RECENT ADVANCES IN OTO-LARYNGOLOGY

THIRD EDITION

By

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FOREWORD

THIS book is described as the third edition of *Recent Advances in Oto-laryngology*, the first and second editions of which I was the author, but in reality it is an entirely new book. Advances in oto-laryngology have been so many in recent years, and the literature of the specialty has been so voluminous, that the subjects selected for appraisal and discussion in the present book bear little resemblance to those discussed in the previous editions.

I am glad that Mr. Boyes Korkis has been able to resist the temptation to farm out various chapters to other colleagues, as is so general in books on oto-laryngology, for I think it is important that this book should present a personal survey of the whole field of the specialty, wide as it is, seen through the eyes of one practising oto-laryngologist, who nowadays has to be as knowledgeable about problems of rehabilitation of the deaf as about bronchoscopy and the surgery of the mediastinum.

I was happy to be able to hand over the responsibility for this new edition to my old friend and colleague, Mr. F. Boyes Korkis, whom I knew first when he was house surgeon to Mr. Lionel Colledge at Golden Square Hospital and we served together in one of the hospitals of the Emergency Medical Service in 1939. He went on to work in the anatomy department at Edinburgh, took his Edinburgh F.R.C.S. and became Otologist to the 2nd New Zealand Expeditionary Force in the Middle East and Italy. At the end of the war he was appointed Registrar to the Metropolitan Ear, Nose and Throat Hospital, and in February, 1946, he published in the *British Medical Journal* an authoritative article on the effect of blast on the human ear; this article aroused widespread interest because Major Boyes Korkis had, under active service conditions, made careful notes, with audiograms, of all his patients —and none of the 150 otologists in the British Army had ever had access to an audiometer. He returned to New Zealand for demobilization, but at the beginning of 1948, when a vacancy occurred, he was invited to return to the Metropolitan Ear, Nose and Throat Hospital as honorary surgeon, and shared its undeserved vicissitudes on the inauguration of the National Health Service. He subsequently added to his qualifications and to his contributions to the literature of oto-laryngology.

The new author is now one of the pillars of the rejuvenated Hospital and as Dean is responsible for the organization of its postgraduate teaching. He has a high and growing reputation, there and elsewhere, for sound judgment and hard work, as well as for his careful microscopic surgery of the ear and labyrinth and his excellent results in the radical surgery of the pharynx and larynx.

R. Scott Stevenson.

Gibraltar,
1957.

PREFACE

THIS book is designed to supplement standard reference works and is intended to stimulate the interest of practitioners in ear, nose and throat problems, and to bring to their notice recent advances in diagnosis and treatment. The reader's attention is directed to preventive and therapeutic measures which are based upon modern concepts of pathology, upon new outlooks on the clinical aspects, and upon the individual needs of the patient.

It is hoped it will be of help to house officers, clinical assistants, registrars and other postgraduates working for higher degrees in oto-laryngology. Practising oto-laryngologists may perhaps find it a useful compendium of modern work.

The ever-increasing demand upon the time of the present-day practitioner makes it exceedingly difficult for any one individual to keep abreast of recent refinements in all branches of the specialty. The multiplicity of papers and journals adds to the problem. When the author agreed to write this book he had little idea of the arduous task he was about to undertake. Hundreds of papers in dozens of journals have been studied in preparation for the text. Every attempt has been made to include the more important recent advances, but selection has had to be rigid in order to keep the text within reasonable bounds.

In a book dealing with recent advances the passage of time leads inevitably to the need for extensive revision. The advent of a new author augments these alterations. Unlike a text-book, its framework can be changed completely and the author can then start afresh. Although this edition has been entirely recast, rewritten and enlarged, the principle of surveying *recent* literature has been retained. With the exception of important historical references, the quoted literature has been published mostly within the past five years. Osler said that a text-book must state views which have stood the test of time, while a year-book must record the proceedings of the previous year like the minutes of a meeting. 'Recent Advances' stands midway between the two. Its purpose is to assess, comment upon, and draw conclusions from, reports dealing with subjects of topical interest.

It would have been impossible to do this without access to a comprehensive medical library, and the facilities available at the

Royal Society of Medicine. The co-operation and assistance of Mr. P. Wade, the Librarian, and his most helpful staff have enabled the author to review the literature.

The author acknowledges with gratitude the courtesy of the many authors who have allowed him to quote and abstract their original work, and to make use of their illustrations. A footnote is appended to those in acknowledgement; it also expresses his thanks to the journals' editors who have put blocks and illustrations at his disposal.

The author's clinical photographs depict patients in his care. Mr. S. Joffe (Metropolitan Ear, Nose and Throat Hospital), Mr. E. Stride (Hillingdon Hospital), the Department of Medical Photography of the Royal Marsden Hospital and of the National Hospital, Queen Square, have been responsible for most of the photography; Mr. S. V. Anand has kindly furnished the line drawings, and has helped in proof-reading.

The author is under grateful obligation to many colleagues and friends for their welcome advice and kindly criticism on various points—Mr. J. Chalmers Ballantyne, Dr. R. Bodman, Miss V. Dalley, Air Vice-Marshal E. D. D. Dickson, Miss M. R. Dix, Mr. D. A. Draffin, Dr. G. E. Hale-Enderby, Mr. G. Fennell, Mr. I. Simson Hall, Mr. C. S. Hallpike, Dr. J. D. Hood, Professor L. B. W. Jongkees, Dr. M. Lederman, Dr. Hayes Martin, Mr. Wylie McKissock, Mr. R. T. Payne, Dr. T. Powell, Mr. J. P. Stewart, Miss Edith Whetnall and Professor F. Zöllner and to all his many other helpers.

Mr. J. R. Elder and Mr. J. T. Jackson have checked and corrected the page proofs. Their help in this onerous task has proved invaluable. The preparation of the index has been the responsibility of Mr. L. T. Morton. Special thanks are due to the publishers, Messrs. J. and A. Churchill, Ltd., who have shown the author every consideration; Mr. J. Rivers, the managing director, and Mr. A. S. Knightley of that firm have been especially helpful in making the author's task easier by their friendly co-operation.

Mr. R. Scott Stevenson has kindly written a Foreword. He is a friend and colleague of many years' standing. The author tenders grateful thanks to him for his advice, wise counsel, encouragement and unfailing interest. It is an honour to have been given the privilege of rewriting his book.

F. Boyes Korkis.

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CONTENTS

CHAPTER I

ANÆSTHESIA IN OTO-LARYNGOLOGY

THE oto-laryngologist, operating as he does on the vital upper respiratory tract, is more directly concerned with anæsthesia than surgeons working in other regions. Important and far-reaching advances have taken place in the field of anæsthesia, and these are of immense practical importance to patient and doctor alike. Modern techniques enable long operations to be performed with comparative safety to the patient, and with a minimum blood loss. Post-operative chest complications are infrequent, since endotracheal anæsthesia has become standard practice; the intravenous injection of anæsthetic agents, followed by the use of short-acting relaxant drugs, has revolutionized the technique of induction and intubation. An anæsthetist, with the aid of relaxants, can now pass an endotracheal tube under direct vision with ease, and without undue trauma to pharynx, larynx and trachea. The anæsthetist has become the clinical physiologist and physician of the surgical team, and to take advantage of these benefits the surgeon should co-operate fully with him; each must know what can be achieved by the use of special techniques, and this calls for a knowledge of each other's problems.

Ear, nose and throat operations are often of short duration. Full relaxation will be required by the anæsthetist to perform intubation, and by the surgeon if mouth gags or endoscopes are to be introduced. A rapid return of reflexes is also highly desirable. To meet these requirements, the modern trend is to employ the intravenous route for induction, using thiopentone which is followed by an injection of a relaxant drug, such as succinylcholine chloride dihydrate ('Scoline'). Intubation is performed and the anæsthesia continued with nitrous oxide and oxygen, supplemented by other agents. If surgical diathermy is to be used, the surgeon informs the anæsthetist beforehand so that a non-explosive mixture is given. Before the operation is begun, a lubricated pack is placed in the hypopharynx around the tube. This makes for smoother anæsthesia and prevents the entry of blood into the lower air-passages. It is the responsibility of the anæsthetist to see that this pack is removed at the termination of the operation, but the wise surgeon also ensures that his patient's airway is free and

unobstructed before the patient leaves the theatre. Knowing the speed of his surgeon, the skilled anæsthetist adjusts the depth of anæsthesia so that the cough reflex has returned at the termination of the operation.

When operations are of longer duration, the time may be shortened, blood loss prevented, and the surgery facilitated by using one of several methods that have been introduced for lowering the blood-pressure, but hypotension anæsthesia is essentially an adjunct and not a necessity. It carries with it certain risks and it should not be employed indiscriminately for the convenience of the surgeon. Experience in the technique makes for safety and there should be close consultation between all members of the team—medical and nursing alike—at all stages; cases require careful selection pre-operatively, rigorous control in the theatre, and strict observation upon return to the ward.

Endotracheal Anæsthesia

Intubation was first performed to carry out artificial respiration, but soon afterwards it was realized that this method provides the surgeon with better and safer operating conditions, especially for procedures involving the head and neck, and the anæsthetist with smoother and easier control. Since Magill and Rowbotham introduced intubation in a plastic surgical unit after the 1914–18 War, there has been general recognition of its usefulness, until today it has become standard practice. But despite the undoubted advantages, the risks should not be underestimated. Wylie (1950), of St. Thomas's Hospital, London, has assessed some of the minor and major hazards of intubation. He found that the incidence of post-operative sore throat, operations within the mouth and nose being excluded, was extremely high, for, of 100 cases, 57 patients developed mild sore throats and 13 severe ones. After removal of the tube under direct vision, he noted obvious œdema with or without bruising in 47 of these patients, 31 of whom developed mild, and 10 severe sore throats, 6 having no symptoms. Visible traumatic lesions do not, therefore, necessarily produce clinical symptoms; on the other hand, the absence of trauma is no guarantee that sore throat, due to pharyngitis, will not develop. This results from the pressure of either the tube or the pack. Laryngitis is not a common complication—in 100 abdominal cases it occurred in only 2. Tracheitis is a definite complication evidenced by retrosternal soreness and cough, and intubation in

the presence of upper respiratory infections is likely to produce post-operative pulmonary complications. The most obvious dangers attending unskilful intubation are gross traumatic lesions, such as broken teeth, torn lips, abraded gums and lacerations of the nasal mucosa. Baron and Kohlmoos (1951), in America, also found a high incidence of trauma, *all* of 80 patients complaining of discomfort in the first 24 hours; 34 complained of hoarseness which lasted for up to 5 days.

Since Clausen (1932) described the first case of laryngeal granuloma following intubation, a number of other reports have appeared, and it is probable that the condition is not as rare as is generally supposed. Flagg (1951*a*), as a result of a questionnaire sent out to each member of the American Laryngological, Rhinological and Otological Society, Inc., found that thirty-four of these reported a total of 101 granulomata. Acute glottic or subglottic stenosis, due either to membrane formation or to œdema, is another complication which is very occasionally encountered. Baron and Kohmoos (1951) have reported 15 cases with laryngeal sequelæ following intubation, as follows:

1. Eight cases of laryngeal obstruction; 4 from œdema, all children, 2 of whom died, and 4 from membranous laryngitis or tracheitis, or both.
2. Seven cases of laryngeal granuloma. The most common site was near the vocal process of the arytenoid and in the majority of cases the lesions were bilateral, the onset of hoarseness being as late as 4 months after the operation in 2 cases.

The majority of laryngeal complications occur when the tube has been in position for a considerable time. The use of tubes which are too large, or of an unsuitable laryngoscope, is another possible ætiological factor in the experience of Flagg (1951*b*); he also mentions that immediate laryngeal reactions may be caused by contact allergy to anæsthetic lubricants, such as 'Nupercaine'. Reaction to various antiseptics is mentioned by others.

In children, hyperextension of the head is blamed by Smith (1953). The loose areolar tissue is especially susceptible to trauma. The narrow subglottic space is another factor of importance, according to Holinger and Johnston (1950) and to Eckenhoff (1951). In reporting 5 cases, Feinmesser, Aladjemoff and Chayen (1954) draw attention to this complication in children (3 cases) and in women (2 cases). They recommend early tracheotomy

because of the relative smallness of the larynx, if the respiratory obstruction is not relieved after bronchoscopic treatment.

An intra-tracheal tube has been shown by Barton to occupy a posterior position in the larynx. This finding explains why granulomata occur in the posterior part of the glottis. Epstein and Winston also accede to this theory. They believe that static pressure caused by the tube is a more important ætiological factor than direct trauma during laryngoscopy and intubation.

The cuffed tube is a fairly recent innovation but is not free from danger. Turner (1949) has reported 3 cases in which tracheal sloughs have developed following its use. Flagg prefers a pharyngeal pack to prevent aspiration around the tube. He does not employ subglottic packs because they are bulky and unnecessary. His post-operative trauma rate of less than 2 per cent (which is similar to that reported by laryngologists performing bronchoscopy) underlines the importance of the training of the anæsthetist, not only in his own specialty, but in laryngoscopy and in atraumatic endoscopic instrumentation as well. Any procedure which is carried out under direct vision is better than a blind method. The relaxants have robbed laryngoscopy of its terrors, and there is no reason why intubation should not be performed by the anæsthetist with the same degree of gentleness and skill as that exhibited by the laryngologist, once he has learnt the art of endoscopy. The laryngologist can do much to help the inexperienced anæsthetist to acquire this dexterity.

Hypotension Anæsthesia

In the past the surgeon employed various local methods to obtain a bloodless operative field, such as the ligation or compression of main vessels, or the application or injection of vasoconstrictor drugs. More recently, the anæsthetist has achieved this object by general measures designed to lower the blood-pressure. Griffiths and Gillies (1948) use a high spinal block with the deliberate intention of reducing the blood-pressure to a level of approximately 60 mm. of Hg. They found that this pressure was sufficient to maintain cellular respiration and metabolism in all the vital organs, provided the blood was well oxygenated and vasodilatation was brought about. The same result was achieved by Enderby (1950–53) by the intravenous injection of methonium compounds which produce paralysis of all autonomic ganglia, sympathetic and parasympathetic alike. He found that the degree of hypotension could be controlled by alteration of the tilt of the

operating table; the optimum safe level of 60–65 mm. Hg. could be maintained by adjusting the posture. The first drug used for this purpose was pentamethonium iodide, but this proved unreliable. Next, hexamethonium bromide was given, and a more consistent fall of blood-pressure ensued. However, this drug was still unsatisfactory in young adults as it caused a rise in pulse rate to 120–140 per minute, followed by a rise of blood-pressure, further doses being ineffective. The present writer has recorded his experience in operating upon 100 cases when hexamethonium bromide was used to produce hypotension. Of these, 30 were major cervical operations; 51 were on the temporal bone; 17 were major nasal procedures, and 2 were plastic in nature. The cases were classified into three groups:

Group One: A very dry field throughout the greater part of the operation, the method aiding materially—56 cases.
Group Two: A moderately dry field throughout, the hypotension being of some assistance—36 cases.
Group Three: Were failures in which no benefit was gained—8 cases. (Korkis, 1953.)

In view of the failures, Enderby (1954) is now using pentolinium tartrate ('Ansolysen'), which he finds is superior to hexamethonium, especially in its longer duration of action. 'Ansolysen' gave successful control of blood-pressure in 180 patients, whose ages ranged from 5 to 78 years, and there were no undesirable side effects. The drug is injected after induction and intubation, whilst the patient is still horizontal, and the fall of blood-pressure is noted before tilting the table. Pentolinium tartrate produces a relatively slow initial fall, which is an advantage, and the hypotensive effects of posture and of controlled respiration are greater than with other ganglion blocking agents. The return of pressure is also slow, and tachycardia is rare, even in young subjects.

Trimethylene thiophanium camphor sulphate ('Arfonad') is another ganglion blocking agent, which was first described by Randall *et al.* in 1949, and is widely employed by many anæsthetists today because it is rapidly destroyed in the body and has a rapid, short and readily reversible action in lowering blood-pressure. It is therefore considered to be a relatively safe agent to use, for it can be given by a continuous intravenous drip, the usual concentration being 0·1 per cent, which is easily controlled. Sadove, Wyant and Gleave (1953) state that in a normal man the blood-pressure level attained is not below 90 mm. Hg, a further fall being

produced by posturing the subject; but under anæsthesia a greater degree of hypotension is possible. The pressure rises a few minutes after discontinuing the drip. Instead of using this method of administration, Fildulff (1954) uses repeated intravenous injections at short intervals and considers that this single-dose technique is particularly useful when a short period of hypotension is required; he finds that 'Arfonad' is less satisfactory than the longer-acting agents when a dry field has to be maintained for a long time. If 'Arfonad' is given over a long period there is a fall in body temperature due to the peripheral vasodilatation which is produced by this drug.

'Arfonad', like hexamethonium, is antagonized by the vasopressors—adrenaline, noradrenaline, ephedrine and desoxyephedrine. From the surgeon's point of view, local infiltration with adrenaline-containing solutions should not be employed. Hypotensive techniques are contraindicated in patients with advanced arteriosclerosis, anæmia, kidney disease and in any condition where the coronary or cerebral circulation is already impaired. It is at present difficult to assess the nature and extent of complications which have arisen from hypotensive techniques. Hewer and Goldsmith (1952) have reported the occurrence of unilateral amaurosis due to spasm of the central retinal artery. Other possible complications are blindness from retinal atrophy; hemiplegia, paraplegia and coronary and cerebral thromboses. Cardiac arrest from ischaemia is a real danger, especially when the initial fall of pressure is abrupt and profound.

Personal experience of three cases of cardiac arrest has demonstrated the need for prompt remedial action on the part of both anæsthetist and operator. The former takes immediate action by bringing the operating table into the horizontal position and by warning the surgeon so that he may be prepared to carry out cardiac massage without delay. To wait longer than one minute before proceeding with this life-saving measure is to court disaster. In two of the three personal cases of cardiac arrest, the author carried out cardiac massage within one minute of being informed of the position by his anæsthetist; both of these patients recovered, although naturally the operation was not proceeded with under hypotensive anæsthesia. The third patient's cardiac massage was delayed longer than a minute; all efforts to restart the heart failed—an extreme degree of hypotension had been allowed to continue for too long a period before adequate steps were taken to resuscitate the patient. This fatality underlines the necessity for:

1. Wide experience on the part of both the anæsthetist and surgeon.
2. Close co-operation between them.
3. The acceptance by the operator of the need for sudden changes in the tilt of the table at the discretion of the anæsthetist.
4. The real need for speed in performing transabdominal or transthoracic cardiac massage. As already stated, this can and should be done in under one minute.

Poor oxygenation of the circulating blood may prove fatal, but should be avoidable if care is taken. In this connection, an asthmatic patient whose bronchi are in a state of spasm is a dangerous risk for hypotension anæsthesia, for relative anoxia still occurs despite intubation. The shortness of the thoracic part of the trachea after the upper portion has been divided in operations such as laryngectomy and laryngopharyngectomy is sometimes not appreciated by anæsthetists who pass a tube through the tracheotomy opening into one (usually the right) main bronchus. The other lung collapses, and the blood leaves the uncollapsed lung underoxygenated. The vital centres in the brain stem are thereby starved of oxygen, and death may ensue, as it did in two cases known to the author. The laryngologist should, therefore, ensure that the endotracheal tubes to be used are of such a length as to lie above the carina. This is especially important when the second tube is passed after the division of the trachea. If a cuffed tube, not longer than one and a half inches, is sterilized and passed by the surgeon himself at the appropriate stage of the laryngectomy, this hazard will be avoided.

Reactionary hæmorrhage may prove troublesome if all bleeding is not controlled before closure of the wound, especially if the blood-pressure is allowed to return to normal quickly. This applies mostly to operations of short duration when the drug used is a long-acting one. Thus, in six S.M.R. operations personally performed, and carried out under hexamethonium hypotension as an experimental measure, post-operative hæmatomata developed in three. The method should not be employed for short, simple operations when ordinary anæsthetic measures suffice. With longer operations any bleeding that does occur, even if trivial, is controlled before closure of the wound; a tiny ooze can lead to troublesome reactionary hæmorrhage later! If a sudden and large hæmorrhage takes place at the time of operation (*i.e.* primary hæmorrhage), a

blood transfusion is given immediately, in order to maintain the oxygen content of the circulating blood and to combat the excessive fall of blood-pressure which ensues. Compatible blood must therefore always be available in the theatre for emergency use in such an event.

If an operation can be performed equally well without hypotension, it is not justifiable to expose the patient to the added risks involved. Careful selection of cases is necessary to obtain positive benefits for both patient and surgeon. When a long operation can be performed better, with a greater chance of success, and when there is likely to be considerable blood loss, hypotension is justifiable. The technique almost obviates the need for blood transfusion, although a large blood loss should always be replaced after major operations. Surgical shock is greatly reduced, and the patients feel and look better than they would have done had no hypotension been employed. To sum up the advantages of the technique:

1. Long operations may be undertaken with a minimum of blood loss and primary surgical shock (*i.e.* laryngo-pharyngectomy with block dissection of glands of neck).
2. In difficult areas it enables a *better* operation to be performed so that the chances of successful surgery are enhanced (*i.e.* fenestration and external ethmoidectomy).
3. It shortens the time taken to a considerable degree—a factor of importance to the patient, and of convenience to the surgeon.
4. It sometimes obviates a preliminary ligation operation (*i.e.* ligation of external carotid artery before resection of the upper jaw).
5. It often obviates the need for blood transfusion and other restorative methods to combat primary and reactionary shock.
6. Less absorbable material is buried in the wound with less fibrous tissue reaction around the catgut—of importance in plastic operations.
7. There is a reduction in tissue bruising, traumatic œdema and fibrous tissue formation, leading to rapid healing with minimum scar tissue formation—it may reduce the chance of fibrous tissue closure of a newly created fenestra.
8. Twenty-four hours after operation the patient is in surprisingly good general health. Why this is so, apart from the reduction of surgical shock, is not known.

The author is accustomed to employ hypotension anæsthesia for the following operations: fenestration; facial nerve explorations and grafts; long cervical operations such as block dissections, laryngectomies, and thyroidectomies when there has been preliminary preparation with thiouracil; operations on the nose and upper jaw for malignant disease; external ethmoidectomies; and certain long plastic operations on the head and neck.

At the same time the surgeon must remember that this technique is difficult and exceedingly trying even for the most skilled anæsthetist. It is vitally important to ensure the utmost degree of safety. Safety depends on the skill and experience of the anæsthetist and on the co-operation and competence of the surgeon.

Muscle Relaxants

An outstanding advance has been the use of synthetic muscle relaxants which allow full muscular relaxation without deep anæsthesia. The natural alkaloid *d*-tubocurarine was first isolated in 1935, but was not used in anæsthesia until 1942. Supplies of the imported plant were difficult to obtain in sufficient quantity, so a search was made for synthetic substitutes.

Gallamine triethiodide ('Flaxedil') was found by Bovet, Depierre and De Lestrange (1947) to have curariform properties. The mode of action of tubocurarine and gallamine is to block transmission across the myoneural junction of voluntary muscle by a reduction of the end-plate potential. This is brought about by an accumulation of acetyl choline and is readily antagonized by the anticholinesterases, such as neostigmine. Gallamine has been found to be safer than tubocurarine, the period of relaxation lasting for about 20 minutes. This relatively long period of relaxation, whilst ideal for abdominal operations, is unnecessary for simple intubation, or for endoscopic examinations. The discovery of other short-acting relaxants has put into the hands of the anæsthetist and surgeon further valuable weapons for carrying out these procedures, and other short operations.

Bovet and his co-workers found that the succinyl esters of certain carboxylic acids produced brief but profound relaxation lasting for 3 to 5 minutes. Suxamethonium ('Brevidil M') is twice as potent and lasts longer than suxethonium ('Brevidil E'). Succinylcholine chloride dihydrate ('Scoline') is another similar short-acting relaxant and has the practical advantage that it is relatively stable in temperate climates. As it is already dissolved, it is marketed in liquid form in ampoules, ready for use,