Middle Articles

Training of Surgeons

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It has been generally accepted for many years that the staffing structure of the N.H.S. is urgently in need of revision. Professional bodies, politicians, the national press, and individuals in every sphere of medical life have kept up a continuous pressure for review of working conditions, proclaiming the unsatisfactory state of the medical services to be responsible for the loss of hundreds of trained medical personnel from Britain each year. The urgency for action is always stressed and the imminent breakdown of the Service prophesied, yet the changes which have been acceded have come in dribbles, forced by crises such as the revolt of the junior hospital staff, wrung from a reluctant ministry and treasury by a profession unfortunately divided in its effort by self-interest and politics, with the result that the grievances have been largely unremedied and the frustration has been compounded.

The graduate may well be in his early forties before he becomes a consultant, to culminate a training period of 20 years during which he has for several years had to seek a new appointment each six months, to uproot his family from home and school with equal frequency, and to spend the years of his early married life in grinding work to achieve the higher diplomas essential to his progress, often at relatively great expense which he could ill afford in course and examination fees. During all this time he has had to work in a subordinate capacity.

It must be apparent to anyone who stops to consider the present conditions that something must be done now. There must be a radical reappraisal of our whole attitude towards medical training in every sphere. It is in this light that we should consider the report of the Royal Commission on Medical Education 1965-8, better called the Todd Report, which proposes extensive changes in the whole training structure. It has occasioned surprisingly little comment in the medical press, but if it is to be implemented the effects could be very important; it should therefore be carefully examined by the profession before it is accepted.

It is proposed in this paper to examine the problem of the training of surgeons in broad perspective as a reasoned basis of comparison with the proposals of the Todd Report for this discipline.

Requirements of N.H.S.

It is virtually impossible for a surgeon to practise surgery in the British Isles outside the N.H.S., so that the number of surgeons in the country must be governed by the posts available in the Service.

Table I gives the numbers of surgeons in the different specialties, excluding ophthalmology and otolaryngology, in 1967. It also gives the number of S.H.M.O.s and medical assistants.

The resultant estimate of the surgical consultant posts falling vacant annually is shown in Table II. Even if this is an under-

estimate of the number of new surgeons required, it is evident that the number cannot be much above 100 per annum. The prospective surgeon has first to pass his primary Fellowship examination before he can achieve registrar training status. The modal time for this is four years after qualification (Todd, para. 89). Then follows the final Fellowship examination, for which a minimum period of four years' work after qualification is required. The modal time for the attainment of this is in fact six years (Todd, para. 89). Appointment to senior registrar status is not possible without the Fellowship Diploma, and a minimum of four years in this grade before consultant status can be sought means a period of at least 10 years after qualification. In fact it is likely to be nearer 14 years. The Todd Report recommends changes in this career gradation (Todd, paras. 93-112), but these changes are likely to be slow in coming and it is better to consider the problem in present circumstances if any speedy change is contemplated.

TABLE I.—Consultants. England and Wales, September 1967

	Consultants	S.H.M.O.s	Medical Assistants
Faediatic surgery	15	—	1
General surgery	892	24	47
Orthopaedic surgery	467	15	85
Urology	56	—	—
Plastic surgery	62	—	1
Thoracic surgery	69	—	5
Neurosurgery	72	—	1
Total	1,663	39	140

TABLE II.—Annual Consultant Requirements

	Annual loss by Death and Retirement	Annual addition to implement Platt Expansion	Total annual vacancies
General surgery	35	9	44
Neurosurgery	1-2	1-2	2-4
Plastic surgery	1-2	1-2	2-1
Thoracic surgery	2	1	3
Traumatic and orthopaedic surgery	12	1½	26
Urology	2	—	More than 2
Total			81

If on completion of the period of training there is to be no delay in the attainment of consultant status, it is obvious that production must be geared to ultimate posts available, and that there must be no large pool of qualified surgeons awaiting a post. Thus if 100 surgeons are required annually, and the

TABLE III.—Senior Registrars, 1967

	Total	Born in G.B. or Ireland	Born Elsewhere	In Post More than 4 Years
Paediatic surgery	4	4	—	—
General surgery	126	111	15	10
Orthopaedic surgery	74	62	12	2
Urology	17	15	2	2
Plastic surgery	16	11	5	1
Thoracic surgery	24	13	11	—
Neurosurgery	20	16	4	—
Total	281	232	49	

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senior registrar grade is to be of three years' duration, 300 senior registrar posts are all that are needed to supply this number. Allowing for wastage, and for some specialties which require a longer period of training, say four years, 350 posts would seem a reasonable eventual requirement.

It will be seen from Table III, which gives details of the 1967 senior registrar posts, that this number, 281 posts, is just about enough to meet present requirements.

When he reaches this grade the trainee has undergone several years of specialist training and has entered his advance training period, at the end of which he must be assured of attaining consultant status. Thus the elimination of those who will not achieve this must be carried out before entry into the senior registrar grade. Under present circumstances much of the culling occurs in the registrar grade, either by failure to pass the final Fellowship examination or through exasperation after years of fruitless endeavour to obtain higher posts, but always after several years of training. Even the completion of four years in the senior registrar grade, however, provides no guarantee that a consultant post will be attainable.

Table IV shows the current number of posts in the registrar grade. If the time spent in this grade is ideally two to three years it is evident that not many more than 300 posts are required to produce an annual output of 100 men to go on to the senior grade. The remainder of the 1,200 posts must still be staffed, because the hospital work must be done, and they present the opportunity for the training of graduates from overseas who will not compete for the senior registrar posts.

TABLE IV.—*Registrars, 1967*

	Total	Born in G.B. or Ireland	Born Elsewhere
Paediatric surgery	23	11	12
General surgery	685	323	362
Orthopaedic surgery	321	108	213
Urology	24	14	10
Plastic surgery	25	7	18
Thoracic surgery	75	22	53
Neurosurgery	47	15	32
Total ..	1,200	500	700

The number of S.H.O. and H.S. posts presents no problem in this context, but it is apparent that in the years between qualification and senior registrar status the needs of the N.H.S. for filling hospital posts and the needs of the training programme diverge, and it is in the early part of this period that the elimination of those who will not achieve consultant status must be effected, before too much time is spent in the pursuit of the specialty.

Requirement of the Trainee

All are aware of the present discontent of junior hospital staff with their terms of service and their career prospects, and, apart from the demands of the inevitable extremists, they are genuine grievances.

A qualified doctor is the equal in intelligence and character of his contemporary in any other profession. There is no reason, other than the minimal training period necessary to achieve competence, why he should not be qualified to assume full responsibility at a similar age, and to accept that this period should be between 10 and 14 years is manifest nonsense. If it takes this length of time to train an intelligent man to the required standard there is something radically wrong with the training.

The present surgical training schedule is a reproach to us all. The young man aspiring to surgery must complete his pre-registration appointments, and probably a further year of hospital appointments—two of six months' duration and each requiring application in competition with many others for the better appointments in whichever town he may hope to be

successful, and with no continuity of employment between posts. Then he must tackle his first hurdle, the primary Fellowship of one of the royal colleges. Of all candidates presenting themselves for the primary of the English Royal College of Surgeons 35% eventually get through. The figures for the examination in February 1966 are typical and revealing. Of 395 candidates 119 (30%) passed. Of the British entry of 166 candidates 61 (37%) passed—46 (27.5%) at the first attempt, 6 (3.5%) at the second attempt, 4 (2.5%) at the third attempt, and 5 (3%) at the fifth or later attempt. The overseas entry was 229, of whom 58 (25%) passed. Thus about 65% of the candidates are permanently eliminated by this examination, and, as previously stated, the modal period for success is four years from qualification.

With this diploma, and having completed four years of work in designated posts, the trainee may attempt the final Fellowship. The figures for May 1966, an average result, were as follows: total entry 640, total pass 183 (28.6%); British entry 221, passes 77 (35%). Breakdown of the British entry showed: first attempt, 29 passes (13%); second attempt, 21 passes (10%); third attempt, 17 passes (8%); fourth attempt, 6 passes (3%); and fifth or later attempt, 4 passes (2%).

The modal time for passing this examination is six years, and, as it can be assumed that most candidates who are finally unsuccessful will present themselves several times before giving up, 60% of those who achieve the primary will be eliminated after spending at least six years in training. Some, of course, will be successful in achieving the Fellowship of one of the other Royal Colleges of Surgeons, but this presents another unsatisfactory state of affairs in that the Fellowships are theoretically of equal status.

Thus of all candidates setting out on a surgical career about 35% eventually pass the primary examination. Of this 35%, only 35%—that is, about one-third—will eventually achieve the English Fellowship—that is, 12% of the original field. Nevertheless the average number of U.K. candidates granted the Fellowship annually in the last seven years is 140, apart from those achieving the Fellowship of the Scottish and Irish royal colleges. We have seen that only 100 of this number can hope to achieve a consultant post, so that even after six years of training, at the end of which almost 90% of the original field has been eliminated, the successful candidates, now highly trained, have no career security. This is manifestly unjust.

Alternative Selection

Unless the primary Fellowship examination is to be of such a nature that diverse disciplines are open to successful candidates, it must be geared to become a true eliminating examination, and the pass rate should not be more than 10–15% of all candidates. There must therefore be some form of selection other than by examination. The obvious alternative method is by availability of appointments. By making the primary examination a selective hurdle for all those who aspire to eventual consultant status in any discipline, and making it of a standard sufficiently high to eliminate those unsuitable intellectually or temperamentally, control will from then onward be by appointment availability, requiring an intake proportionate to the eventual output, with due allowance for those who will fail to achieve the final diploma.

Thus if there is to be an eventual annual requirement of 100 trained surgeons, there cannot reasonably be a bigger intake than 200 candidates annually into the training programme. If the requisite posts are limited to this number, competition for posts will be the eliminating factor, as it should be, early in the career. The Todd Report proposes a period of general professional training after the preregistration year. This is to be an integral part of all medical training, lasting about three years and embracing the present S.H.O. and registrar grades, and it envisages that all doctors, including those destined for general

practice, should have this training. By the end of this period, however, the man will have been qualified for four years and should be well on his way in special training, and the delay seems difficult to justify. A preferable scheme would be a three-year internship, including the preregistration year, during which the aspiring consultant in any discipline could opt for an advanced course in basic sciences and could, if he wished, during the period of general professional training take a common advanced basic sciences diploma. Having achieved this he would choose his future course. During his general professional training he would have the opportunity of wider experience in subjects relating to the discipline which he proposed following, but he would not enter the training echelons until he had passed the basic sciences examination. During his general professional training he should be allowed the option of taking his study period (H.M. 67/27) as prescribed, or of conserving it for an advanced basic sciences course in which he could be supplemented financially if necessary, but could live on the salary accumulated by his study days.

At this point the Todd Report (paras. 93–100 and paras. 172–174) recommends the abolition of examination as the entry to Fellowship of the royal colleges, proposing (para. 98) that the surgical colleges should reserve the title of "Member" for those who have satisfactorily completed general professional training for surgery, and that Fellowship should be granted without examination at a later stage of training (paras. 98 and 111). Their reasoning cannot be discussed here, but certainly it is far too vague and woolly to offer a convincing argument to many in the profession. A major criticism of the Fellowship diplomas of the royal colleges of the U.K. is that they are granted at a time when the recipient is not a fully trained surgeon, and his diploma is regarded as indicating only that he is suitable for further training, in contradistinction to the Fellowship of the colleges of Canada and of the U.S.A., which indicates a fully trained surgeon. This criticism is quite invalid. If there is to be a change in the status of the diploma, it should be in the standard of training required of the candidate presenting himself for examination. This is not possible under present conditions because a controlled training programme is non-existent, and there is no way of assessing the quality of training anyone has received, but this is a fault which could easily be rectified.

Overseas Students

The importance to the staffing of the N.H.S. by graduates from overseas is known to the medical profession and public alike. Reference to doctors from overseas, however, is often in uncomplimentary terms which do no justice to the immense contribution these men and women make in filling essential posts in the junior grades of hospital staffing, nor to their intellectual capacity and their dedication to their work. Tables IV and V show how necessary overseas graduates are in the surgical staffing alone. The senior registrar grade is difficult for them to attain and they hold only 50 of the 281 posts, but in the registrar grade they hold 700 of the 1,200 posts, and in S.H.O. grade 950 of the 1,327 posts. Thus we need the physical presence of the overseas graduates to run the N.H.S. What is not generally recognized is that the graduates coming here from

all over the world are the outstanding products of their universities, men selected to be the future consultants of their generation. They come here either with the financial backing of their governments or under conditions of considerable financial stress to themselves, for many countries will not allow any money to be taken abroad. We are fortunate in having men of this calibre to supplement the staffing of our hospitals.

Their reception in this country, however, leaves much to be desired. The British Federation of Postgraduate Medicine will give advice about the availability of appointments and methods of applying for them, but there is no mechanism at all for helping overseas graduates to obtain jobs. Accordingly each must start applying for the advertised posts. It is not at all uncommon for a man to apply for 50 posts, with all the form filling and references required, without even being short-listed for interview. Many young surgeons have passed the primary examination in their own countries, examined by teams of examiners sent from this country. Having passed the examination, they are required to come to the U.K. to take the final Fellowship examination and must spend a year working in this country before they may take it, yet when they arrive here no help is forthcoming in placing them in appropriate posts beyond advice, unsupported by any executive power, given by one of the many people interested in their needs.

With the growth of medical education in the developing countries the demand for teachers is pressing, and the training of them an urgent need. Our higher diplomas are still much sought after, representing as they do Fellowship of a college commanding international respect. As these countries progress, however, they will form their own colleges, and will encourage their graduates to take their higher diplomas at home, with the result that the demand for the diplomas of the U.K. colleges will slacken and candidates may dwindle to very small numbers.

Two aspects of the situation must be emphasized at this point. Firstly, the developing countries need and will need for many years the facilities for postgraduate and specialist training which exist, though in an unorganized state, in the U.K. Secondly, it is part of our heritage that we should help the countries which once were our dominions and colonies to obtain the trained personnel they so badly need. We have an integrity and ethical standard equal to any in the world, and we should be proud to pass it on. This in itself is reason enough for welcoming the overseas graduates, quite apart from the unpalatable practical fact that if they stop coming here our Health Service will collapse. Nor can we complacently expect them to keep coming. Such countries as Russia, Germany, and the U.S.A. welcome these graduates; they provide funds and scholarships to draw them to their countries, and some even have permanent staff stationed in the developing countries to persuade the leading students to study abroad. The U.S.A. needs these people as much as we do. Forty per cent. of the junior hospital staff in New York hospitals come from abroad. Thus if we do not recognize our obligation to cater for their needs the graduates will go elsewhere.

An organization must be established in the U.K. whereby universities abroad wishing to send their leading students to the U.K. for specialist training can make arrangements before the student leaves his home for a post to be available for him, with the knowledge that he will receive definitive training and will return home at the end of a specific period enriched by his experience. Enlightenment is also needed abroad. Several countries demand the return of their doctors immediately on achievement of the higher diploma, literally within a few days of the result being known. The man consequently returns home having gained his diploma but with no experience of surgery in this country beyond what he has gleaned in a six-months casualty post and from whatever courses of instruction he has been able to attend. The diploma should be incidental to the experience he set out to gain, and not the signal that his education here is complete.

TABLE V.—*S.H.O. Posts England and Wales, 1967*

	Total	Born in G.B. or Ireland	Born Elsewhere
Paediatric surgery	26	9	17
General surgery	718	237	481
Orthopaedic surgery	453	102	351
Urology	21	7	14
Plastic surgery	28	3	25
Thoracic surgery	48	10	38
Neurosurgery	33	10	23
Total	1,327	378	949

Training

The year of compulsory preregistration appointments is generally accepted as an essential part of training. The pre-registration posts are carefully controlled so that their standard is maintained. The proposed period of general professional training is more debatable, particularly if it is to be compulsory. If it provides the opportunity for a diploma of basic sciences to act as an initial screening for all future consultant trainees it could be immensely valuable. In assessing the capabilities of applicants for the basic sciences course of the Royal College of Surgeons of England it has become apparent that the performance of the candidate at the end of the course can be fairly accurately gauged by a multi-choice question examination paper set on the first day of the course. This screening could easily be extended to cover all candidates who during their period of general professional training wished to take a basic sciences course with a view to taking the diploma which in turn would be a "primary," common to all disciplines, to be taken two years after qualification. Once he has achieved it (and the number of attempts should be limited) the candidate should be accepted for training in the discipline of his choice. From then on his training should be monitored by the requisite college or professional body in that discipline. The standard of the diploma should be high enough to eliminate a large proportion of the candidates so that those not fitted for eventual consultant status, or not wishing to pursue such a career, might arrange their lives accordingly.

With a knowledge of the eventual number of consultant posts available it is a simple matter to adjust the numbers of initial training posts required in all disciplines. The exact number of posts to be allocated is at this point irrelevant. Experience will show the varying requirements from time to time. If, however, it is anticipated that two or three years should elapse between the acquisition of the basic sciences diploma and the Fellowship, and about 100 men are to be fed into the senior registrar grade each year, then some 300 posts will be necessary. These will be in the present registrar grade in which at the moment 1,200 posts are available. The essential feature of the posts designated as training posts must be the maintenance of a high standard of teaching, with a programme and progress report of each trainee under the constant scrutiny of a credentials committee. This will mean careful selection of the training posts with regard to material, teachers, and facilities such as suitable rotation arrangements.

Throughout the country there are large numbers of surgeons in peripheral hospitals who are able and enthusiastic teachers and who are at present involved in local postgraduate training schemes. To attempt to select suitable training posts from the many eligible will involve whichever authority attempts it in an invidious task in which choice will have to be arbitrary and offence be easily given. The Todd Report (para. 500) recommends the discontinuation of present boards of governors of teaching hospitals in England and Wales and in their stead "under the general responsibility—both medical and financial—of the regional boards the main hospitals associated with each medical school, and preferably any other hospitals in the immediate area of the medical school, should be grouped under a single newly constituted governing body with a small number of members, about one-half of whom should be nominated by the university concerned; we think that hospitals in such groups should be known as university hospitals."

Designated Training Posts

Thus if it were stipulated that posts could be accepted as training posts only if they were administered by university hospitals the numbers could be limited and adequate control could be exercised. The excellent posts available in district hospitals must be included, but should be eligible only if they participate in a rotation scheme with a university hospital. Those not

able to form such a liaison, despite an equally high standard, should be drawn into a similar training scheme for overseas graduates, and should also always be eligible to apply for participation in the university hospital schedules. This would offer a great incentive to hospitals to improve their training standards. The American organization is able to publish a list of all the training posts in the hospitals throughout the country and also the names of the surgeons in the hospitals and the branches of surgery in which they are recognized as teachers; control on this basis can be comprehensive. As the number of these posts can easily be controlled, competition for the designated training posts would be the next eliminating factor, and if the candidate who had obtained his basic sciences diploma was not successful in finding a post in the discipline of his choice he would have the opportunity of doing so in another direction.

The framework for the control of these teaching posts in this country exists in the regional tutors scheme of the Royal College of Surgeons, now well established.

Reference has been made to the proposals in the Todd Report for the abolition of the diplomas of the royal colleges (paras. 172-174). With these recommendations many will disagree. The examination standards of these diplomas are open to criticism, but the diplomas are undoubted incentives to higher education, and where an incentive can also be a standard for selection to further training it can be of great value. The present high elimination rate of the English Fellowship, 65% after six years of specialization, is quite unrealistic. After preliminary screening by a basic sciences diploma and a further two years of intensive surgical training it should be possible to set a high standard for the F.R.C.S. diploma and still have an 80% pass rate, if the examination is related to requirement and capability. Again there must be a limit to the number of attempts allowed to any candidate, and the standards of the different Royal Colleges of Surgeons must be made equal. Rather than be abolished, the diploma should constitute the entry to the final phase of training, at present senior registrar grade, which is recognized as the period of specialized training.

Detailed planning for the training in different disciplines is already well advanced in the Royal College of Surgeons of England, and subcommittees have produced schedules of requirements which will ensure adequate standards. What has not yet been accomplished is a scheme for clearance of the final-year posts when training has been completed. Senior registrars are frequently held in these posts while they search for suitable consultant vacancies, sometimes for a period of years, and the training ladder is accordingly blocked. It is essential that the posts be relinquished immediately. The trained men should be retained in some holding capacity and be expected to accept consultant vacancies within a specified period with the opportunity of applying for other consultant posts later.

A training progression along these lines would do much to abolish the present unsatisfactory conditions and could easily be implemented.

Conclusion

With the general recognition by the profession and the Government that major changes in the structure of medical education are essential, it is imperative that certain principles are observed. We know too well that mistakes take 20 years to rectify, and such time is not available to us.

Firstly, the N.H.S. must be staffed by adequately trained doctors in all grades.

Secondly, training must be an active supervised process, not a haphazard accumulation by the trainee of whatever knowledge and experience he can glean by struggling for posts in competition with his contemporaries under conditions of much personal hardship. If he is not to be able to achieve the discipline of his choice he must have the chance to change course before he has gone too far along the wrong course, or if he is

not of the calibre to achieve consultant status at all he must be eliminated from the training programme before he has spent years which will end in frustration. Above all, once accepted for training he must be assured of independent consultant status at the completion of his training and before he has lost his drive and initiative.

Finally, the needs of the overseas students must be met. Responsibility for their training should rest with the colleges and should be separately administered from the consultant training scheme.

These principles are not impossible to achieve, but they do require appreciation by the profession of their importance and a great deal of work if they are to be carried out.

The problems are well recognized and sympathetically discussed in chapter 11 of the Todd Report, with an obvious understanding of the needs of the developing countries and of the postgraduates themselves, and the difficulties to be overcome by the U.K. institutions in trying to satisfy them.

The pressing need is to get on with the task of implementing the recommendations.

CONFERENCES AND MEETINGS

International Congress on Chest Diseases

[FROM A SPECIAL CORRESPONDENT]

Fifteen hundred doctors from all parts of the world attended the 10th International Congress on Diseases of the Chest in Washington, D.C., from 4 to 8 October under the Presidency of Dr. ARTHUR M. OLSEN (Mayo Clinic, Rochester).

Cardiac Surgery

Dr. DENTON A. COOLEY and his colleagues (Houston) had undertaken 10 human heart transplants with seven survivors to date. The indications for cardiac transplants were advanced coronary artery disease in eight patients, multivalvular rheumatic heart disease in one, and fibroelastosis in a 5-year-old girl. Dr. Cooley felt that this child died postoperatively because she had rejected the donor heart much as she had rejected her own by an autoimmune process. With experience, the postoperative discipline had relaxed, with benefit to the patient; whereas the first patient only sat out of bed after eight days, the tenth breakfasted and read morning paper accounts of his operation within 36 hours. Haemodynamic studies postoperatively showed initial lack of response to the Valsalva manoeuvre because of lack of nervous control. Dr. JAMES NORA, immunologist in this team, described the rejection phenomenon, which began with pericardial friction and abnormal rise in cardiac lactic dehydrogenase, inversion of T waves, leucocytosis, and cardiac failure. In an effort to overcome rejection he recommended large doses of oral corticosteroids, moderate amounts of azathioprine and anti-lymphocytic serum for the critical first two weeks, thereafter tapering the doses slowly for outpatient therapy. Another member of the Houston team, Dr. ROBERT BLOODWELL, had analysed the causes of death of the donors, who were aged 11 to 50 years. They had usually sustained sudden fatal trauma, severe haemorrhage, or brain tumours.

Professor CHRISTIAAN BARNARD (Cape Town), reporting his third cardiac transplant, to a patient with cardiomyopathy, said that within two weeks tests of renal function, erythrocyte sedimentation rate, and enzyme levels had all returned to normal, and the patient was discharged from hospital in a month.

Cardiogenic Shock

Dr. BERNARD WALSH (Washington, D.C.) defined cardiogenic shock as a state of circulatory failure with a systolic blood pressure below 90 mm. Hg, scanty urine, cold and clammy skin, and evidence of poor tissue perfusion. Dr. I. L. VURAL (Ankara) had used intravenous lignocaine in the presence of ventricular tachycardia or isoproterenol in the presence of atrioventricular block. The latter was apt to cause a precipitous fall in the central venous pressure, so a careful watch had to be kept and if necessary treated initially with plasma expanders. He felt that large doses of corticosteroids, such as 10 g. of hydrocortisone two-hourly, improved tissue perfusion by peripheral vasodilatation.

Dr. J. CALLAN (Illinois) said that he had treated heart block complicating myocardial infarction in an eleven-bedded intensive care unit using intravenous pace-making, intravenous fluids and corticosteroids, various anti-arrhythmic drugs, and close nursing supervision. This aggressive regimen had produced a fall in mortality rate from 35 to 15% in the first year and to 9% in the second year, but it remained at 65% when cardiogenic shock was also present.

Emphysema

Dr. G. L. CRENSHAW (Oakland, California) said that three major organs in the human have a dual blood supply—the liver, heart, and lungs. The bronchial blood supply to the lung was the nutrient blood supply to all structures of the lung, including the alveolar wall and the vasa vasorum of the pulmonary vessels. More blood flowed through this vascular system per unit of time than the coronary vessels of the heart. He had found that rapid occlusion of the bronchial artery in the horse produced gangrene, whereas slow obliteration produced destructive changes identical to the pathology of pulmonary emphysema in man. Slow obliteration could be achieved by inert glass beads or by chlorpromazine, which gave rise to endarteritis.

Dr. W. H. ANDERSON (Louisville) and Dr. L. LAPUERTA (San Antonio) had observed

that when a lobe or the lung of a small animal was suspended in an atmosphere of carbon dioxide it underwent spontaneous expansion. From this observation they had evolved the technique of placing a lung biopsy specimen in a small flask, exposing it to 100% carbon dioxide for 10 minutes, and then flooding the specimen with formalin saturated with carbon dioxide. Fixation in this distended state permitted better visualization of structures, particularly the connective tissue structure of the lung.

Dr. M. AGURTO and his colleagues (Lima, Peru) had noted a high incidence of gastroduodenal ulceration in emphysematous patients. During a 10-year period 20 of 35 patients with emphysema also developed gastroduodenal ulceration. The chairman of the session, Professor J. GOUGH (Cardiff), with long experience as a pathologist surveying both disorders, felt that the association remained a mystery, with equal reports being for and against the association.

Sarcoidosis

Dr. E. M. GOLDBERG (Chicago) exhibited the value of mediastinoscopy in obtaining histological confirmation of sarcoidosis, quoting the combined results of Carlsen, Bergh, Friedel, Lofgren, and Goldberg. In these series mediastinoscopy had provided positive biopsies in 304 of 311 patients, compared with 25 to 85 by scalene node biopsy and 38 of 222 by bronchoscopy.

Dr. L. E. SILTZBACH and Dr. A. S. TEIRSTEIN (New York) had analysed 26 deaths in 311 patients; 17 were related to sarcoidosis (pulmonary insufficiency in 13, renal failure in 2, and aspergillosis or tuberculosis in one patient each) and the remainder were due to other causes. Dr. O. P. SHARMA and Dr. D. GERAINT JAMES (London) had correlated histological evidence of granuloma formation with skin test evidence of depression of delayed-type hypersensitivity and with in vitro lymphocyte anergy. This immunologically abnormal triad distinguished sarcoidosis from tuberculosis, but was also a feature of other disorders such as primary biliary cirrhosis and regional ileitis.