THE AMERICAN APPROACH TO ANAESTHESIA

BY

M. K. SYKES, M.B., F.F.A.R.C.S., D.A.*

*Assistant Anaesthetics Registrar,
University College Hospital, London*

Until very recent times the main training centres for anaesthesia were in the United States of America and in the United Kingdom. Historically, the foundations of anaesthesia were laid when the first successful operations were performed under ether anaesthesia in 1846 at the Massachusetts General Hospital, Boston, and University College Hospital, London. Although subsequent progress has been along similar lines, the rapid growth of the American population and a geographical environment dissimilar to our own have resulted in a somewhat different approach to anaesthesia. This paper attempts to examine the factors which have led to these contrasts with British anaesthetic practice.

The rapid expansion of the American population during the past century has been due both to a high birth rate and to immigration. Originally, most of the immigrants settling in the States were poor. Few professional persons moved with them, for there were adequate opportunities in the mother countries. The American medical schools were insufficient to cope with the increasing demand for doctors, and consequently there was a persistent shortage. The present-day shortage is not apparent in the larger hospitals because they attract many postgraduate students for training. It does, however, affect the smaller hospitals, many of which rely on foreign doctors for junior staffing. Such foreign doctors are allowed to practise in most hospitals on a temporary licence basis, but their subsequent assimilation presents many problems owing to their greatly varied background, temperament, and standard of training. It must be remembered also that many foreign doctors go to America for specialist training and then return home. A recent census¹ showed that 5,036 physicians from 84 countries trained in American hospitals as interns or residents during the academic year 1954-5. One-quarter of these came from Far Eastern countries, whilst nearly as large a number came from Latin America and Europe.

The resultant general shortage is accentuated by two factors which cause maldistribution within the country. Firstly, there is a natural tendency for doctors to remain in the more highly populated areas where a closer contact can be maintained with other medical centres, and where practice is usually more lucrative. Despite the advantage of a closely knit air-transport service, distance is a very real barrier to the spread of new ideas and developments in medicine. Secondly, climatic and topographical factors attract men to the more pleasant parts of the country. Both these problems exist in Great Britain, but they are much smaller in magnitude.

Status of the Anaesthetist

The specific shortage of suitable applicants for residency training in anaesthesia is even more marked than the general

shortage. A brief glance at the history of the specialty shows why. Just as in England the nurse-midwife has relieved the obstetric services of routine deliveries, so, in America, the nurse-anaesthetist has carried the main load of general anaesthesia. A nurse spending her whole day administering ether tends to become more proficient than the occasional general-practitioner anaesthetist. If the surgeon is prepared to accept the additional responsibility she forms a cheap and efficient substitute in the average good-risk case. The low standards of many medical anaesthetists and the wide employment of nurses caused the surgeon to treat the anaesthetist merely as a technician. The status of the anaesthetist was accordingly lowered. As recently as 1949 this low status was being deplored,² and a sociologist³ was reporting on his position in the operating team. Both were pleading for higher professional competence as the first step in raising the status of the profession.

Similar conditions existed in earlier times in England, where for many years it was the duty of the local general practitioner or the most junior houseman to "drop the ether." A few stalwarts followed John Snow's lead and worked for the ideal of a full-time anaesthetist, but it was not until the immediate pre-war years that the number of consultants greatly increased. The rapid increase in the number of anaesthetists trained for wartime purposes, the close co-operation between anaesthetists and surgeons in the Service hospitals, and the further expansion of anaesthetic services in the immediate post-war years have virtually remedied this situation in England. In addition, the foundation of academic chairs has done much to foster the scientific aspects of the subject.

The Present Situation

The results of a recent questionnaire sent by the American Association of Nurse-Anesthetists to 7,032 hospital administrators⁴ indicate in some degree the present situation in America. Only 52% of all anaesthetics given in hospital operating-rooms are given by persons who have attained recognition as specialists. Of the remaining 48%, 27% are given by physicians whose qualifications as specialists are unknown, 19% by nurses whose qualifications are unknown, and the remaining 2% by persons who are neither registered nurses nor physicians. Of the 52% given by qualified anaesthetists, 34% are administered by members of the American Association of Nurse-Anesthetists and 18% by members of the American Society of Anesthesiologists. Therefore in only 45% of all cases anaesthetized in hospitals is anaesthesia induced by physicians, whilst in the remaining 55% it is done by nurses or non-qualified persons.

The employment of nurses is the cause of much contention within the profession at the present time. Certain anaesthetists⁵ feel that there are not enough adequately trained medical anaesthetists to take over the immense volume of work being handled by nurses. Until there are enough doctors, they believe that the training of nurses must continue. On the other hand, the American Society of Anesthesiologists, Inc., has adopted a resolution in which it expresses "disapproval of the training of persons other than doctors of medicine in the science and art of anaesthesia. . . ." Although the provision of purely medical anaesthesia throughout the States is acknowledged to be the ideal, it is at present impracticable. It has been estimated⁶ that 18,000 trained people would be required to cope adequately with all the anaesthesia in the States. The magnitude of the problem is apparent. It does seem that it will be many years before it is possible to dispense with the nurse-anaesthetist.

At the present time, therefore, America has three main categories of anaesthetic specialist. Firstly, the salaried staff man or resident working full-time in a department, attached to a hospital and perhaps to a university medical school. Secondly, the private practitioner who has set up in practice after one, two, or more years of training, who works from an "office," and anaesthetizes for individual surgeons in different hospitals, or who covers one or more hospitals as

*A visit to the U.S.A. was made possible by the award of the Rickman Godlee Travelling Scholarship from University College Hospital Medical School, London, and by the tenure of a Fellowship in Anaesthesia at the Massachusetts General Hospital, Boston, U.S.A. To the Trustees of both these institutions I would like to express my gratitude.

part of a group. He is usually paid by fee, but may work on a group practice basis. Thirdly, there is the nurse-anaesthetist, who is usually the salaried employee of a hospital, but who may work for a group practice on a salary. In some hospitals the nurses work under the supervision of one or more physician-anaesthetists; in others they are directly supervised by the chief of surgery or his deputy. The latter arrangement is not limited to the smaller hospitals; at the time of writing one of the foremost teaching hospitals in the eastern states is staffed solely by nurse-anaesthetists working under the direction of the chief surgeon.

I will now turn from the general to the particular and discuss three problems: (1) the organization of a department; (2) the training of the medical and nurse-anaesthetist; and (3) the techniques in common use.

Organization of a Department

The larger departments are under the direct control of one head, who is assisted by several staff men. In most private, semi-private, and charity cases the anaesthetics are administered by residents and nurses in training under the supervision of these staff men. The ratio of staff to residents varies greatly from one to one to one to ten—and in some hospitals the senior residents supervise the juniors. The tendency is to group many operating-rooms together for reasons of economy. This in turn makes supervision easier. The residents are assigned to a particular case—either on the previous night or as cases come up to the theatre. Pre-operative visits are by no means routine, and the anaesthetist generally has less say in pre-operative treatment and medication than his English counterpart. On the other hand, the widespread use of recovery rooms close to the operating-floor enables the anaesthetist to watch his cases closely after operation. In some hospitals patients who are seriously ill are held for several days in these rooms. This helps to solve the problem of 24-hour staffing in hospitals whose emergency load would not otherwise justify the use of extra nurses.

Anaesthetic rooms are by no means the rule: this is surprising, because in America inhalational methods of induction are common. However, there is usually no shortage of operating-room space, since surgeons tend to operate on one or two cases a day rather than on the concentrated schedules so often seen in English theatres. Operating times are rather longer than in this country, owing to the more exacting techniques of surgery used. It is interesting that although vigorous pre- and post-operative chest physiotherapy is not practised as extensively as in England, the incidence of post-operative chest complications is no greater. Possibly the low incidence of bronchial disease in patients submitted to surgery is an important factor.

Training of Anaesthetists

The medical anaesthetist spends two (in some cases three) years at a recognized teaching centre. He attends formal lectures on the basic sciences related to anaesthesia, and on the pharmacology and use of anaesthetic drugs. Most departments have a weekly meeting for the discussion of deaths and complications, and lectures by outside speakers are frequent. Journal clubs thrive in most departments, and in the larger medical centres joint teaching programmes with other hospitals are arranged. Supervision and teaching in the operating-room varies greatly from hospital to hospital, yet residents progress rapidly to difficult cases. This is a natural result of the shorter training period. Great importance is attached to a thorough rotation through all types of anaesthesia and surgery, including such specialized procedures as bronchoscopies, therapeutic nerve blocks, and oxygen therapy. It is not at all uncommon for residents to be sent to different hospitals for a wider experience in such specialized fields as obstetric and children's anaesthesia. On completion of the two years of residency training the graduate is eligible to take the first part of his "Board Examination." This examination is run by the National Board of Certification, founded in the 1930's, and is the

equivalent of the English F.F.A. R.C.S. He then either stays on in salaried employment as a staff man or enters private practice. After a further three years' experience in either of these fields he may take the final examinations for Board recognition.

The nurse-anaesthetist receives a year's training in a recognized teaching department. During this time she is required to induce a statutory number of anaesthesias of all types and has to attend lectures on the basic sciences and on the pharmacology of anaesthetic drugs. She is taught the theory of spinal, epidural, and nerve-block anaesthesia, and to administer the commoner inhalational agents such as nitrous oxide, ether and ethylene, and, in some cases, cyclopropane and trichlorethylene. Intravenous therapy, including blood replacement, is carried out by nurses under the direction of the surgeon. Most nurses are capable of administering thiopentone. Intubation by both nasal and oral routes is taught; so is the use of the relaxants in some cases. In short, a competent nurse-anaesthetist is able to handle most routine forms of anaesthesia, including that for operation on the open chest.

Equipment and Technique

The grouping together of many operating-rooms leads to many differences from English theatre practice. Since to have a full range of equipment in each operating-room would be grossly inefficient, most of the supplies are kept in a central store-room. From this central point, before starting a case, the anaesthetist gathers all the equipment which he thinks he will need. In some hospitals anaesthetic machines are also kept centrally. The mass of equipment is then transported on trays, in baskets, or on trolleys to the room concerned. Many departments equip each resident with a box containing basic drugs, tubes, laryngoscope, sphygmomanometer, etc.⁶ This also solves the problem of equipment for resuscitation in wards and casualty departments and of anaesthetics in widely scattered places. Equipment is looked after by the anaesthetists themselves or by nurses or lay staff. The trained nurse-assistant now establishing a niche in some English hospitals is virtually unknown.

The two machines most commonly used are the Heidbrink and the Foregger. The closed circuit therefore forms an integral part of most techniques. The short training period and restricted ability of some trainees necessitates the teaching of fairly standardized and safe techniques. These may be varied locally, according to the preferences of the chief anaesthetist and by local conditions. For example, at Denver, with an altitude of about one mile (1.6 km.), the partial pressure of nitrous oxide is insufficient to produce satisfactory anaesthesia and other agents have to be substituted. Again, the explosion hazard is much greater than in this country owing to the dryness of the atmosphere. Antistatic precautions are therefore more strict.

British anaesthesia is to a great extent based on the thiopentone-nitrous-oxide-relaxant sequence. In America, ether, spinal analgesia, and cyclopropane are most commonly used. Ether is used universally as the basis for teaching, and is still regarded as the safest and most generally applicable of all the agents. The intense interest in its administration is reflected in the continued production of new vaporizers. An example is the "copper kettle" now fitted to Foregger machines. In this, a constant quantity of ether is added to each volume of gas passed through the vaporizer. The concentration in the final mixture is varied by altering the proportions of the total oxygen flow by-passed through it. Recent work by Brewster *et al.*⁷ has stressed the supportive role of adrenaline and noradrenaline in counteracting the depressant effect of ether on the myocardium, and has thrown new light on the severe and intractable hypotensive episodes which follow the administration of this agent to those with deficient sympatho-adrenal function.

The battle over spinal analgesia still rages. In some districts the legal activity has caused anaesthetists to be

extremely cautious in the use of the method. Public feeling is becoming more antagonistic, if for no other reason than the high incidence of headache after spinal analgesia. Nevertheless, the method is still widely used, particularly in those departments where the surgeons command much influence. Its advocates quote the recent study of Dripps and Vandam⁸: emanating as it does from a great school, this undoubtedly deserves close examination. Amethocaine and procaine are the drugs most commonly used, whilst lignocaine is probably the most popular drug for epidural, caudal, and nerve-block procedures. Therapeutic nerve-blocking is commonly practised. While certain centres have an international reputation in this field, it is also regarded as an important aspect of the work of the anaesthetist in private practice.

Cyclopropane has many adherents in different parts of the country. It is, however, much feared as an explosive agent, and the increasing surgical demands for diathermy act as a deterrent to its use. Trichlorethylene is little used, the reason possibly being that premedication is light by English standards, often consisting of only a small dose of a barbiturate with hyoscine or atropine. The lack of basal analgesia renders the subsequent attainment of a satisfactory level of analgesia with trichlorethylene more difficult. A further deterrent to its use is the close similarity of its actions on the myocardium to those of chloroform, a drug which has never attained great popularity in the States. Ethyl chloride is also banned from many clinics because of the tendency to produce cardiac arrest in children. Vinyl ether is the drug chiefly used before open drop ether.

A recent paper⁹ has cast grave doubts on the comparative safety of the relaxants when used under present American conditions. Many surgeons seem to have been influenced by the Bostonian pronouncements and have enjoined great caution in the use of these drugs. A critique of the paper has recently been published¹⁰; but, until a suitably controlled study has been undertaken, further controversy will only deepen emotions and will not clarify the issue. It is not insignificant, however, that many of the centres taking part in the study still enthusiastically teach the use of relaxants to their residents.

Oxygen therapy forms an important aspect of the work in an American department. Usually it is supervised by one of the staff with the assistance of residents in training and of technicians. There are many types of apparatus on the market for administering high concentrations of oxygen, for assisting coughing, and for resuscitation. Many hospitals have oxygen piped throughout the hospital from a liquid oxygen tank. Besides the saving in man-power required for hauling cylinders, the basic cost of the gas is reduced to about a third. Humidifiers of various types are almost the rule, and proprietary mucolytic detergents are often added to break down crusts in the bronchial tree.

Research

A word must be said about research. Most departments in their early years adhered to Waters's dictum of clinical anaesthesia first, teaching second, and research third and last. However, many departments now boast very generous research facilities. There is still an acute shortage of trained research workers, though many have migrated from such associated fields as pharmacology, biochemistry, and physiology. Residents are encouraged to take an active interest in research programmes as part of their training. In some centres, indeed, they may spend an extra year on a research project. Local and national meetings have special sessions for the presentation of this work. As a training in critical analysis and as an insight into research methods these activities are invaluable.

Conclusion

To sum up: one may say that the anaesthetist in America is still fighting an uphill battle for recognition. He has little say in the clinical management of patients, and in

some cases is not allowed to advise on the premedication or even the choice of anaesthetic which the surgeon orders him to administer. As a result the general standard of clinical anaesthesia is probably lower than in this country. But the theoretical teaching in the best centres is of a distinctly high standard, and, combined with the research undertaken in these centres, is doing much to achieve recognition for the younger generation of anaesthetists. The present intense interest in progress is reflected in the vast attendances at congresses and at the meetings of the many thriving local societies. Such enthusiasm for the subject, when disciplined by a training in critical thought, can lead to great strides being made in the future. Until anaesthesia follows the lead given by other branches of medicine and develops methods of measurement of comparable accuracy, it will not reach full maturity. It is in the attempt to produce such methods that America is ahead of us. The utilization of such methods on a clinical scale will surely eventually replace the meagre clinical signs upon which we at present rely.

REFERENCES

- 1 "Open Doors." Annual Census of Foreign Exchanges for Academic Year 1954-5. Institute of International Education, New York.
- 2 Griffith, H. R., *Curr. Res. Anesth.*, 1949, 28, 105.
- 3 Lortie, D. C., *ibid.*, 1950, 29, 181.
- 4 Questionnaire sent to Hospital Administrators. Reported at Annual Meeting of American Association of Nurse-Anesthetists, Atlantic City, 1955.
- 5 Beecher, H. K., *Surg. Gynec. Obstet.*, 1948, 86, 115.
- 6 Brigger, B. D., *Anesthesiology*, 1954, 15, 323.
- 7 Brewster, W. R., jun., Isaacs, J. P., and Waino-Andersen, T., *Amer. J. Physiol.*, 1953, 175, 399.
- 8 Dripps, R. D., and Vandam, L. D., *J. Amer. med. Ass.*, 1954, 156, 1486.
- 9 Beecher, H. K., and Todd, D. P., *Ann. Surg.*, 1954, 140, 2.
- 10 *Ann. Surg.*, 1955, 142, 138.

Medical Memoranda

Rupture of Rectus Abdominis in Tetanus

Actual case reports on rupture of the rectus abdominis muscle caused by tetanic spasm are difficult to find. A search through the library of the Royal Society of Medicine discloses several oblique references to the degenerative changes produced in muscle by infectious diseases, including tetanus, but no recorded case of rupture of this muscle as such could be discovered more recent than 1829. In that year Baron Larrey reported a case which had occurred in a soldier from a line regiment wounded by gunshot in the right hip. Treatment had consisted in plunging the patient into cold baths. His spasms became worse, and subterfuge and force were required to immerse him. Suddenly the patient developed a swelling like a hen's egg close to the white line above the umbilicus. The rigidity of tetanus was present in all the muscles at necropsy. The swelling was due to a blood clot between portions of the right rectus abdominis, which was ruptured through the whole thickness of the muscle.

CASE REPORT

A man aged 62 was sent to the County Infirmary, Louth, on June 14, 1955, as a suspected case of acute appendicitis. His illness began three days previously with pain on deglutition and in the jaws, with slight lower abdominal pain. The symptoms grew worse, particularly the abdominal pain on the day before admission. On the day of admission he had suffered from severe colicky abdominal pain accentuated in spasms which caused him to roll about. The pain was principally in the suprapubic region and did not radiate to the back. There had been no vomiting, nausea, or anorexia. He had had no bowel action or (he said) passage of flatus during three days. Later, after admission, he said the pain on swallowing and in the jaws had gone.

About 10 days before admission the patient, who is a blacksmith, had struck the ring-finger of the left hand with a hammer.

On examination tetanus was borne in mind because of the history of dysphagia and pain in the jaws. The patient's