Middle Articles

RESEARCH IN PROGRESS

Below is printed the first in a series of occasional articles describing research in progress in centres in Great Britain.

M.R.C. Burns and Industrial Injuries Unit, Birmingham

[FROM A SPECIAL CORRESPONDENT]

In 1941 the old Queen's Hospital in Birmingham was threatened with closure, having been superseded as a teaching hospital by the Queen Elizabeth's, just completed. Some local industrialists, however, felt that a hospital in Birmingham was still needed to deal with factory casualties, and appealed against the closure. It was in these circumstances that Mr. (now Sir William) Gissane came to take clinical charge of the hospital, which then started a new life as an accident centre.

M.R.C. Research Units

From the outset one of the chief problems—and it still is only partly solved—was infection. Because of its importance and the practical difficulties it gave rise to, the Medical Research Council was invited to help. The result was the establishment of a Wound Infection Research Unit, directed by Dr. (now Professor) R. E. O. Williams and Dr. (now Sir) Ashley Miles. They found that trivial injuries tended to become serious owing to infection introduced during dressing in factory first-aid rooms. To combat this they taught a system of wound dressing by non-touch technique, which was introduced into the factories and the hospital casualty department.

All types of accidents found their way to the hospital—domestic, industrial, and traffic—and the work expanded rapidly. The fact that Birmingham is a highly industrialized area was not an important reason for the steady growth of the unit, nor did any industrial or highway disaster put it on the map. It simply grew out of the need for an accident centre, and it was then, and is now, the only one of its kind in the country. Burns injuries constituted a special problem, about 400 burned patients being admitted to the hospital every year. To investigate this, from the point of view of prophylaxis and treatment, the M.R.C. established a Burns Unit—also at Queen's Hospital—under the direction of Dr. Leonard Colebrook. He devised the special dressing station supplied with filtered and conditioned air which became the prototype for many others throughout the world. The wound infection research unit was expanded and became the Industrial Medicine Research Unit, with Dr. J. R. Squire as its director. Shortly after the end of the war Squire was appointed a professor at Birmingham University, and Colebrook retired. The two units were then merged, Dr. J. P. Bull becoming director of the combined unit, which was named the Medical Research Council Burns and Industrial Injuries Unit. Working with him is a team of fourteen research workers and an equal number of technicians. There is close co-operation between these workers and the members of the hospital clinical staff, some of whom are attached to the M.R.C. in a part-time capacity.

Considerable modifications have been carried out within the nineteenth-century framework of the hospital to deal with twentieth-century problems. The casualty department has been arranged so that traffic through it is one way only, and patients do not retrace their steps through a potentially dirty area. An important recent development has been an intensive care area for major injuries with separate access for ambulances. Here the shock treatment of severely injured patients can be efficiently undertaken and in the adjoining ward patients can have special supervision until they are fit for transfer to the ordinary wards. Two 20-bedded cubicle wards for burns are provided on the second floor, and adjacent to them is the special plenum-ventilated dressing station. Two burns shock rooms are held ready with apparatus for resuscitation of patients with large burns. There are general accident wards for 180 patients, a special room for patients with tracheostomies, and on the second floor of the 1841 block two disused wards have been turned into research laboratories.

Treatment Schedule

All patients are seen on admission and treated by the surgeon from whichever of the four surgical teams is on duty. There is a routine treatment schedule which is changed only if some special trial is being conducted, or a new recommendation has been made by the research team. Transfusion and skin grafting, the basis of treatment of burns, are carried out as soon as possible. Patients are treated by intravenous transfusion ; small burns are excised and grafted immediately. This technique of immediate grafting has been tried with large burns, but so far the results have proved disappointing because of the limited number of " takes." The investigation of failures is one of the main research projects at present. The concept of adequate transfusion after injury, and techniques to assess its adequacy by serial estimations of blood volume, originated in the Birmingham unit. This work has shown that even closed injuries cause appreciable blood loss, and replacement effects rapid improvement in the patient's condition.

Present Research

The research in progress at present falls into four main groups: bacteriological research ; investigations into transfusion fluids and plasma proteins ; skin and tissue metabolism ; and the epidemiology of accidents.

Combating Infection

Most fresh burns are infection-free on admission to hospital but become infected later. Dr. E. J. Lowbury, who is in charge of the bacteriological section, has made a comprehensive study of sources of infection and of the types, causes, and prevention of infection in hospital. Wound isolation techniques are being studied to eliminate cross-infection. " The whole body isolator " is another method being used to eliminate airborne pathogens. This apparatus is a transparent plastic box inside which the

patient is nursed, with potential openings along its sides through which hands (in sterile gloves) may be introduced. Controlled trials on all new antibiotics are carried out as they become available. Most organisms have been found to be sensitive to one or other antibiotic, but trials of systemic antibiotics for prophylaxis have been disappointing. *Pseudomonas pyocyanea* is a troublesome cause of infection resistant to ordinary doses of antibiotics and is controlled only by giving doses that are toxic. A study in progress in mice, whose reaction to burn infection is similar to man's, suggests that the organisms produce an immune reaction in the host. Further work is being done with the aim of making prophylaxis and treatment with antisera an effective means of controlling infection with *Ps. pyocyanea.*

Transfusion Studies

Studies on transfusion have two main aspects—investigations into blood and plasma, and research into plasma substitutes. Work by the Birmingham unit showed that early replacement of blood was of paramount importance in injury, and that the loss of large amounts was compatible with satisfactory recovery if replacement was adequate. The circulatory volume, determined by isotope-labelled red blood cells and plasma, has been estimated both in casualties and in normal subjects. In patients with fractures and uncomplicated injuries blood loss can be measured and accounted for. Burned patients, on the other hand, undergo more complex circulatory changes; thus heat damages red cells, breakdown of haemoglobin is increased threefold, and even adequate transfusion of whole blood does not prevent the development of anaemia a week to ten days after injury. In addition, there is a constant leak of plasma through the burned surfaces until grafting or healing has taken place. Serum-gammaglobulin production increases after injury, and the serum albumin-globulin ratio is reversed. Fibrinogen production is considerably increased over its rate of breakdown. These changes in the alterations of blood proteins after injury are being studied in order to assess the patients' protein requirements more accurately.

In ordinary conditions supplies of blood for transfusion are sufficient, but substitutes have to be available in the event of a large-scale disaster. The use of dextran is well established and largely derives from work done in the Birmingham department of chemistry. Dr. C. R. Ricketts, a member of this department, is engaged in further studies. Using samples of dextran of different molecular weights labelled with radioactive sulphur, he has been able to find the smallest size of dextran that just does not pass through the renal tubular epithelium. Large molecular dextran encourages intravascular retention of fluid, but it may also result in "sludging" of red cells, accompanied by raised erythrocyte sedimentation rate, possibly causing liver damage. Recently it has been found possible to retain the good qualities of clinical dextran and minimize its disadvantages by a change of size distribution. Very small molecular dextran solutions, on the other hand, have been found to encourage a high circulatory volume initially, but this is not maintained. Moreover, renal-function studies show that the glomerular filtration rate is diminished in these patients, and therefore the excretion of this fluid imposes a burden on the kidneys.

There has been a revival of interest in normal saline solution as an effective transfusion fluid in this unit. It has been found that the blood volume can be maintained at 70% of normal using saline, even when the skin loss is 35% of the body surface. When plasma is used as a transfusion fluid a blood volume of 90% of normal can be maintained under similar conditions. Up to now, freeze-dried pooled plasma has been given with satisfactory results, but the workers at the Birmingham unit are now proposing to use a plasma solution from which gammaglobulin and fibrinogen have been removed, which is likely to be superior to the freeze-dried material.

Skin and Tissue Metabolism

The reasons why skin-grafts often fail to "take" are being studied by a series of tests on skin and tissue metabolism. A microrespirometer technique of skin tissue-culture developed in this unit has been used to investigate the metabolic activity of normal skin. This technique has now been expanded to study various aspects of skin biochemistry, and the response of skin to different insults—for example, burning injury, toxic effect of bacterial products, effects of locally applied drugs, and injuries caused by microwave radiation and lasers. It has been found that at a critical temperature there is a 50% inhibition of uptake of sulphate into intercellular chondroitin sulphate, of phosphate into the various intracellular phosphorylated compounds, of total respiratory activity, and of the synthesis of collagen. These results suggest a common underlying biochemical lesion; further studies to identify this may have important implications for wound and graft healing.

Epidemiology of Accidents

Epidemiological studies of patients admitted to the unit have shown that about two-thirds of the burns injuries are domestic, and that most general accidents are road-traffic accidents. Work on the lines originally laid down by Colebrook into the flammability of fabric, and the causation of home acidents, has formed the basis of some legislation and of improved safety standards imposed by the Board of Trade. With financial support from the Automobile Association traffic accidents are being studied from three points of view: evidence from the casualties themselves; examination of the scene of the accident (often with the help of the police); and examination of the coroners' records. From consideration of these three factors it has usually been possible to deduce the probable cause of the accident, the factor responsible for the individual injury, and what type of injuries can be expected from a particular type of accident.

Co-operation with Clinicians

The members of the research staff feel that their studies have benefited by the siting of the unit in the only accident hospital in Britain. They have found that contact with the day-to-day problems of the clinicians tends to correct an overacademic approach towards research, and to keep practical considerations to the forefront. There is close co-operation between the surgeons and physicians attached to the unit itself, and between them and the clinicians in the various specialties who may be consulted in the course of treatment. For example, head injuries are dealt with as immediate emergencies at the accident unit, but at a later stage there may be consultation with a regional neurosurgeon. The excellent relations the unit has with other hospitals in the area and with the university allows the interchange of ideas and opinions.

Future Plans

At present the unit is seriously handicapped by the outdated design of the building and lack of space. These disadvantages will soon be overcome. A new Accident Unit is to be built in two years' time near the new University Hospital on the university site at Edgbaston. This will increase opportunities for research and collaboration with the university departments. The new hospital will have a fully equipped intensive care unit for severely injured patients and an improved burns treatment unit, incorporating the lessons learnt from previous study. Plans have already been approved by the Ministry, and funds allocated by the regional hospital board. The present contacts

between the M.R.C. workers and the university departments with which they are most concerned—for example, bacteriology, chemistry, and biochemistry—will become much easier by being closer geographically. Facilities in certain departments of the University should make collaborational studies possible. For example, the members of the M.R.C. teams are proposing studies into respiratory problems after chest injuries, and the application of the newest surgical techniques in cardiac and neurosurgery. Other possible improvements in clinical management include better diagnostic techniques for patients with head injuries, and better postoperative management. Yet another advantage that the new unit will bring is a fully automated routine biochemical and haematology service, which means that some studies hitherto ruled out through lack of space can be undertaken. More space will also mean easier working conditions for research workers, while the new buildings should eliminate some of the infection which is so hard to eradicate from the fabric of the old hospital.

MEDICAL EDUCATION

Survey by University Grants Committee

The Annual Survey of the University Grants Committee, which was published on 30 January,[1] shows that for the period 1965–6 there were 6,391 students of preclinical medicine and dentistry and 7,959 students of clinical medicine. Discussing medical education the survey states, " In view of the national shortage of doctors, the Committee and their Medical Subcommittee have been continuously engaged over a number of years in planning the provision of additional places for medical students. As a result of measures taken by the Committee on the advice of the Medical Subcommittee and of the Universities' willing response to the national need, the intake of students to the preclinical course rose from 2,020 in 1961–2 to 2,444 in October 1965, an increase of 21% over a period of five years. This expansion was, in the main, achieved by squeezing more students into existing accommodation and by duplication and triplication of classes. Special capital grants amounting to £370,000 were made for building alterations and extensions to assist in taking the larger numbers. There was a further increase in the intake to 2,507 in October 1966.

" The Medical Subcommittee (who had earlier visited the London Medical Schools) visited all the Medical Schools outside London in the course of the quinquennial visitations in the academic year 1965–6, and they discussed with the Universities the practicability of further expansion. Their inquiries showed that, since the possibilities of further squeezing up were virtually exhausted and the majority of Medical School buildings were cramped, overcrowded, and obsolescent, a further increase in student numbers would require major building developments. No special funds were made available by the Government for the Medical Schools, but the Committee felt that the need was so urgent that they set aside substantial amounts for this purpose from the general University capital programmes for the years 1966–7 to 1969–70. The projects so financed will enable the Schools to increase their intake over a period by about a further 340 a year. In addition, the capital programmes will provide for a first stage of the new Medical Teaching Centre at Nottingham ; this is now being planned, under the joint auspices of the Ministry of Health and the Committee, for an annual entry of 130 to 160 medical students.

" The question of establishing further new Medical Schools is under consideration by the Royal Commission on Medical Education. Fifteen Universities have shown interest in having a Medical School, and a number of these have prepared proposals in some detail. The Medical Subcommittee are urgently examining these proposals in order to be ready with their advice if and when a decision is taken in favour of more Schools."

[1] *University Grants Committee, Annual Survey Academic Year, 1965–1966*, 1967. H.M.S.O.

CONTEMPORARY THEMES

Abortion Law Reform

Since the publication of the joint statement on the views of the B.M.A. and the Royal College of Obstetricians and Gynaecologists (see B.M.J., 31 December 1966, pages 1607 and 1649) there have been several statements of opinion on the subject by interested societies and professional bodies. At a press conference on 1 February at the Royal College of Obstetricians and Gynaecologists, with Sir John Peel in the chair, the following statement was issued.

The views of the Royal College of Obstetricians and Gynaecologists and the British Medical Association are that the law should be amended to provide that therapeutic abortion is lawful only if carried out by, or under the supervision of, a registered medical practitioner of the required skill and experience, in a hospital or nursing home approved for the purpose by the Minister of Health and after consultation and with the agreement of at least one professional colleague who has examined the patient. The law should be further amended to make it clear that, subject to the above conditions, it is lawful for a registered medical practitioner to terminate pregnancy if, in good faith, he considers it to be either in the interests of the physical or mental health of the mother or because of the risk of serious abnormality of the foetus. In deciding whether termination is in the interests of the health of the mother the doctor is entitled to take into account the total environment of the mother, both actual and reasonably foreseeable. In the absence of the above indications the Royal College of Obstetricians and Gynaecologists and the British Medical Association do not consider that termination of pregnancy is justifiable.