material was yearly going to waste owing to the absence of proper records. Notes of medical, surgical and obstetrical cases were in the majority of cases carefully kept, and the individual learned and gained thereby. Why was such recording considered unnecessary by so many anæsthetists? Not only would the keeping of these ensure close observation of the patient, but it was only by such means that the anæsthetist could estimate the relative merits of different drugs and techniques, and improve his own, and incidentally the general, knowledge of the subject. In Dr. Troup's own case the value of the experience of his non-recording years was comparatively lost, and the older he grew, the more carefully and fully did he try to keep records.

It was human nature to mutter about the price that had to be paid for various drugs and machines, but Dr. Troup thought that they had a really big grouse at the cost of nitrous oxide in Australia. It was hard to their commercially untutored minds to appreciate a cost for this gas of almost three times what it was in England. With the carbon dioxide absorption technique, the importance of cost was not so acute, but where the method was not applicable the disability still remained. Nitrous oxide analgesia in obstetrics had apparently proved itself as a valuable method, and its use with such machines as the Minnett was common today. The carbon dioxide absorption method was impracticable with this particular type of administration, and as a consequence comparatively large quantities of the gas had to be given per case. Obstetricians who had gone to the trouble and expense of acquiring such machines said that their use in Australia with nitrous oxide at its present price was economically impossible except in rare lucrative cases. The benefit to the patient of a method proved of great value was thus lost for the most part in Australia.

In conclusion, Dr. Troup wished to pay a tribute to the Australian surgeon. He could not imagine that his own experience of him had been unique. The surgeon had always been encouraging in the trying out of new drugs and techniques. He had sometimes, therefore, had to put up with indifferent relaxation when good relaxation was needed; he had been patient when one had been struggling with a strange method of high recommendation and promise, and he had been flattering in his praise when occasionally results had justified it. Without the surgeon's kindly and forbearing help and encouragement, Dr. Troup ventured to suggest that the art of anæsthesia would not be in the position it occupied in Australia today.

Anæsthesia in Pulmonary Tuberculosis.

DR. GILBERT BROWN (Adelaide) read the opening paper in a discussion on anæsthesia in pulmonary tuberculosis. He began by stating that free and unobstructed respiration was considered to be essential in good anæsthesia of any kind. When the respiratory system was itself affected, the difficulties were much increased. The involvment of the lungs might vary both in intensity of infection and extent of destruction from a small chronic focus to a gross infection of an acute type. Further difficulties might have been introduced by induced pneumothorax, or by paralysis of the diaphragm from phrenic avulsion. The operation itself might vary from the extraction of a tooth to any major operation in surgery, even to thoracoplasty for treatment of the disease itself. Unless the general principles were closely followed, the result might be an exacerbation of the disease, or even death of the patient.

The essentials of a good anæsthetic for patients with pulmonary tuberculosis were: (i) The agent, or combination of agents, should cause no irritation or damage to the lungs. (ii) The method employed should ensure adequate oxygenation. (iii) Any general anæsthetic selected should allow rapid recovery of the reflexes, so that any sputum might be coughed up as soon as possible. (iv) The drugs used should neither raise nor lower the blood pressure to any marked degree. (v) Agents which were liable to cause post-operative acidosis should be avoided as far as possible.

A review of 13,073 of Dr. Brown's own records showed that 208 of the patients were suffering from pulmonary tuberculosis. Amongst these were two cases in which acute pulmonary tuberculosis followed the operation within a few days. Ether was the anæsthetic in the first. Nitrous oxide and oxygen to which a small amount of ether was added to assist in passing an endotracheal tube, were responsible for the other. Tables were shown of the operations performed and the anæsthetics employed.

Dr. Brown discussed the preparation of the patient and laid stress on the importance of a warm operating theatre. He went on to say that premedication helped to allay the fears of the patient, gave a smoother and easier narcosis and permitted the use of a higher percentage of oxygen. The drugs should be chosen from those which did not unduly depress the respiration and which were eliminated rapidly. "Avertin", paraldehyde, "Sodium amytal" and "Nembutal" were eliminated slowly, and consequently should not be used except for patients whose disease was of the chronic fibrous type. "Evipan sodium" had many advantages as a basal narcotic before the use of gaseous anæsthetics. "Seconal" was the most suitable for oral use.

Dr. Brown reviewed the various anæsthetics and described their advantages and disadvantages. Local, caudal and spinal anæsthesia had, he stated, a definite, but limited, scope. Of the inhalation anæsthetics the most valuable were the gaseous ones, nitrous oxide, ethylene and cyclopropane, the last named allowing the use of the highest percentage of oxygen. In the presence of diathermy, however, the only one permissible was nitrous oxide. Chloroform was to be avoided unless better methods were unobtainable; a small amount as an adjuvant to nitrous oxide was sometimes given. Ether should never be used in the presence of pulmonary tuberculosis, either as the main anæsthetic, or as an adjuvant to the gaseous anæsthetics. "Vinyl ether" was valuable and might often replace chloroform as a supplement to nitrous oxide. Anæsthesia induced by the intravenous administration of "Evipan sodium" and "Pentothal sodium" was useful in certain operations. "Avertin" caused no irritation or injury to the lungs, but was eliminated slowly; it should not be used as the sole anæsthetic, except perhaps in bronchoscopy. It lowered the blood pressure, depressed the respiration and lengthened the period of unconsciousness. The dose should be usually sub-basal and at the end of the narcosis an intravenous injection should be given of "Cardiazol" or "Coramine" for their "awakening effect".

Dr. Brown then reviewed the special operations for the treatment of pulmonary tuberculosis, and discussed the methods of anæsthesia for each. The gaseous anæsthetics were the most useful. Administration by the carbon dioxide absorption technique was preferable, as the breathing was quieter and the respiratory excursions decreased. Endotracheal methods were advisable in certain cases. Spinal anæsthesia had been employed successfully for removal of the lower ribs in thoracoplasty.

DR. ALLAN LAMPHEE (Adelaide) said that Dr. Gilbert Brown had opened the discussion by giving an excellent practical survey of the present position of anæsthesia in pulmonary tuberculosis. Dr. Lamphee thought that everyone would agree with him in his conclusion, especially as regards the necessity for some form of gaseous anæs-

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thesia in this disease. Dr. Lamphee said that, as invited speaker, he would confine his few remarks chiefly to some points dealing with premedication. He had always believed that adequate premedication was an important factor before a gas anæsthetic, and he felt happier and more confident about the success and smooth running of his part of the job if the patient was brought into the theatre either asleep or very drowsy and unconcerned. This might not be so important in minor operations, but it became increasingly important in the longer major surgical procedures, such as abdominal section, thoracoplasty and thoracotomy. Dr. Lamphee did not like a patient straining and coughing throughout the course of a thoracoplasty, for instance, and it was in this operation particularly that he liked to have a smooth even anæsthesia throughout.

Dr. Gilbert Brown had mentioned the various methods of premedication that could be employed. In this connexion every anæsthetist had his own particular drug which he preferred. Those present had probably all used most of them at some time or another. Some, they thought, acted more efficiently than others, and they stuck to them as much as possible. Dr. Lamphee had used the barbiturates by mouth, "Evipan sodium" intravenously, hyoscine and morphine, "Avertin" and others. They were all good, but the drug that he had found most reliable in its action was paraldehyde given in six ounces of saline solution per rectum about one and a half hours before the time fixed for operation; he preceded this by the administration of one-eighth grain of morphine and one two-hundredth grain of hyoscine. He then felt confident that the patient would come into the theatre oblivious of everything that was going on. However, knowing that paraldehyde was excreted slowly by the lungs, he had hesitated about using it in any case of pulmonary tuberculosis, although he could find in the available literature no contraindications to its use.

Dr. Lamphee said that at the beginning of the year he had decided to use paraldehyde with the following results. During the last five years he had given fifty-two anæsthetics for thoracic operations on patients suffering from active pulmonary tuberculosis (these figures did not include operations for phrenic avulsion). The operations had all been performed by the same surgeon, and with the exception of five or six thoracotomies for division of adhesions, were all thoracoplastic operations. Every patient was given either ethylene or nitrous oxide. None had any ether, and various forms of premedication were used. In this series five patients had been given paraldehyde by the method he had described and in every case there were immediate post-operative signs of local spread, but not in any of the others. One patient died four days after operation from an acute tuberculous bronchopneumonia of both lungs. This was proved at autopsy. Another patient died ten days after operation from an enormous hæmoptysis. Another patient recovered, but contracted a tuberculous bronchopneumonia of both lower lobes, although the condition at the time of operation was believed to be unilateral. The other two patients had more reaction than usual and there was evidence indicating that the tuberculous condition was more active than it had been before operation.

In view of these cases, Dr. Lamphee felt justified in assuming that paraldehyde was contraindicated just as much in pulmonary tuberculosis as ether, and he would never use it again in a known case of phthisis. He was quite prepared to be told that he should have known this beforehand, but his main purpose in making this contribution to the discussion was to draw added attention to it so that others who might be as ignorant as he was might hesitate before using paraldehyde in pulmonary tuberculosis.

DR. GEOFFREY KAYE (Melbourne) said that he agreed with Dr. Brown and Dr. Lamphee in what they had said. He himself had reported two or three cases in which a condition of pulmonary tuberculosis had not been diagnosed and in which dire consequences had followed the administration of ether. He pleaded guilty to having given small quantities of ether to patients suffering from pulmonary tuberculosis and he thought he could get away with it. He did not like chloroform in combination with gas anæsthesia. With regard to salivation following the use of vinyl ethyl, he thought that a substance which produced salivation must be irritating to the respiratory tract.

He wished to join issue on the question of the use of increasing quantities of oxygen. Waters had shown that the basis of anæsthesia appeared to be interference of the oxygen exchange over the cell frontier. There was need of more evidence in comparing one case with another on the question of oxygen. It was on the cell frontier and not in the blood that variations in oxygen metabolism acted. Dr. Kaye's own experience with anæsthesia in pulmonary tuberculosis was small. He used nitrous oxide and oxygen with the positive pressure in the operation of thoracoplasty. He did not intubate these patients. These operations were performed under light anæsthesia. Intubation required deep anæsthesia.

DR. S. V. MARSHALL (Sydney) said there was another aspect of the matter, namely, the question of anæsthesia with ether as an ætiological or predisposing factor in the development of pulmonary tuberculosis.

In one series of 125 cases at a hospital dealing with chest diseases he went into the question of anæsthesia in its relation to these diseases. Seventeen of these patients had had operation under ether anæsthesia. In nine of these there was no definite association between the anæsthetic and the disease. In seven of the cases there was a definite association between the operation and the exacerbation of symptoms occuring shortly afterwards. Ether should not be given to any patients suffering from pulmonary tuberculosis or to those associated with such patients.

Dr. Marshall said that in addition to the anæsthetics mentioned by Dr. Brown, cyclopropane was an excellent adjuvant to nitrous oxide and oxygen. In thoracoplasty local anæsthesia could first be used, and then the patient could be given "Pentothal sodium". He wished to draw attention to a monograph by Dawkins, who had pointed out that post-operative respiratory complications were almost doubled under heavy premedication.

DR. HUGH HUNTER (Sydney) said that he had used chloroform in combination with nitrous oxide and oxygen in thoracoplasty with good results. He considered that in dealing with this subject it was necessary not to lose sight of the fact that, following the use of any form of anæsthesia, respiratory complications were likely to occur and produce trouble.

DR. LORNA BRAY (Victoria) stated that her results with high spinal anæsthesia were very satisfactory. She had not spared premedication.

DR. GILBERT TROUP (Perth) said that the only certain method of producing deep prenarcosis was with the use of "Avertin". Paraldehyde was uncertain in its action; there was no antidote for it, whereas "Coramine" might be used as an antidote for "Avertin". After the use of "Penthothal sodium" he found difficulty in intubating. He thought that Dawkin's figures were probably influenced by climatic conditions.

Dr. Brown, in his reply, referred to the fact that he had had experience of a case of idiosyncrasy to paraldehyde. Since then he had not used it so much. He told Dr. Hunter that he had occasionally given chloroform with nitrous oxide and oxygen. He was interested in Dr. Marshall's statistics dealing with the administration of ether to patients suffering from pulmonary tuberculosis. With regard to the excessive use of premedication, he could agree with other speakers, but it had to be decided what was excessive. Like Dr. Kaye, he had used ether as a supplement to gas anæsthesia. He had considered that two or three drachms of ether would do no harm, but he had given it up.

With regard to the remarks of other speakers on the question of physiology of extra oxygen used in anæsthesia, there were certain surgeons who would not consider their patients oxygenated unless their colour was very good.

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Cyclopropane Anæsthesia.

DR. S. V. MARSHALL (Sydney) opened the discussion on cyclopropane anæsthesia. His remarks represented a summary of a paper prepared jointly by himself and Dr. H. J. Daly, based upon observations and study abroad, especially in the United States of America and Canada, and on subsequent experiences in Australia. The authors regarded the discovery of cyclopropane as the greatest advance since the original application of anæsthetics nearly one hundred years ago. They stated that Canada, and so indirectly the British Empire, enjoyed the credit for this new discovery in that Henderson and Lucas, of the University of Toronto, established by animal experiment the many advantages of cyclopropane over other agents in current use. The clinical application had been undertaken by Waters and his associates of Madison, Wisconsin, United States of America, followed by Griffith in Montreal, since when a rapid extension in its use had occurred in the United States of America and Canada, while favourable reports had emanated from England and South Africa. The tardy recognition in Australia of this, among other improvements in anæsthetic agents and technique, was attributed to Australian isolation and to the inferior status and endowments of anæsthesia in this country.

The authors pointed out that of the chemical and physical properties of cyclopropane the chief points were: isomerism with propylene (C_3H_6); density (heavier than air); high lipoid solubility; absence of irritating properties; and inflammability. As with ether, and especially the nitrous oxide, oxygen and ether combination, this last property demanded the usual precautions against ignition.

The pharmacology was discussed at length, and the very slight deviation in metabolic processes from the normal was emphasized; this contrasted markedly with the situation prevailing with ether, chloroform and some other agents. The authors stated that the alkali reserve and non-protein nitrogen of the blood plasma were virtually unaltered; sympathetic hyperactivity not being stimulated, hyperglycæmia was a rare occurrence; and the blood volume remained normal. No hepatic or renal damage occurred.

Cyclopropane was so potent that the deepest anæsthesia might be produced with concentrations not exceeding 25%, high excess of oxygen thus being possible. This provided at all times a wide safety margin. The signs of anæsthesia were as for other agents, but more rapid transitions between the different planes occurred because of the flexibility of the gas. There was evidence of parasympathetic hyperactivity during cyclopropane anæsthesia, which was amenable to regulation by the preliminary administration of atropine or hyoscine. With excessive concentrations cardiac irregularities and arryhthmias were apt to develop, but were always transient. Such phenomena occurred with unsuspected frequency in other forms of anæsthesia. Increased capillary bleeding was sometimes noticed, but might be to a large extent ignored, since it would cease on terminating the administration. The blood pressure remained at nearly normal levels even after prolonged administration.

Well-designed apparatus, with carbon dioxide absorption attachments, was essential in the administration of cyclopropane. The system was entirely closed, the exhalations being continuously rebreathed, while oxygen, in amounts sufficient to meet metabolic requirements (200 to 500 cubic centimetres per minute), was continuously supplied. The carbon dioxide eliminated by the lungs was absorbed by soda-lime; heat and moisture were conserved; desiccation and irritation of mucous surfaces were prevented; and the risk of ignition was rendered negligible. Volatile adjuvants, such as chloroform, ether or vinyl ether, might be added if necessary, their toxicity being minimized by the oxygen excess present. Dosages were regulated at all times in accordance with the reactions of the patient, no fixed percentages or rates of gas-flow being predetermined.

Moderate premedication was, in the opinion of the authors, always desirable and, if necessary, full basal narcosis might be employed, the use by intravenous injection of the rapidly-eliminated barbiturates being especially valuable in this regard. They stressed the necessity for thoroughly efficient carbon dioxide absorption throughout the administration. Accumulation of carbon dioxide, while favouring the development of dangerous blood concentrations of cyclopropane, also, they held, caused unnecessary respiratory efforts and an undesirable rise of the blood pressure. Removal of the strong stimulus at the end of the administration might result in alarming symptoms of collapse. Induction of anæsthesia was quiet and pleasant, maintenance placid, and recovery fairly speedy with little sickness.

The authors went on to state that cyclopropane anæsthesia was indicated for practically all operations, in some being invaluable, especially when impaired vital capacity and posture (thoracic surgery), metabolic disturbances (hyperthyreodism, diabetes), debility, anæmia, shock *et cetera* were complicating factors. Apparently having a tonic effect on the uterus, it was of great value in obstetric operations, especially Cæsarean section. Contraindications, by no means absolute, chiefly referred to its inflammability and the tendency to increased oozing. Complications developing both during and after the administration of cyclopropane showed a remarkable reduction in comparison with their incidence in other forms of anæsthesia. Post-operative pulmonary complications were greatly reduced. Figures quoted indicated a slightly increased incidence of circulatory complications, which was attributed to the selection of this agent for poor-risk cases. Post-anæsthetic nausea and vomiting occurred, but were less severe than with ether, while severe vomiting with acidosis was very rare after cyclopropane anæsthesia. Post-operative intestinal atony was also a very rare complication with cyclopropane.

The conclusions reached was that, although present experience was limited, a high degree of confidence in the use of this new agent was justified. Further experience would improve knowledge and help to solve some of the outstanding problems of the agent and technique. The authors stated that as yet its use should be attempted only by those specially qualified by the possession of experience and facilities, and, above all, a thorough knowledge of the physiology of anæsthesia.

DR. GILBERT TROUP (Perth) said that the paper by Dr. Marshall and Dr. Daly was the best summary of the subject he had read or listened to, and their sources of it had been vast, as one could see by glancing at the bibliography. Dr. Troup said that the oil-water solubility ratio was given at even a higher figure than they quoted, namely, 34·3:1. Lucas and Henderson gave a figure of 64·4:1, ethylene being 13·3:1 and ether 2·5:1. Its relative anæsthetic potency was therefore obvious.

Being a happy and contented user of the to-and-fro carbon dioxide absorber, Dr. Troup could not accept all that Dr. Marshall said concerning the circuit absorber of Sword. The heating that occurred in the soda-lime canister in the former was never sufficient to affect the patient by its proximity. Waters had shown that even in the centre of the soda-lime granules the temperature was never over 47° C. More heat certainly reached the patient than in the circuit absorber, but this helped to counteract heat loss from body surfaces *et cetera*, which was an advantage. The increased resistance of the circuit absorber due to the presence of the valves, especially if the openings in the system were not of wide bore, was quoted as a disadvantage of this method—and this by users of both the to-and-fro and circuit absorbers. Joints were fewer in the to-and-fro absorber and, no matter how carefully made, joints tended to loosen and to leak and to interfere with what for success must be a closed system.

Finally, the to-and-fro absorber was very much cheaper, simpler, and where portability had to be considered, took up less room. To Dr. Troup's mind, the only disadvantage of the to-and-fro absorber was its apparent clumsiness, but one very soon got used to its bulk and by the judicious use of supports it was easy to manage. To illustrate this point, Dr. Troup showed slides which had been made from photographs taken in its actual use in various techniques.

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Concerning full narcosis with "Avertin" prior to cyclopropane, Dr. Troup said that Wood's technique, which was a subbasal dose *plus* morphine, would give in the majority of cases a completely unconscious patient coming to the theatre; and Wood's figures did not suggest that the sequence increased pulmonary complications. Dr. Troup had found this sequence extremely useful in certain cases. Dr. Troup said that he used the carbon dioxide absorber from the start of induction with cyclopropane and did not find any disadvantage therefrom. As Dr. Marshall pointed out, it antagonized any tendency to dangerous hyperpnœa.

Perhaps in no other anæsthetic method was the fundamental necessity of a clear airway so essential for efficient results as in cyclopropane with carbon dioxide absorption. One should never hesitate to use a pharyngeal airway either transnasally or transorally or blindly to carry out intubation endotracheally with a Magill's tube if the slightest obstruction was present. Leech's gasway, as described in *Current Researches in Anesthesia and Analgesia* of January-February, 1937, promised a possible solution of this ever-present problem. Griffiths, of Montreal, in a personal communication had spoken most highly of its efficiency as he had found it in practice. It was alleged also to solve in part the problem of the use of cyclopropane in oral surgery when intubation was not being carried out.

As Dr. Marshall had pointed out, capillary oozing had been a surgical criticism of cyclopropane. Inhalations of carbon dioxide diminished coagulability and bleeding times as pointed out in an article in *Current Researches in Anesthesia and Analgesia* of March-April, 1936. It might be possible therefore that a relative depletion of excess carbon dioxide by the absorption method would bring coagulability and bleeding times nearer the normal figure as Waters had shown. The surgeon, having been in the past used to methods in which carbon dioxide probably collected to excess, interpreted the abnormal as being the physiological.

The change, of which Dr. Marshall spoke, on the sudden withdrawal of a gas mixture rich in oxygen in the debilitated patient was a very real one. When severe circulatory depression was present at the end of an operation as the result of a bad-risk case or a procedure associated with much shock, Dr. Troup's custom was to order continuous and efficient oxygen through an oropharyngeal catheter as soon as the patient was back in bed. Dr. Troup started at 50% (a humidifier with regulation of flow was used) and he gradually reduced the percentage according to the patient's condition.

The effect of cyclopropane on the heart had received much notice and perhaps undue comment. Dr. Troup thought that this was largely because the clinical irregularities noticed had stimulated electrocardiographic studies of patients under anæsthesia. In Kurtz's series under different anæsthetic agents irregularities were noted in 46% under "Procain", 82% under cyclopropane, 90% under ether and 100% under chloroform. From this cyclopropane was not relatively therefore a bad offender. The only disturbing feature was the irregularity called multiple focus ventricular extrasystoles, displayed occasionally and solely in the cyclopropane series. This irregularity, in dogs at any rate, was known to precede ventricular fibrillation. However, it appeared only under very deep cyclopropane anæsthesia. Clinically the anæsthetist got the warning of marked bradycardia before irregularities appeared, and he further had the safeguard that respiratory arrest would occur before circulatory arrest in too high a concentration of cyclopropane. The anæsthetist therefore had plenty of warning signals, and Dr. Troup did not think that they should be unduly biased by the circulatory effects of high concentrations when one considered the advantages which a properly administered cyclopropane anæsthetic showed over other methods.

Like Dr. Marshall and Dr. Daly's limited personal experience of cyclopropane, Dr. Troup's was a small one. Dr. Hayward and he had administered it in 230 cases in Perth up to date, and they were selecting it more and more often as the anæsthetic of choice in "bad risks", apart from using it more frequently in routine cases.

DR. GILBERT BROWN (Adelaide) said he had seen cyclopropane used in England, but had not used it himself. He referred to the Primrose tube and described the method adopted by Primrose in using it.

Dr. Marshall, in reply, referred to Dr. Troup's remarks on the question of resistance in the Sword circuit. In the Heidbrink machine there was no resistance. In the McKesson there was some resistance, but it was hoped that in the latest model of the carbon dioxide absorber some improvement would be shown. He agreed with Dr. Troup that a clear airway was necessary in cyclopropane anæsthesia. The passage of the Magill tube was the best way of overcoming obstruction in the air passages, especially when laryngospasm occurred. Whatever system of absorption was used, whether it was the Waters "to-and-fro" or the Sword circuit, it was not possible for excessive carbon dioxide absorption to occur. Compared with other methods of gas administration, the carbon dioxide absorption method permitted greater economy, the oxygen consumption being reduced to about one-sixth the usual amount.

Deaths under Anæsthesia.

A meeting of the Section of Anæsthetics was held to make a statistical survey of deaths under anæsthesia.

DR. GEOFFREY KAYE (Melbourne) read the opening paper. In this paper he dealt with anæsthetic fatalities that had occurred at the Alfred Hospital, Melbourne, during the period 1932-1937. The chief features of the paper and his conclusions may be summarized as follows.

1. In a five-year period ending December 31, 1936, a total of 17,701 operations upon in-patients was recorded in the hospital. Of these, 9,388, or 53%, were performed under ether anæsthesia; 2,335, or 13·2%, under gaseous anæsthetics; 1,141, or 6·4%, under spinal anæsthesia; 3,014, or 17%, under regional or local anæsthesia, and the remainder under various other anæsthetics.

2. The anæsthetic risk, classified from "A" (the best) to "D" (the worst) as prescribed by the International Anæsthesia Research Society, had been noted in 10,119 of the 17,701 cases. The patients were listed as "A"-risk in 2,993 instances (29·6%), "B"-risk in 5,404 (53·4%), "C"-risk in 1,462 (14·4%) and "D"-risk in 260 (2·5%).

3. The fatalities "on the table" or before recovery from the immediate effects of the anæsthetic totalled 22 in the 17,701 administrations, or 0·12%. Ether was responsible for five fatalities in 9,388 cases, a mortality of 0·05%. The gaseous anæsthetics accounted for nine deaths in 2,335 cases, a mortality of 0·39%. There were three fatalities in 1,141 administrations of spinal anæsthesia (0·26%), whilst local or regional anæsthesia accounted for four deaths in 3,014 cases (0·26%).

4. Analysis of the thirteen fatalities in the series of 10,119 cases in which the anæsthetic "risk" had been recorded did not prove particularly illuminating. The overall mortality was 0·12% and the highest incidence of fatalities came, obviously, amongst the worse ("C"- and "D"-class) "risks". Ether was most usually employed for "A"- and "B"-class patients, in whom it proved reasonably safe, returning but one fatality in 6,899 cases. In "C"- and "D"-class patients, ether was responsible for the not unreasonable mortality of two deaths in 500 administrations. Gaseous anæsthetics were but little used for "A"- and "B" class patients (892 cases without fatality). They were, however, the agents of choice for bad-risk cases, and as such returned eight deaths in 1,058 administrations. Other forms of anæsthesia were represented in numbers too small to repay analysis.

5. No fatality occurred in 10,612 operations upon out-patients, of whom 5,312 received a general and 5,300 a local anæsthetic.

6. Full details of each of the 22 fatal cases were ascertained from the hospital records, autopsy findings and (when applicable) from the coroner's archives. These

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were so tabulated as to direct special attention to: (*a*) the clinical condition of the patient; (*b*) the presence of pathological lesions likely to render anæsthesia hazardous and to account for death; (*c*) the possibility of having prevented, by different choice of anæsthetic agent or technique, a fatal issue.

7. Five deaths under ether, thus analysed, revealed the following probable causes of death, namely: (*a*) cerebral trauma in two instances; (*b*) inhalation of vomitus into the lungs in one case; (*c*) post-operative suffocation by inhaled blood in one case; (*d*) injudicious choice of ether in one instance, the patient suffering from grave toxæmia and bronchopneumonia.

8. Nine fatalities under nitrous oxide or ethylene revealed the following causes for death, namely: (*a*) a case of hæmorrhage from the bronchial artery; (*b*) a case of medullary failure during cerebral exploration; (*c*) a case of pulmonary embolism; (*d*) three deaths at operation for an acute abdominal emergency; (*e*) a case of diabetic gangrene complicated by bilateral hydrothorax; (*f*) a case of *œdema glottidis*; (*g*) a case of suffocation by copious secretion of mucus during thyreoidectomy. It would appear that the two last-mentioned patients might, under other conditions of anæsthesia, have been possibly prevented from dying.

9. Spinal anæsthesia was associated with three fatalities, in two of which the choice of anæsthetic was open to criticism. In the first instance the patient was old, debilitated and atherosclerotic; in the second, general peritonitis was present and the patient was desperately ill.

10. A fatality was returned as having occurred under a combination of "Avertin" narcosis with local anæsthesia; the case was one of cerebral tumour.

11. Local anæsthesia accounted for four deaths, of which three were in connexion with procedures of cerebral surgery. The fourth was a case of cocaine intoxication during tonsillectomy in a healthy young man.

12. Of the twenty-two fatalities, only one (due to post-operative inhalation of blood) was directly preventible. In six instances death might have been possibly averted under other conditions of anæsthesia. In the remaining fifteen cases it would seem to have been unavoidable.

13. Certain recommendations, based upon the present series of fatalities, might be summarized as follows: (*a*) Adequate use of endotracheal anæsthesia, especially in presence of vomiting or respiratory obstruction. (*b*) Use of gas anæsthesia where indicated, especially for "bad-risk" cases. Positive pressure may be advantageously employed in thyreoid surgery and in cases of respiratory embarrassment. (*c*) Avoidance of spinal anæsthesia in toxic, debilitated or atherosclerotic patients. (*d*) Replacement of cocaine by less toxic surface anæsthetics wherever practicable. (*e*) Adequate post-operative care of anæsthetized patients by properly trained attendants.

DR. GILBERT TROUP (Perth) made a report on anæsthetic fatalities in the Perth Hospital covering the period January 1, 1933, to December 31, 1936. Among 12,600 cases there were 26 deaths, a mortality of 0·22%. One death occurred among "A"-risk patients, eight among "B"-risk, eight among "C"-risk and nine among "D"-risk patients. In one case chloroform was the anæsthetic, in fourteen cases ether was given, in three nitrous oxide was given, in four cases spinal anæsthesia was used; local anæsthesia was used in one instance. In three instances the anæsthetic was not specified. It was considered that none of the deaths were frankly preventible, one was probably preventible, five were possibly preventible, two were possibly unavoidable, eighteen were probably unavoidable.

DR. HUGH HUNTER (Sydney) read, on behalf of Dr. H. J. Daly, a short report on anæsthetic deaths at Saint Vincent's Hospital, Sydney. The anæsthetics given numbered 19,240; there were ten deaths. The opinion was expressed that this total was probably incomplete. Details of the ten case histories were given.

DR. E. COUPER BLACK (Adelaide) presented a report on the anæsthetic fatalities in the Adelaide Children's Hospital for the period October 1, 1931, to September 30, 1932. There were 18,080 administrations and eight deaths, a mortality percentage of 0·044. In each of the eight instances the anæsthetic was ether; this included induction with ethyl chloride, nitrous oxide and chloroform.

DR. S. V. MARSHALL (Sydney) said that the main thing brought out was that the word "oxygen" should be the motto of anæsthetists. He considered spinal anæsthesia as bad for "poor risks". The gaseous anæsthetics were the best for these cases. It was necessary not to lose sight of oxygen deficiency as being one of the disadvantages of nitrous oxide-oxygen anæsthesia. It would be better to use ethylene or cyclopropane. He was pleased to hear Dr. Kaye mention barbiturates as antidotes to cocaine. It was important to provide oxygen for "poor-risk cases" for the first few hours after operation. He thought that oxygen deficiency was the cause of the trouble in a case Dr. Hunter quoted of a patient suffering from severe jaundice, who had had a half grain of morphia administered as premedication before nitrous oxide-oxygen anæsthesia. He believed that the stimulating effects of ether were fallacious. He thought the time had come for the establishment of directorships and professorships in anæsthesia.

DR. F. E. MCAREE (Melbourne) thought there was the necessity for the training of general practitioners in anæsthesia, and that "bad-risk" cases should have their anæsthetic administered by a specialist. He was strongly in favour of resident anæsthetists in hospitals. He was unable to understand the success obtained at dental clinics in the administration of anæsthetics.

DR. E. C. BLACK (Adelaide) expressed the opinion that the question of morbidity from anæsthesia should be discussed in addition to mortality.

Dr. Kaye, in reply, stated that he regarded Dr. Marshall's suggestion of "oxygen" as the anæsthetist's watchword as splendid. He could not, however, accept Dr. Marshall's dictum that anæsthesia with nitrous oxide and oxygen necessarily involved true anoxæmia as shown by the pulse, blood pressure and respiration. He drew attention to the 24,000 demonstrations in a certain children's hospital associated with 16 deaths (0·67 per 1,000), the average mortality for that city being 0·45 per 1,000. Several of these deaths were in operations for repair of hare-lip and cleft palate under endopharyngeal ether anæsthesia. The hospital anæsthetic staff was anxious to hear the experience of members with endotracheal anæsthesia for such operations in children, many of whom were only six months old.

Vinyl Ether ("Vinesthene").

DR. GILBERT BROWN (Adelaide) read a short paper setting out the results of seventeen administrations of vinyl ether ("Vinesthene"). He said that by the courtesy of Dr. Gilbert Troup he received a small amount of "Vinesthene" which he had brought from America in 1935. A further amount had been given to him by Mr. F. C. Marrington, representing Messrs. May and Baker, Limited.

Describing the properties of vinyl ether, Dr. Brown said it had the chemical formula $CH_2 : CH.O.CH : CH_2$. It was a colorless liquid with a characteristic smell. The boiling point was 28·31° C. and the specific gravity was 0·77. It rapidly decomposed and consequently had added to it 3·5% of alcohol and 0·01% of a non-volatile inhibitor (phenyl naphthylamine). It was highly inflammable and burned with a very smoky flame.

The ages of the patients anæsthetized had varied from four to fifty-seven years. Ten were males and seven females.

The open method had been used as induction to nitrous oxide and oxygen in one instance, the closed method in five instances. The substance was used as an adjuvant to nitrous oxide and oxygen in five instances and as an adjuvant to ethylene and oxygen in six. The operations performed were: dental, 11; hernia, 2; cholecystectomy, 1; prostatectomy, 1; nephro-lithotomy, 1; closure of colostomy, 1; a total of 17.

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No premedication was used in five cases. In the remainder the premedication included "Seconal" in 5, morphine and hyoscine in 2, morphine and atropine in 4.

In regard to complications, vomiting occurred once or twice in patients in whom "Vinesthene" was used as an adjuvant to gaseous anæsthetics; it was slight and occurred not more than once in these cases.

Dr. Brown said that the series was too small to form definite conclusions, but he made the following comments:

1. Induction of anæsthesia was rapid and pleasant.
2. Recovery was quick and without unpleasant sequelæ.
3. It appeared to be suitable for short dental operations in children and to be able to replace ethyl chloride or gas.
4. When used as an adjuvant to the gaseous anæsthetics, it rapidly deepened the anæsthesia and produced excellent relaxation.
5. Rowbotham's micrometer chloroform bottle for use with McKesson's apparatus was most useful for the addition of "Vinesthene" to a gaseous anæsthetic.

DR. S. V. MARSHALL (Sydney) said that he had a limited experience of about ten cases. The best practice was to administer the drug in a closed system and to give it with "Carbogen". The duration of anæsthesia was sufficient for the extraction of several teeth. There was a better hang-over following the use of "Vinesthene" than with ethyl chloride. In his cases there was no vomiting. A good supply of oxygen was necessary. When oxygen deficiency was present during the use of "Vinesthene", liver damage occurred.

Experiences with "Pentothal Sodium".

DR. GILBERT BROWN (Adelaide) and DR. GILBERT TROUP (Perth) presented a joint paper in which they set out their experiences with "Pentothal sodium" which had been supplied to them by the courtesy of Messrs. Abbotts, Limited. The series of patients was 56 in number. The ages of the patients varied from fifteen to eighty years; 39 were males and 17 females. The longest recorded time of effective anæsthesia without any adjuvant was 25 minutes. Adjuvant anæsthesia was used in 12 of the 56 cases. The operations were mostly minor. Four abdominal sections were included; in three of these adjuvant anæsthesia was necessary; the fourth operation was a laparotomy. The authors drew no definite conclusions, but made certain comments. In comparison with "Evipan", induction appeared to be quicker, quieter, and had less tendency to jactitation. "Evipan" was, however, eliminated more slowly. Patients had no unpleasant sensations, and there was no post-anæsthetic vomiting. The use of atropine before administration of the "Pentothal sodium" would reduce excessive salivation, and morphine would allay apprehension to a certain extent.

DR. S. V. MARSHALL (Sydney) stated that he had recently used "Pentothal sodium" a good deal. He disagreed with Dr. Troup that the indications for its use were few and far between. It was dangerous in inexperienced hands. The 5% solution was invariably employed. No sloughing of the tissues around the site of injection had been seen by him. If by chance the solution was injected into the tissues instead of into the vein, normal saline solution was immediately injected. Fractional injection was essential. Premedication was extremely valuable. One-sixth of a grain of morphine and one one-hundred-and-fiftieth of a grain of atropine were generally used by him. "Pentothal sodium" was an excellent basis for subsequent nitrous oxide-oxygen anæsthesia. Good recovery occurred with this sequence. In eye operations it was very valuable, but it was necessary not to allow the eye surgeon to start too soon, otherwise the patient might sneeze. The surgeon should be asked to cocainize the eye beforehand, and atropine should be given. Full relaxation was obtained and it was better than that obtained with "Sodium evipan". Cystoscopy had been done while the patient was under "Pentothal sodium" anæsthesia. Even bronchoscopy could be done, but it was necessary to carry the patient to the stage of respiratory depression. It was better to cocainize the larynx beforehand. There were, in his experience, no complications. The impression had been gained by him that "Pentothal sodium" was eliminated more slowly than "Sodium evipan"; but this was possibly due to the fact that the patient was under deep anæsthesia. Shallow respiration was apt to be disconcerting.

DR. LORNA BRAY (Melbourne) said she had used "Pentothal sodium" in about sixty cases. No premedication was used, with the exception of one operation on a gall-bladder, when one-sixth of a grain of morphine and one one-hundred-and-fiftieth of a grain of hyoscine were used. In this case, good relaxation was obtained and no other anæsthetic was necessary. The 10% solution was the only one she had used. In one case the patient was given ten cubic centimetres; and this dose was repeated. No ill-effects were seen. In another operation for appendicectomy the patient became cyanosed following the injection of two or three cubic centimetres of the solution, and restoratives were required. "Pentothal sodium" was so quick in its action that Dr. Bray thought no premedication was necessary. She had not experienced any salivation, although atropine had not been used.

DR. GILBERT BROWN (Adelaide) stated that Lundy's routine was to give one and a half grains of "Nembutal", one-sixth of a grain of morphine, and one one-hundredth of a grain of atropine before using "Pentothal sodium".

DR. HUGH HUNTER (Sydney) referred to his early experience with the drug at the time when he used the 10% solution. In one case he had given ten cubic centimetres to an adult with little or no anæsthetic effect. When ether was used as an adjuvant, the patient coughed violently, only a few drops being necessary to produce this effect. It became almost impossible to control. In a child to whom he had given seven cubic centimetres of the solution, extreme restlessness had occurred following recovery. He thought the jactitation mentioned by some of the speakers following the use of "Sodium evipan" was probably due to too quick a rate of injection. A slower rate of injection tended to eliminate this complication.

(To be continued.)

Books Received.

DISEASES OF THE HEART DESCRIBED FOR PRACTITIONERS AND STUDENTS, by Sir Thomas Lewis, C.B.E., F.R.S., M.D., D.Sc., LL.D., F.R.C.P.; Second Edition; 1937. London: Macmillan and Company Limited Demy 8vo, pp 317, with illustrations. Price: 12s. 6d. net.

THE SURGERY OF THE SYMPATHETIC NERVOUS SYSTEM, by G. E. Gask, C.M.G., D.S.O., F.R.C.S., and J. P. Ross, M.S., F.R.C.S.; Second Edition; 1937. London: Baillière, Tindall and Cox. Super royal 8vo, pp. 198, with illustrations. Price: 16s. net.

THE ENDOCRINES IN OBSTETRICS AND GYNECOLOGY, by R. Kurzrok, Ph.D., M.D.; 1937. London: Baillière, Tindall and Cox. Medium 8vo, pp. 504, with illustrations. Price: 34s. net.

MEDICAL ESSAYS, by J. C. Meakins, M.D., F.R.C.P.; 1937. Australia: Angus and Robertson Limited. Demy 8vo, pp. 188, with illustrations. Price: 10s. 6d. net.

LEAGUE OF NATIONS PUBLICATIONS. BULLETIN OF THE HEALTH ORGANISATION. VOLUME VI, NUMBER 2: REPORT ON THE WORK OF THE GROUP OF EXPERTS APPOINTED TO STUDY METHODS OF ASSESSING THE STATE OF NUTRITION IN INFANTS AND ADOLESCENTS; 1937. Geneva: Publications Department of the League of Nations; Australia: H. A. Goddard Limited. Medium 8vo, pp. 298. Price: 2s. 6d. net.

RECENT ADVANCES IN PULMONARY TUBERCULOSIS, by L. S. T. Burrell, M.A., M.D., F.R.C.P.; Third Edition; 1937. London: J. and A. Churchill Limited. Large crown 8vo, pp. 328, with 48 plates and 22 text figures. Price: 15s. net.

A TEXT-BOOK OF OPHTHALMIC OPERATIONS, by H. Grimsdale, M.B., F.R.C.S., and E. Brewerton, F.R.C.S.; Third Edition; 1937. London: Baillière, Tindall and Cox. Medium 8vo, pp. 331, with illustrations. Price: 17s. 6d. net.

THE PATIENT AND THE WEATHER, by W. F. Petersen, M.D., with the assistance of M. E. Milliken, S.M.; Volume IV, Part II: Organic Disease—Hypo and Hyperthyroidism, Diabetes, the Blood Dyscrasias, Tuberculosis; 1937. Michigan: Edwards Brothers Incorporated. Imperial 8vo, pp. 757, with illustrations. Price: $11.00 net.

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