

it will find a place alongside conventional methods now in use when its indications, technicalities, and complications have been much more clearly defined, but it seems unlikely to supplant them for a long time yet.

Total Replacement of the Knee

Rheumatoid arthritis and osteoarthritis both commonly damage the knee, and neither can be halted reliably. Thus a painful, stiff, and often unstable knee is a frequent outcome. No surgical procedure can at present restore full painless movement and stability, but theoretically total excision of the joint and its replacement with a prosthesis could do this. The problem of the design and implantation of such prostheses is partly surgical, partly biomechanical.

Three prostheses are now in use in Great Britain—one designed by B. Walldius¹ in Norway, and one by L. G. P. Shiers² and one by G. K. McKee³ in Britain. All in their present versions are cobalt-chrome hinges attached to stems introduced into the medullary cavities of the tibia and femur. Because they are to some extent under trial, and because their implantation has sometimes met with surgical difficulties, they have usually been employed for patients with advanced disease who are not expected to return to full activity. As might be expected of such patients, they do not regain full function of the knee, but pain is diminished and the knee may be moderately mobile for some years after the operation. It was impossible to be sure, though, on the basis of this experience, that these devices would withstand many years of relatively normal use.

To test prostheses rigorously in clinical practice would be both hazardous to the patient and time-consuming. Machines have therefore been developed in two laboratories in England which will simulate the mechanical environment of the hip and knee. In these conditions the working lifetime of a prosthesis can be shortened by continuous use, and its response can be studied as it wears out. At the Royal National Orthopaedic Hospital the biomechanics unit under J. T. Scales has developed a simulator in which particular attention has been paid to the hip.⁴ A second machine has been designed in the biomechanics unit of the Mechanical Engineering Department at Imperial College, London, and with this work has started on the knee.

Laboratory testing is quicker, safer, and—with respect to the mode of failure of the bearing itself—more informative than clinical testing, but it has the great disadvantage that the behaviour of soft tissues and changes in living bone cannot be simulated. Two design requirements for total-replacement prostheses lend themselves in particular to laboratory testing. These are, firstly, the biological acceptability and mechanical efficiency (i.e., the biomechanics) of the bearing, and, secondly, with certain reservations, the biomechanics of the bond between the bearing and bone.

With regard to the bearing itself, only two combinations of material have so far proved to be acceptable experimentally and clinically—a cobalt-chrome alloy on itself¹ and high-density polyethylene on stainless steel.⁵ At Imperial College bearings suitable for the knee will be tested in these two combinations, and other materials will be studied if both prove to be inadequate. The life to be expected from a prosthetic knee constructed of either combination is unknown, but it is hoped that studies in the laboratory may afford a guide.

As the bearing wears out, friction rises, and particles and solutes are produced. Rising friction throws an increasing load on to the bond between prosthesis and bone, and might be expected gradually to loosen the prosthesis. Thus measurements of friction will provide a basis for preferring one design to another. Wear particles are deposited in the tissues round cobalt-chrome prostheses and appear (in the short term) to be inert. Their long-term effect is unknown. Equally unknown (in relation to total-replacement prostheses) is the rate of production and biological effect of soluble salts of chromium and cobalt. It is known, however, that these ions may be toxic.⁶ As to plastic materials, Teflon particles are known to produce locally a very undesirable foreign-body reaction.⁷ For these reasons it is planned to examine wear particles and solutes produced in the laboratory, and this information will form another criterion of clinical acceptability.

At the hip a loose prosthesis is painful, and hence the bond between the prosthesis and bone is crucial to the success of the implant. The clinical success so far achieved at the hip has been attributed to the use of a quick-setting acrylic (polymethylmethacrylate) as a filling-agent between the prosthesis and the bone.⁸ The problem of bonding the prosthesis to bone is in some ways more difficult at the knee. This is because, firstly, lateral and rotatory movements do not occur at the bearing (as they do in the hip), so that loads producing lateral bending and torsion must be borne entirely by the bond; and, secondly, the direction of the loads applied to the femoral component may vary through a right-angle (or more) when weight is taken on the flexed in contrast to the extended knee. Though so far satisfactory at the hip, it cannot therefore be assumed that polymethylmethacrylate will prove to be satisfactory in the long term at the knee. While a bond which is satisfactory in the laboratory may subsequently fail clinically for biological reasons, laboratory studies should eliminate mechanically unsuitable bonds.

It is to be hoped that further engineering and surgical study will make total replacement of the knee a more routine surgical procedure. Combined engineering and surgical work of this kind will surely make a valuable contribution to medicine—perhaps especially to orthopaedics—in the future.

Public Health Dispute

At a special meeting on 17 May (*Supplement*, p. 132) the B.M.A. Council decided that sanctions should be introduced at once on behalf of public health medical officers in their dispute with the Management Side of Whitley Committee C. This decision was taken after Council had heard an account of the previous day's emergency meeting of the Public Health

¹ Walldius, B., *Acta orthop. scand.*, 1960, 30, 137.

² Shiers, L. G. P., *J. Bone Jt Surg.*, 1960, 42B, 31.

³ McKee, G. K., unpublished.

⁴ Scales, J. T., Duff-Barclay, I., and Burrows, H. J., *Proceedings of a Symposium on Biomechanics and Related Bio-Engineering Topics*, 1965, ed. Kenedi, R. M., p. 205. London.

⁵ Charnley, J., *Fed. Proc.*, 1966, 25, 1079.

⁶ Goodman, L. S., and Gilman, A., *The Pharmacological Basis of Therapeutics*, 1965, 3rd ed., pp. 1030 and 1407. New York.

⁷ Leidholt, J. D., and Gorman, H. A., *J. Bone Jt Surg.*, 1965, 47A, 1414.

⁸ Charnley, J., *ibid.*, 1964, 46B, 518.

Committee, which had considered the latest moves by the Minister of Health and the Management Side.

The dispute is long-standing and complex.^{1 2} Local authority chief officers other than doctors are waiting for the decision of the Prices and Incomes Board on their claim. The Minister has offered to call both sides of Whitley Committee C together when this decision is known; but the Staff Side has always stated that the pay of the other chief officers is irrelevant and that there is no need to wait for this ruling. Public health medical officers, it holds, should be paid as doctors and not as local government employees. The Management Side has suggested that the pay of junior public health doctors could be discussed on the basis of the Government's third White Paper³; but in the Public Health Committee the junior doctors themselves, the most poorly paid in the service, rejected the suggestion and supported the Committee's demand that the pay of all public health doctors should be considered at the same time in any negotiation.

Once two sides in a dispute have taken up their positions statements and counterstatements in the case are apt in the eyes of the onlookers to assume the intricacies of a Victorian case in Chancery. But here the basic issue is clear. Public health doctors are underpaid, recruitment to the service is poor, and morale is low. Almost a year ago a just claim was submitted on their behalf in Whitley C, their own negotiating committee, and the Management Side has not yet replied to this claim.

There is now general agreement that there must be an inquiry into the public health service, and that its structure and function must be reviewed in the light of changes in other fields of medicine. This will take time. But the immediate problems of the service must be settled urgently in order to keep it alive long enough for the inquiry to be made. It is to try to hasten a solution to these problems that sanctions have been introduced. If they fail there may well be nothing left to build on.

Better Conditions of Service

The first report on the negotiations on the current problems of hospital medical and dental staff, printed in full in the *Supplement*, is an encouraging document. The Minister of Health himself has taken an active part in the discussions, and specific problems have been examined in the first instance by small working groups or panels with members from each side. Thus more doctors than the eight on the main representative committee of nine—one is a dental surgeon—have been able to bring their special experience to bear on particular matters. There is a separate panel for Scotland. Hospital junior doctors are well represented, and the effectiveness of their contribution may be detected in the terms of the report.

Major matters of remuneration have been excluded from the negotiations. These are for the Review Body. But agreements on such things as off-duty time and leave have a financial bearing, and the decision that a part of the telephone costs of certain junior staff should be paid will help to resolve a long-standing injustice. Allowances for the use of cars on official business and mileage rates are being discussed.

A notable feature in the report is the Government's decision to ask selected hospital boards to advertise additional consultant posts and all boards to re-advertise vacant posts. The profession has always maintained that there was a need for more consultants, and the reviews of hospital medical staffing confirmed this view. There seems to be no shortage of well-qualified doctors to choose from. It is therefore somewhat of a paradox that there are vacant consultant posts that need to be re-advertised. Presumably they are mostly in areas where the professional opportunities are fewer than in the main centres. The profession will hope to see these posts filled. The Ministry no doubt aims to establish whether suitable candidates are in fact available. The choice will be widened, since in future applicants will not be rejected merely because they have spent little or no time as a senior registrar.

Lack of time for study and research and too little off-duty time have been among the main complaints of the younger hospital doctors. The proposals in the report, set out in greater detail in circulars for the guidance of hospital authorities (copies will be obtainable from hospital secretaries), should go a long way to meet these complaints. Time off entails inconvenience and more work for those remaining on duty. These are practical problems that medical staff will have largely to solve for themselves. Consultants may well be irked at times by the legitimate absences of their juniors. Goodwill will be needed on all sides to try to achieve the right balance between the proper requirements of doctors and the immediate needs of their patients, which must have priority.

The negotiations are continuing, and shortly there will be further circulars giving effect to what has been agreed. No hospital doctors can now feel that their affairs are being neglected or that their representatives are not working on their behalf. Patently they are. Negotiations on terms and conditions of service are, by nature, never ending. But the current ones are catching up on many matters that should have been settled before.

B.M.A.'s Annual Meeting

Though he was the first to sight a tempting stretch of land on the far side of the Atlantic that has since become better known, John Cabot preferred to return to Bristol to live, prizing it incidentally above his native Italy too. And as a port, a centre of industry, and later a university town Bristol has been the source of many subsequent men of stature. With its pleasing setting and historic monuments it offers other and present attractions, so that the decision of the B.M.A. to hold its Annual Meeting there this year will, it is hoped, be appreciated by a great many members.

At the Annual Scientific Meeting (10 to 14 July) symposia, panel discussions, lectures, and demonstrations will bring before their audiences many leading experts. As the programme shows (see *Supplement*, page 123), subjects of daily importance in medical practice are to be discussed, and a series of "Modern Trends Lectures" strike a particularly topical note. The Scientific Meeting is preceded as usual by the Annual Representative Meeting (6 to 10 July) and accompanied by a full programme of social events. Members who have not attended an Annual Meeting before are specially urged to do so, for they will find they receive both a warm welcome and a refreshing view of many aspects of medicine.

¹ *Brit. med. J.*, 1967, 1, 586.

² *Ibid.*, 1967, 2, 130.

³ *Prices and Incomes Policy after 30th June, 1967*, Cmnd. 3235. H.M.S.O.