A previous pilot study on 20 normal subjects had shown the first three modes of vibration (rigid body, single bending and double bending) could be consistently identified. Subsequently, over 20 patients with closed tibial fractures had been assessed at various stages during healing. The frequency spectra and the frequencies of the vibration modes were influenced by the stage of healing; higher vibration modes were observed and the modal frequencies of fractured and unfractured tibiae approximated as healing progressed. Examination of the frequency spectra also enabled delayed healing to be identified at an early stage.

Bone weakness after the removal of internal fixation plates: cortical atrophy or residual screw holes? – J. Rosson, J. Egan, P. Monro and J. Shearer (Southampton) stated that the adverse effects of rigid plates on cortical bone structure had attracted considerable attention, but the relative importance of cortical atrophy and residual screw holes on bone weakness after plate removal had attracted less interest. They had used paired rabbit tibiae to compare the mechanical consequences of bone demineralisation (simulating cortical atrophy) and solitary drill holes.

Diminution of mineral content to between 75% and 85% of normal reduced maximum bending moment to a mean of 78% normal. Drill holes exerted a similar effect. In contrast, energy-absorbing capacity was reduced to a mean value of 98% of normal in bone with 75% to 85% of the normal mineral content, but fell to a mean value of 50% of normal in the presence of a solitary drill hole.

They concluded that, after plate removal, residual screw holes are a more potent cause of bone weakness than the degrees of cortical atrophy described in animal studies. Accordingly, the value of reducing plate stiffness in an attempt to reduce cortical atrophy should be questioned.

A case control study of Colles’ fracture: heel bone density, kyphosis and height – D. McCutcheon, K. Johnson and R. W. Porter (Doncaster) had conducted a case/control study of 294 women with Colles’ fracture, and a similar number of aged-matched volunteer women, comparing the ultrasound attenuation of the os calcis, thoracic kyphosis, standing height and weight, using the Student two-sample t-test for analysis.

The mean age was 66.4 years. The women with Colles’ fracture had significantly less ultrasound attenuation of the os calcis than the controls, significantly more thoracic kyphosis (p < 0.0005) and were significantly shorter (p < 0.0005). Their weight was not significantly different. Previous studies of post-menopausal women by the authors had shown a reduction of ultrasound attenuation of 1 dB/MHz per year, suggesting that the Colles’ fracture population had measurements not to be expected in the control group for a further 12 years. The increase in thoracic kyphosis supported the concept that both the axial and appendicular
skeleton were usually osteoporotic in women with Colles' fracture. The reduction in standing height could be explained in relation to the increase in kyphosis.

Healing of diaphysal fractures: the relative contribution of individual osseous tissues – O. O. A. Oni, H. Stafford and P. J. Gregg (Leicester) had investigated the relative contributions of individual osseous tissues to diaphysal fracture healing by isolating individual osseous tissues. A transverse osteotomy was made in the right tibia of mature rabbits shortly after death or under general anaesthesia. In group I (periosteal healing), the medullary cavity was reamed and nailed; in group II (medullary healing), the periosteum was elevated and a silastic sheath was wrapped around the osteotomy; in group III (intracortical healing), the osteotomy was nailed and a silastic sheath was also applied. In each group, three animals were used for an early post-mortem study (control) and 12 for a survival study, the animals being killed at intervals of up to four weeks. The osteotomies were studied by radiography, arteriography and histology.

Arteriography revealed numerous periosteal vessels in group I; medullary vessels in the proximal fragments only from one week postoperatively in group II; and intracortical vessels in the proximal fragments only after one week in group III. Histological examination revealed sub-periosteal new bone and cartilage formation in group I from one week postoperatively and union from two weeks; the osteotomy was ununited in groups II and III but medullary osteogenesis was observed in the proximal fragments from one week. The authors suggest that, because healing is delayed only in the absence of the periosteum, the latter is the vital tissue with regard to normal healing.

Epiphyseal distraction for bone bridges across the growth plate: biological and mechanical effects – C. J. Kershaw and J. Kenwright (Oxford) reported that an experimental model had been developed to determine if epiphyseal distraction could correct and prevent recurrence of deformities due to bony bridges. The medial 10% of the distal femoral growth plate was resected in 14 eight-week-old New Zealand white rabbits; this procedure consistently produced a bony bridge after 2-4 weeks, with 5° to 20° angulation. A bilateral external fixator, strain-gaused to determine distraction forces, was then applied across the physis. The opposite femur acted as control. Asymmetric distraction was performed for 14 days: 1.0 mm/day medially and 0.5 mm/day laterally. Weekly radiographs were obtained to monitor distraction. Animals were killed at 0, 3 and 6 weeks after distraction for histological examination of the femur.

Fracture of the bony bridge and correction of angulation was achieved in 10 rabbits. The fracture typically propagated through the metaphyseal end of the bridge. Force readings showed a characteristic pattern corresponding to fracture of the bony bridge. Large forces (mean ± s.d. = 89N ± 28) were needed for bridge fracture. Despite low forces acting on the uninjured lateral side (mean ± s.d. = 25N ± 15), all femora displayed complete, premature physeal closure. The results suggested that the technique could correct angular deformity due to bony bridges but should be performed close to skeletal maturity because of the risk of premature closure of the growth plate.

Early strain-related changes in enzyme activity in osteocytes following bone loading in vivo – T. M. Skerry, L. Bitensky, J. Chayen and L. E. Lanyon (Bristol and London) had studied the relationship between mechanical loading and the activity of cell populations in bone.

Bones were exposed in vivo to a single short period of loading which, if repeated daily, had been shown to result in increased new bone formation. After six minutes of loading, there was an increase in the activity of glucose 6-phosphate dehydrogenase (G6PD) in periosteal cells which was proportional to the magnitude of the strain induced by the loading. In osteocytes, although the G6PD activity in each individual cell was unchanged by loading, the number of cells displaying activity increased in proportion to the applied strain. Activation of G6PD was unaccompanied by equivalent changes in the activities of other oxidative enzymes studied. This finding was consistent with loading increasing the activity of the oxidative part of the pentose monophosphate shunt, which suggested stimulation of a synthetic process such as the production of RNA from ribose 5-phosphate.

The results showed that intermittent loading of bone tissue produces rapid strain-related effects on the metabolism of both osteocytes and periosteal cells.

The role of the cruciate ligaments in normal level walking – J. J. Collins, R. J. Jefferson and J. J. O'Connor (Oxford) stated that earlier work in gait analysis had mostly ignored the role of the cruciate ligaments in load transmission across the knee. They had used a two-dimensional mathematical model of the human knee joint to estimate the magnitudes of ligament forces developed during normal level walking in 10 normal subjects.

The model was based upon a four-bar linkage (femur, tibia and two cruciate ligaments) which takes account of the rolling of the femur on the tibia during flexion/extension and the associated changes in direction of the ligaments and muscle tendons. Forces transmitted by six elements were considered: the quadriceps, hamstrings, gastrocnemius, anterior cruciate ligament (ACL), posterior cruciate ligament (PCL) and tibiofemoral contact. The equations of mechanics could be used to determine the absolute values of only three of the joint forces simultaneously. It was assumed that all shear forces were transmitted across the knee by the soft tissues.

For the subjects tested, calculations showed the ACL had a possible role in 75% to 100% of the gait cycle, whereas the PCL had a possible role in only 30% to 70% of the cycle. Mean maximum ACL forces were significantly larger than mean maximum PCL forces (1.3 × body-weight versus 0.4 × body-weight). The model strongly supported the hypothesis that the ACL plays a significant role in the transmission of forces across the knee during walking.

Functional biomechanical results of unicompartmental knee arthroplasty compared with total condylar arthroplasty and tibial osteotomy – R. J. Jefferson and M. W. Whittle (Oxford) had performed a prospective biomechanical study of unicompartmental arthroplasty (Oxford Meniscal Knee), total condylar arthroplasty and tibial osteotomy on patients, all with degenerative osteoarthritis associated with a varus or valgus deformity. The patients were divided into three groups: unicompartmental arthroplasty (20 patients), total condylar replacement (10) and tibial osteotomy (20). The two arthroplasty groups were not significantly different from each other, but both showed more evidence of a flexion deformity and the patients were older than the tibial osteotomy group. Assessments of biomechanical function before and after surgery were made using a three-dimensional television/force platform/computer system.

Cadence, velocity and stride length improved in all three groups, with the unicompartmental group showing the greatest increase. Changes in sagittal plane parameters were generally small: the unicompartmental group showed less
limitation of full extension postoperatively. In the coronal plane all groups showed good correction of varus or valgus deformity, with corresponding decreases in the adduction/abduction moment. The best results were observed in the unicompartamental group: they were more predictable than those of Tibial osteotomy, and showed better correction of coronal plane deformity than those of total condylar arthroplasty.

The biomechanical effect of orthoses on hindfoot function – I. Stockley, N. Messenger, D. I. Rowley and P. Bowker (Salford) reported a study on the orthotic management of valgus hindfoot deformities. Ten adult female rheumatoid patients with passively correctable valgus hindfoot deformities (range 5% to 20%) were treated with polypropylene extended heel cups and silicone rubber insoles.

Assessment was both objective and subjective. Objective assessments included static radiographic measurements, strain gauge goniometer measurements of hindfoot inversion and eversion, Kistler force plate analysis and temporal spatial parameters of gait velocity cadence, step length and foot angle. All measurements were taken with the patients walking in their normal shoes with no orthoses and then in extra-depth non-customised shoes with their orthoses.

The patients tolerated the orthoses well, all but one preferring the insole to the heel cup. The objective assessments showed similar results with heel cups and insoles: radiographic correction of the hindfoot, mean 8° (range 5° to 15°), and an increased range of inversion/eversion 4° to 9° (mean 7°). The Kistler force plate and temporal spatial studies demonstrated no difference with or without an orthosis.

The authors concluded that the two dynamic orthoses described probably acted by stabilising the hindfoot complex and by producing an increased functional range of movement of the subtalar joint.

Assessment of cervical immobilisation by halo orthoses – P. Convery and D. L. Hamblen (Glasgow) had assessed the mechanical rigidity of four types of halo orthoses: Zimmer, Jerome, Fillauer and Harlow Wood. A test jig was designed, utilising a model trunk with a detached head, to enable comparative studies of cervical motion under various loading modes. An order of rigidity was determined for the four halo designs tested in shear, torsion, flexion, extension and axial compression. The Zimmer design was most effective in cervical immobilisation with the Fillauer halo the next most rigid.

A 50% decrease in cervical motion could be achieved by converting the prefabricated halo vest to a customised halo jacket. The repeatability of orthotic fit was assessed by comparing the consistency of the rigidity test results. A dramatic improvement in consistency of fit was noted with the customised body jacket. Based on the consistency of the test results, the Fillauer had least scatter in the 'as supplied' results and hence the most repeatable fit.

The effect of locking loops on the strength of tendon sutures – Z. B. Mashadi and A. A. Amis (London) stated that in the early state of flexor tendon repair, if the repair was strong enough to allow movement without separation, adhesions could be avoided by allowing the tendon to move freely. The problem was to design a strong enough tendon repair technique.

They had developed a 'multiple x-raying' method which allowed them to examine various suturing techniques during collapse or pull through on tensile testing. They had examined the 'locking loop' tendon sutures, such as the Kessler, Verdan, and Ketchum 'lateral trap' techniques.

Locking elements did not contribute towards strength when small diameter (5/0) sutures of various materials were applied to the tendon, collapsing at 12 N. Larger diameter sutures (4/0) slightly reduced the risk of failure of the locking elements (p < 0.001), but still collapsed at 15 N or less, so suture techniques which depended on locking loops would often lead to gap formation and hence poor results.

The authors concluded that good tendon repair results would only come after the development of a suture technique without locking loops.

Preliminary report on the effect of creep of polymethylmethacrylate (PMMA) bone cement and its relevance to total hip arthroplasty – R. D. Perkins, A. J. C. Lee and R. S. M. Ling (Exeter) said that most orthopaedic surgeons regarded PMMA bone cement as a rigid brittle material. However, PMMA was a polymer and one of the characteristics of polymeric materials was that they creep, that is, exhibit a slow, time-dependent deformation under load at body temperature. The creep characteristics of bone cement were investigated, using four-point bending tests, to determine the variation of creep of PMMA with temperature, age, stress level, porosity/density and degree of hydration. A series of tests were used to determine the effects of the surface finish of the femoral component and the degree of constraint around the cement. Tests were performed to determine the effect of cyclic versus constant loading and the effect of storage in intra lipid as against normal saline.

The findings indicated that bone cement would creep under in vivo loading conditions. Creep rate was highest shortly after polymerisation, was higher at body temperature than at room temperature, and was higher in hydrated specimens than in dry specimens. It was postulated that creep of bone cement had significance in load transference between implant and bone in total hip replacement.

Bone cement under operating theatre conditions – G. C. Bannister and A. W. Miles (Bristol and Bath) stated that acrylic bone cement was often found to be fractured at revision arthroplasty and, under laboratory conditions, could be weakened by porosity and lamination with air and blood. Therefore, pure and blood-contaminated cement extruded from the femoral medullary cavity on prosthetic insertion was retained from 64 primary total hip replacements. Old cement was also retrieved from 11 revision arthroplasties. The material was tested to failure in compression and shear and its blood contamination and elasticity were assessed.

In both compression and shear, pure and old cement were significantly stronger than extruded polymethylmethacrylate (p < 0.01). There was a highly significant correlation (p < 0.001) between the strength of pure and extruded cement from the same mix. Blood contamination ranged from 0% to 14%, but did not correlate directly with cement strength. Cement became slightly more brittle with age.

Acrylic bone cement appeared to retain its mechanical properties in the clinical arena. However, it was highly susceptible to preparation technique and there was a threefold variation in the strength of pure cement prepared in operating theatres. Improvements in handling seemed to offer greater potential than modifying the material.

Bone cement bonding in an animal model – J. Mackinnon, S. James and A. Goodship (Bristol) stated that the sheep's distal femur was a satisfactory model for cemented stemmed implant insertion in the human. After exposure of the knee in adult ewes, the distal 6 mm of the femur was removed and the bone reamed with a conical reamer. Standard wooden volumetric spacers were cemented into groups of
six femora under varying conditions of bone state, preparation, cement viscosity and bone bleeding. The femora were then harvested and frozen pending reverse pushout tests on 1 cm slices of bones using a Dartec servohydraulic device.

Good cement technique (early introduction, pressurisation, and slow prosthetic insertion), and maximal bone preparation (reaming, brushing and high pressure lavage) increased bond strength in all cases (p < 0.01). All tests performed on dry bone showed increased bond strength compared with freshly dead bone, itself better than live bone (p < 0.01). In live bone, the maximum achievable bond strength compared with that obtained in freshly dead bone by using only a crude cement technique, and low viscosity cement conferred no advantage.

Optimum bonding was obtained in well prepared bone with good cement technique; further improvement may be expected if bone bleeding could be reduced. Intra-osseous fat appeared to be deleterious.

Control of bleeding in cemented arthroplasty – G. C. Bannister, S. K. Young, A. S. Baker, J. G. Mackinnon and P. A. Magnusen (Bristol) said that bleeding caused laminar flow in bone cement and its prosthetic interfaces and weakened the fixation of joint replacements. They had studied the effects of anaesthesia and blood pressure on bleeding in the proximal femoral medullary cavity and the local response to freezing saline, 1:200 000 adrenaline solution, hydrogen peroxide and saline at room temperature. The rate of bleeding in the proximal human femur was assessed by gauze swabs inserted into the medullary canal.

Under general anaesthesia, the proximal femur bled at a constant rate of 20 ml per minute for 10 minutes. During this phase, the effect of each test solution was assessed by measuring femoral bleeding before and after its application for one minute. A total of 151 proximal femora were studied, 83 under general and 68 under regional anaesthesia. Under general anaesthesia, bone bleeding correlated directly with systolic blood pressure (p < 0.001). Under regional block, bleeding fell to 12 ml per minute (p < 0.001). Freezing saline reduced bleeding by 5 ml per minute and exerted a significantly greater haemostatic effect than adrenaline solution, hydrogen peroxide or saline at room temperature. The effects of regional anaesthesia and freezing saline were additive and reduced bleeding by a mean of 56%. The reduction of bone bleeding should contribute to better prosthetic fixation.

The in vitro release of streptomycin from bone cement – W. M. Harper, H. Stafford, D. Wood and P. J. Gregg (Leicester), stated that arthroplasty for tuberculous arthritis may cause reactivation of disease. The incorporation of an antituberculous drug (streptomycin) into polymethylmethacrylate (PMMA) had theoretical attractions. To ascertain whether streptomycin would effectively leach out of PMMA an experiment was conducted using five cements: Simplex, CMW, Palacos R, Palacos LV and Palacos. To 40 g of streptomycin sulphate was added and three blocks were formed (mean weight 5.92 g). The blocks were incubated at 37°C in 20 ml phosphate-buffered saline. Assays of streptomycin concentration were undertaken using a competitive binding assay (TDX system) at six hours and then daily for seven days. For the assay the percentage of covariance was < 0.5%. For all cements there was an exponential curve with initially very high values of streptomycin concentration falling rapidly. When the five cements were compared, and results corrected for varying block weights, elution of antibiotic was significantly better from Palacos than from Simplex (p < 0.05) at 6, 48, 72, 96, 120 and 144 hours and from CMW at 6, 48 and 168 hours.

The authors concluded that streptomycin could be effectively leached from PMMA and thus could be used when a cemented arthroplasty was performed for tuberculous arthritis.

Neoplastic transformation of cells by orthopaedic metals in vitro – A. Doran, N. Rushton and F. C. Law (Cambridge) reported that there had been renewed interest in the long-term effects of metallic corrosion products, and in particular the possibility of malignant change, as a result of the increasing use of joint implants. The effects of cobalt, chromium and nickel were examined in the C3H10T1/2 mouse fibroblast cell transformation system. Cells were exposed to metal salts at various concentrations based on cytotoxicity studies (Cobalt chloride 0.1 to 10 μg/ml, nickel chloride 1 to 60 μg/ml, chromium chloride 300 to 1 200 μg/ml, sodium chromate 0.01 to 0.5 μg/ml). After 48 hours exposure, cells were incubated in confluent monolayers for five to six weeks following which cultures were scored for the frequency of transformation foci and compared with positive and negative controls. Statistically significant (p < 0.01) dose-related increases in transformation incidence were found in the cobalt, nickel and chromate assays. The majority of changes occurred at toxic concentrations. These findings indicated the potential for malignant change by metal ions in relatively high concentrations. Further work was required both on the longer-term effects at low exposure levels, and in particular on the effects in human cell systems.

Collagen and ceramic as an osteoconductive matrix for heterotopic bone formation – A. Kociałkowski, W. A. Wallace, R. G. Burwell and J. Hardy (Nottingham) said there were three prerequisites for heterotopic bone formation: determined or inducible osteogenic precursor cells, an inductive agent and a mechanical framework for bone formation. They had attempted to clarify whether collagen and ceramic could induce heterotopic bone formation, or if they only served as an osteoconductive matrix. Experiments had been performed on New Zealand white rabbits.

Autologous bone marrow was used as a source for determined and inducible osteogenic cells and different mixtures of collagen, ceramic and bone marrow were implanted intramuscularly into abdominal pouches on the right side and mixtures of collagen and ceramic only on the left side. Twenty-seven animals were used, each with 12 implants, and were killed at 3, 6, 9 and 12 weeks. Heterotopic bone formation was quantitatively assessed by technetium-99m isotope scintigraphy using a gamma counter and by a histomorphometric point counting technique.

The results showed that 99Tc isotope scintigraphy could accurately assess bone formation, that collagen and ceramic did not induce bone formation, and that mixtures of bone marrow with collagen or ceramic induced bone formation. Bone formation was maximised by mixtures of 25% ceramic to 75% collagen by volume, with the standard addition of 20% bone marrow by volume.

Use of a radio-labelled monoclonal antibody P256 for studying the natural history of thrombus following total hip replacement – J. Klosok, A. W. Stuttie and J. P. Lavender (London) stated that diagnosis and treatment of deep vein thrombosis (DVT) following hip replacement remained controversial, with at least 1% of patients dying from a silent pulmonary embolus (PE). Venographic studies, which could only be used once and not without risk, formed the basis of present knowledge.

Recently a completely new method of diagnosing DVT
and possible PE had been used. The technique used a radio-labelled Fab1 fragment of a mouse monoclonal antibody (P256) directed against the primate platelet IIb/IIIa glycoprotein complex. The antibody labelled with 111In rapidly became platelet-associated following intravenous injection and sites of abnormal platelet deposition on thrombus were detected by Gamma camera. Patients were injected at 24 and 96 hours postoperatively and scanned at 48, 72, and 96 hours and for three further days.

Of 16 patients studied, eight showed a thrombus occurring primarily in the ipsilateral calf, three showed focal accumulation in the ipsilateral thigh secondary to the calf thrombus. All calf thrombi presented on the first scan, thigh thrombi not appearing until the second scan. Pulmonary embolism occurred in four patients, three confirmed by ventilation/perfusion scanning. Ascending venography confirmed three of the calf thrombi.

This method provided a useful non-invasive technique for studying the natural history of thrombus formation and may be used to study the efficacy of anticoagulant therapy.

Pre-operative venography in patients undergoing total hip replacement – D. P. O'Doherty, M. Pearse, P. A. Magnussen and P. J. Gregg (Leicester) stated that the accepted dogma regarding postoperative deep venous thrombosis (DVT) is that surgery is the precipitating event. However, two studies in general surgical patients have demonstrated that in a significant number of patients there is evidence of DVT prior to surgery. The authors reported a study investigating this concept in 110 consecutive patients undergoing elective total hip replacement.

As expected, the majority of the patients had poor mobility prior to surgery. Only 15% walked without an aid, and 35% were housebound. In a standardised walking test only 50% were able to walk more than 100 m. Two weeks before surgery all patients underwent bilateral ascending venography. Venography was successfully performed on 206 out of 220 legs. There were 14 technical failures, and no complications of the procedure. Abnormalities were detected in only four patients and only one of these had thrombus in deep veins. Postoperatively one patient had clinical evidence of DVT, and repeat venography showed extension of the thrombus.

Routine pre-operative screening for DVT prior to hip replacement appears to be unjustified, although it may be prudent to investigate selected high-risk cases.

The role of oxygen-derived free radicals in damage to skeletal muscle rendered ischaemic by a tourniquet – E. J. Parnell, L. Kleenerman, J. Gower and C. J. Green (Harrow) stated that the role of oxygen-derived free radicals in ischaemic and reperfusion injury was now well recognised. Their study had been into the possibility of blocking the cytotoxic effects using scavengers. Free radicals disrupt cell membranes by lipid peroxidation, and the breakdown products give an indirect measurement of free radical effects. The hind limbs in anaesthetised New Zealand white rabbits were subjected to periods of vascular occlusion, between one and five hours, followed by either none or one hour of reperfusion. Three muscles, differing both anatomically and metabolically were harvested. They were assayed for the products of lipid peroxidation, and investigated by electron microscopy.

There was a significantly raised level of lipid peroxidation in ischaemic muscle. This increased with reperfusion and was confirmed by all the indices measured, and electron microscopy. The level of lipid peroxidation was not related to the length of ischaemia. A marked hypothermic effect was observed with the temperature falling below 26°C after four hours. The major morphological changes occurred in the organelles, with minimal disruption of the contractile elements.

Monitoring soft tissue viability during orthopaedic surgical procedures – D. L. Bader, S. H. White and P. D. Burge (Oxford) stated that pressure sores occurred in elderly patients undergoing surgery for hip fractures. The factors associated with intra-operative pressure sores included prolonged or high interface pressures, thin subcutaneous tissue over bony prominences and poor tissue nutrition. They had investigated the tissue viability of 10 elderly patients during surgery for hip fracture. The experimental system used provided prolonged loading of soft tissue. The resulting interface pressures were recorded, using the Oxford pressure monitor, as well as changes in transcutaneous oxygen tension (T,PO2), an indicator of tissue viability. A load applicator was attached adjacent to the greater trochanter of the non-operated limb, and the subcutaneous interstitial pressure was measured with a slit catheter.

During surgery, there was a critical depression of T,PO2 at interface pressures measured at the bony prominences on the operating table. T,PO2 levels below 2.7 kPa (20 mmHg) and interstitial pressures of over 5.4 kPa (40 mmHg) were often recorded; these levels are likely to lead to cell necrosis and tissue breakdown. The study illustrated the high risk of tissue breakdown in elderly patients during surgery, and provided a base line against which improvements in operation table interface support and modifications of anaesthesia may be assessed.

The treatment of Paget's disease of bone with aminobutane diprophosphate – D. P. O'Doherty, D. R. Bickerstaff, S. Rosini and J. A. Kanis (Sheffield) had examined the effects of aminobutane diprophosphate (ABDP) in 30 patients with symptomatic Paget's disease of bone. ABDP was administered as an intravenous infusion, 5 mg over two to four hours, for five consecutive days, and induced a marked suppression of biochemical indices of disease activity. Urinary excretion of hydroxyproline fell to 50% of pretreatment values within two weeks, and was followed by a later decline in the serum activity of alkaline phosphatase to 38% of pretreatment values at five months. Disease activity remained suppressed throughout the six months of follow-up, and only one patient showed signs of early relapse. A significant decrease in mean serum calcium and urinary calcium excretion occurred from the second day of treatment, with values returning to pretreatment levels towards the end of follow-up. Symptomatic improvement was noted in 27 of the 30 patients. Bone biopsies in 10 patients indicated no adverse effects on mineralisation. A transient fall was seen in the mean total white cell count, particularly the lymphocyte and neutrophil fractions. This was associated with short-lived fever in three patients. It was concluded that ABDP was a promising new treatment for the long-term control of Paget's disease of bone.

The measurement of interstitial fluid flow in cortical bone – I. D. McCarthy, J. T. Bronk and P. J. Kelly (Edinburgh and Rochester, USA) stated that there was qualitative evidence that large molecules moved through the interstitial fluid (ISF) in bone at a much faster rate than could be explained by diffusion, but quantitative measurements of this rate of flow had not been reported.

Three groups of five dogs were anaesthetised and the tibial nutrient artery cannulated. Radioactively-labelled
albunin and red blood cells were perfused through the
tibiae for 10 minutes. A very small proportion of the
albunin entered the ISF. The tibiae were perfused without
tracers for a further five minutes to wash out tracers from
the vascular system so that only albunin in ISF remained
in bone. In two groups, perfusion was continued for a
further 30 minutes, and in one of these groups a venous
tourniquet was applied. The radioactive content of the bones
was measured, together with the bone water and specific
gravity. The amount of albunin in ISF decreased by 49.9%
over 30 minutes. Assuming mono-exponential washout of the
albunin, this represented a fluid flow of approximately
0.25 ml/min/100 g, an extremely high value, and must have
represented an adaptation to the low permeability of bone.
Raising venous pressure did not effect this value.

These results indicated that there was considerable fluid
movement even in unstressed bone, which could influence
bone remodelling.

Normal regional bone formation and increased bone resorption
in recovered hip fracture patients – J. S. Wand, J. Reeve,
T. Smith and J. Green (Harrow) stated that second hip
fractures were common. Whole body bone turnover and
femoral neck bone formation were determined in 12 patients
rehabilitated after hip fracture (age 63 to 76) and 12 controls
(age 65 to 76). A strontium85 method was used with
correction for long-term exchange. Exchange-corrected bone
formation was expressed as H200. The estimated 24-hour
uptake of calcium which remains in situ throughout 200
days. The mean whole body H200 for the fracture group
was 1.47 (s.d. 0.36) mmol Ca/day and 1.36 (s.d. 0.44; NS)
in the controls. H200 in the unfractured Ward’s triangle
region averaged 0.080 (s.d. 0.015) mmol Ca/day versus 0.0734
(s.d. 0.0256) for the controls (NS).

Bone resorption was estimated by four non-consecutive
early morning and one 24-hour urinary hydroxyproline to
creatinine ratios, after 24 hours of a gelatine-free diet.
Results in the fracture patients were higher (mean 0.0253 mmol
versus 0.0162 mmol, p < 0.005). Based on past methodological
comparisons in crush fracture patients, this suggested a
bone resorption rate of 2.73 versus 1.44 mmol Ca/day for
patients versus controls (p < 0.005). Femoral neck bone
densitometry (Novo BMC-LAB 22a) showed that the fracture
group had significantly (p = 0.01) lower bone density than
the control group (0.566 versus 0.652 g/cm2).

The use of culture on the chorio-allantoic membrane to
investigate the effect of intrinsic and extrinsic factors on
skeletal growth and development – P. P. Monro, W. S. Pringle
and J. R. Shearer (Southampton) said that during human
development, there was bilateral symmetry in the growth
of paired long bones. They had examined the relative
importance of intrinsic and extrinsic control of embryonic
development by culturing, for 10 days on the chorio-allantoic
membrane, single and paired femurs removed from 14-day-
old embryonic chicks.

Single femurs underwent a tenfold increase in tissue
mass including mineralisation. Frequently the growth of
bones removed from the same donor bird and cultured on
different host chicks showed a strong positive correlation.
When both femurs from the same donor bird were cultured
on the same host this correlation increased. When two
femurs from different donor birds were cultured on the
same host there was a similar positive correlation. When
comparable duck femurs were cultured for 18 days on duck
host eggs there were similar relationships.

Thus, although intrinsic control of growth was indicated,
these results also confirmed that growth was affected by
extrinsic factors which, in this case, were assumed to be
nutritional. The authors suggested that this model could be
used to demonstrate the effect of such extrinsic factors as
drugs and implant materials on growth and development.
However, to best evaluate any effect they suggested that
younger and smaller femurs were used as, in separate
experiments, they had demonstrated that they grew better.

An evaluation of three-dimensional image reconstruction of
bone – J. D. Tuite, K. W. Marshall, G. J. Lloyd and J. K.
Stevens (London and Toronto) had evaluated the application
of computer graphics to computerised tomography (CT) in
the production of three-dimensional (3-D) images capable
of movement in real time. A 2 cm length of human cadaveric
femoral shaft with a grid of holes 0.5 mm to 3 mm in
iameter on both anterior and lateral surfaces was imaged
with a GE9800 CT scanner. This data was used to produce
3-D images using the ISG Technologies CAMRA system.

Factors affecting resolution of the grids were examined.
Increasing CT slice thickness increased the diameter of the
smallest resolved hole from 0.5 mm in a 1.5 mm slice to
2 mm in a 5 mm slice. There was no difference in the
resolution of the anterior and lateral grids. Rotation of the
specimen up to 35° relative to the plane of CT prior to
scanning did not alter grid resolution. The ratio of
anteroposterior to lateral diameters was increased in the CT
image from 1.1 to 1.3 by 35° rotation; but 3-D reconstruction
of the rotated image returned the ratio to 1.07. Image
volume measurement proved unreliable.

This reconstruction system resolves surface detail down
to 0.5 mm defects in bone and can obviate distortion from
the object rotation seen in CT images.
A meeting of the British Association for Surgery of the Knee was held on February 23, 1989 at St Mary’s Hospital, London. The President, Mr. E. L. Trickey was in the chair.

**SCIENTIFIC PAPERS**

**Proprioception and degenerative joint disease in the knee** – D. S. Barrett, A. G. Cobb, P. J. P. Pongor and G. Bentley (London) presented a new method of measuring joint position sense (JPS) in the knee, which assesses the proprioception of the joint capsule and cruciate ligaments alone. The patient’s leg, supported on a Thomas splint with a knee extension piece, was held passively in certain positions of flexion, and the accuracy of JPS was measured on a visual analogue model. In all, 81 normal and 45 osteoarthritic knees were examined, as well as 21 knees with Insall–Burstein unconstrained or Stanmore hinge prostheses. The test was repeated with or without an elasticated bandage. A steady decline in JPS with age in normal knees was noted. Osteoarthritic knees had significantly poorer joint position sense throughout (p < 0.001). Knee replacement improved JPS slightly (p < 0.02), surface replacements apparently more so than constrained prostheses. The effect of an elasticated bandage in the groups with poor JPS was dramatic: performance was improved by 40% (p < 0.001).

The authors suggested that significantly reduced proprioception in elderly and osteoarthritic patients might initiate or promote the changes of joint degeneration. The effect of an elasticated bandage was discussed.

**Unicondylar or total knee replacement: the patient’s preference** – A. G. Cobb, S. C. Kozinn and R. D. Scott (London and Boston, USA) had interviewed 42 of 66 patients who, between 1974 and 1985, had received a unicondylar knee replacement (UKR) for one knee and a total knee replacement (TKR) for the other. Of the UKRs, eight had been revised and 12 patients had died. Of the remainder, 57% felt that the UKR side had been the better knee pre-operatively, though the measured range of movement had been equal (mean 110°).

Postoperatively the range of flexion was greater in the UKRs (119.4° ± 8.6°) than in the TKRs (110.9° ± 14.3°) (t = 3.5, p < 0.001). Some 50% of the patients now thought their UKR was the better knee and 21% the TKR; 45% thought the UKR felt more ‘normal’, 14% of patients the TKR. In the 40% of patients who could not walk down stairs reciprocally, the TKR led in 88%, suggesting inferior control, strength or range of flexion. Rehabilitation seemed to be more rapid following UKR in 31%, following TKR in 14%.

**Autologous bone grafting in primary uncemented knee replacement** – R. A. Hill and H. Phillips (Norwich), reported a series of 42 uncemented Freeman–Samuelson knee replacements that had required grafting of tibial defects at an average follow-up of 3.9 years. Lateral bone loss had tended to be posterocentral whereas medial bone loss was peripheral; these different types of loss required different grafting techniques. Graft union was assessed radiologically and 41 out of 42 grafts had united. Three had been revised and there was one case of infection.

The merits of the various options available to deal with tibial bone loss were discussed; it was concluded that autologous bone grafting was effective, cheap and flexible. Simple grafting techniques were advised and it was suggested that the screws used to secure grafts should be inserted vertically to avoid the risk of screw fracture. It was pointed out that there was a risk of stress protection of the graft if the screws engaged the cortex distally.

**Antibiotic prophylaxis with cefuroxime in unilateral and sequential bilateral knee arthroplasty** – D. P. Johnson and S. T. Donell (London) stated that for effective antibiotic prophylaxis in knee arthroplasty, an appropriate antibiotic in adequate concentrations must be present in the wound during surgery. They had studied the effect of the use of a tourniquet on the pharmacodynamics of antibiotic prophylaxis. A randomised prospective trial was undertaken of 22 patients undergoing knee arthroplasty who were given 15 g of cefuroxime at intervals of 5, 10, 15 and 20 minutes prior to application of the tourniquet. A further six patients were studied while undergoing sequential bilateral knee arthroplasty; they were given a single dose of antibiotic 10 minutes before the application of the first tourniquet.

Tissue antibiotic assay demonstrated that, to ensure adequate antibiotic concentrations, the injection of antibiotic should be given at least 10 minutes prior to inflation of the tourniquet. In sequential bilateral knee arthroplasty a second prophylactic dose is required before the application of the second tourniquet. In patients of 80 kg or more a larger dose of antibiotic is required.

**Colonisation of drains following total knee replacement** – D. Willemen, S. H. White, J. Paul and D. W. Crook (Oxford) reported the results of a prospective trial to determine when to remove a suction drain. In 41 total knee replacements closed suction drainage (Redivac) was randomly allocated for either 24 or 48 hours. At the time of drain removal, a surface swab was taken from the drain exit site and plated onto Columbia 5% horse-blood agar for incubation. The plastic drain tips were amputated and sent for immediate aerobic and anaerobic culture.

The mean volume of fluid drained during the first 24 hours was 270 ml; during the second 24-hour period a mean volume of only 50 ml was collected. No organisms were isolated from cultures of the swabs or drain tips sampled at 24 hours. However, at 48 hours, 25% of drain tips yielded light growths of Staphylococcus aureus (one drain) and coagulase-negative staphylococci (four drains). Clearly, little is to be gained by continuing drainage beyond 24 hours. If drainage is maintained for longer periods there is an increased risk of contamination by bacteria.
The value of 99mTc bone scintigraphy in the assessment of knee pain – P. A. Butler-Manuel, R. L. Guy, F. W. Heathey and T. O. Nunan (London) had investigated 101 symptomatic knees by bone scintigraphy. The scans were analysed and classified without prior knowledge of the clinical details and were then correlated with the clinical findings. The value of bone scintigraphy was confirmed in osteoid osteoma, osteonecrosis and several other rare conditions, but it also proved valuable in anterior knee pain and osteoarthritis.

The findings were that in anterior knee pain syndrome:
a) chondromalacia patella was always associated with a normal scan, and with local increased uptake localised to the extensor mechanism;
b) sympathetically-mediated pain was associated with a generalised increase of uptake;
c) all post-patellectomy knees showed increased uptake in the femoral groove;
d) a normal scan could not exclude significant chondromalacia patella, although it was associated with a low 'score' for pathology.

In osteoarthritis:
a) the scans were abnormal in all cases, including some where clinical and radiographic examination was misleading; and
b) accurate localisation of pathology helped in choosing the most appropriate operation.

The design and development of tools for upper tibial osteotomy – R. J. Mims, B. B. Porter and R. Mand (Durham) reported that, following the successful design and clinical use of a pin guide and a saw guide on more than 50 patients, a further development of the range of angled cuts was made. It was now possible to guide the saw accurately to produce an orthogonal lateral wedged cut, and a simple modification enables the surgeon to produce an anterior wedge in 5° intervals up to 20° to correct flexion deformities at the knee. The geometry of the guiding surfaces was designed to allow the removal of the minimum amount of bone for all angles of lateral and anterior wedges.

In-substance tears of the anterior cruciate in the growing child – B. E. Scammell and J. A. Robertson (Southampton) stated that in-substance tears of the anterior cruciate ligament in children with open epiphyses were rare. They presented four children aged 12 to 14 years who had sustained such tears after relatively minor injuries. In the three children arthroscoped at Southampton, the ligament was abnormal; in all four knees there was associated medial meniscal damage.

The children were managed conservatively. One girl subsequently developed a medial meniscal tear, four years after the original anterior cruciate injury; this tear had originated in an area of local softening. Although DeLee has advocated early surgical reconstruction, these patients have been managed in braces; ligament reconstruction will be considered at maturity.

The congenital snapping knee – B. D. Ferris and A. M. Jackson (London) described six knees in four patients with a rare form of congenital snapping. In these knees the tibia subluxed anteriorly on the femur in about 30° of flexion, and reduced on further flexion. Both subluxation and reduction were associated with a marked clunk. This form of knee subluxation is habitual and is associated with other severe congenital anomalies. Radiologically the knees show a dysplastic tibia with an abnormality of the femoral condyle. In the younger patient the subluxation in extension was passively reducible, but in the older patient it became fixed.

In all cases there was excessive laxity of the anterior cruciate ligament, but recurvatum of the knee was not a marked feature. The subluxation was resistant to conservative treatment in childhood and to date surgical treatment has only been partially successful in relieving symptoms.

Biomechanical properties of a double prosthetic ligament in the anterior cruciate deficient knee – W. J. P. Radford and A. A. Amis (London) stated that the anterior cruciate (ACL) ligament is made up of at least two identifiable bundles of fibres, anteromedial and posterolateral. To date, nearly all reported methods of reconstructing the ACL have used a single bundle of artificial or allograft fibres. Their biomechanical study had assessed a double-bundled prosthetic ligament for the anterior cruciate deficient knee.

Six human cadaver knees were tested for anteroposterior stability at 20° and 90° of flexion, corresponding to the Lachman and anterior drawer tests respectively. The Instron tensile test machine used in the experiment has an integral graphic plotter which can draw the force displacement curve of the tibia in relation to the femur. Experiments had been performed at the following stages:
1) with the anterior cruciate ligament intact;
2) with the anteromedial bundle divided;
3) with the ACL completely divided;
4) with an ‘over the top’ single bundle repair;
5) with a ‘through the condyle’ single bundle repair; and
6) with a double-bundled ligament.

Preliminary results were presented.

Leeds–Keio ligament anterior cruciate replacement: a clinical, arthroscopic and histological review – M. F. Macnicol and I. D. Penny (Edinburgh) had reviewed 17 patients who had undergone Leeds–Keio ligament insertion for severe chronic ACL insufficiency. The average follow-up was 26 months and the mean age was 30. Follow-up had included a subjective assessment, examination and arthroscopy.

All patients felt the operation had been worthwhile, but only one considered the affected knee to be normal and only two had returned to their pre-injury level of activity. Pivot shift was abolished in only three of 15 patients; six demonstrated a trace pivot shift. As expected, a strong correlation was noted between pivot shift status and the Lysholm knee score. Most knees showed varying degrees of abnormal laxity and four of the 12 knees arthroscoped had ruptured ligaments. Histology of the ligament biopsies revealed a foreign body response to polyester fibres and fibre debris and a variable fibroblastic response, which appeared insufficient to create a functionally significant neoligament.

The authors concluded that while patients’ satisfaction was high, the overall laxity and rupture rate was disappointing.

Evaluation of the Acufex KSS arthrometer and comparison with the Westminster cruciometer – S. T. Moyes, E. J. P. Crawford and P. M. Aichroth (London) reported that various instruments were available for quantification of the Lachman test in the ACL-deficient knee. They had assessed the KSS system and compared it to the Westminster cruciometer on 20 ACL-deficient and 34 normal knees. Thirty separate control readings were taken with each machine and the time taken to perform each observation was also recorded. The knees were held in 20° of flexion and 20 lb of anteroposterior translational force was applied.

The results for normal and ACL-deficient knees showed two separate populations for the quantified Lachman test, and the results with each system correlated strongly. The quantified Lachman was variable, quadriceps tone undoubtedly
plays a strong role, but over a short period, the results were reproducible with each system. The Westminster cruciometer is considerably more user-friendly: it is simpler and quicker to use. The mean observation time was four minutes as compared with 16 minutes for the KSS system.

Is the KT1000 arthrometer reliable? – I. W. Forster, C. Warren-Smith and M. Tew (Nottingham) stated that reconstruction of the anterior cruciate ligament is now frequently performed, but as yet there is no reliable means of assessing objectively the degree of stability conferred by operation. The KT1000 arthrometer appeared to offer an easily applied clinical machine which might do so, and they had used it regularly since 1985. Some of the results, however, led to questions about its reliability.

The arthrometer had been tested against known objective standards to confirm its mechanical accuracy. Then, following the manufacturer's instructions, it was used to examine both knees in 10 patients (four normal and six with anterior cruciate deficiency in one knee), at two forces (15 and 20lb), twice on the same day, by each of four surgeons of whom only two were already experienced in its use. Each measurement was known only to the nurse who recorded it. Thus the trial included 320 independent measurements – eight in each of the 20 knees at each force.

Analysis of the results showed substantial variations in measurements expected to be closely similar. There was both inter- and intra-surgeon variation, both in recording absolute values of displacement in single knees, and in differences of displacement between pairs of knees. The difference in laxity between a damaged knee and its control was often not greater than this difference in normal knees. The trial had confirmed their doubts about the reliability of the KT1000 in assessing ligament laxity.

RHEUMATOID ARTHRITIS SURGICAL SOCIETY

The annual meeting of the Rheumatoid Arthritis Surgical Society was held at Guy's Hospital on November 26, 1988. The President, Mr M. Laurence was in the Chair.

SCIENTIFIC PAPERS

Resection interposition arthroplasty of the wrist in rheumatoid arthritis – K. Tillman and C. Hansens (Hamburg) reported that, between 1971 and 1980, 64 patients underwent a stabilisation procedure for palmar subluxation of the wrist. The dorsal retinaculum was used as a radially based flap and sutured distally to the volar capsule of the joint to pull the carpus dorsally.

Thirty-one patients were available for late study; the mean time of follow-up was 11.3 years (7 to 16). Most of the patients showed severe involvement and underwent operative procedures on other joints of the same extremity; 56% of the patients depended on walking aids and 58% needed tendon repair at the time of the operation. At final assessment they found lasting relief of pain; almost none at rest, moderate pain with movement, but rather marked pain at work. There was slight loss of mobility (mean of 4°). Correction of the pre-existing palmar subluxation was obtained in 72% of all operated joints, and increasing stability over the years. According to a simple, functional assessment, they found a clear improvement of grip strength in contrast to the deteriorating general condition. Six further procedures had been required; one endoprosthetic replacement, one arthrodesis and three carpal tunnel decompressions.

Replacement arthroplasty of the knee at Guy's over a period of 16 years – D. Yanni and M. Laurence (London) reported a series of 432 cases of chronic arthritis of the knee, predominantly rheumatoid (69%). The technique of arthroplasty was described; resection of bone is reduced to a minimum and most of what is resected is re-implanted as sliver graphs into the medullary cavity of the porotic bones. Throughout this series of 432 cases, the prosthesis used was a modification of the original design by Attenborough, omitting the interconnecting peg and, from 1984, reducing the bulk of the intramedullary stem. The resulting 'L' type prosthesis had been used in 132 consecutive cases without cement.

No case of osteolytic loosening had occurred since these modifications were introduced, but microscopic loosening (up to 2 mm halo) with pain had required revision and cementation in six cases. Stiffness had been a problem in 6% of cases but a clear majority, 62%, achieved more than 90° of flexion. Eight-four per cent enjoyed relief of pain, correction of deformity, stability and a comfortable gait. The mean follow-up period was six years.

Arthrodesis of the ankle – J. H. Sheehan (Dublin) described a simple technique using screw fixation of the ankle and allowing early weight-bearing, so often necessary in rheumatoid patients whose upper limbs are unable to support them adequately. Thirteen such arthrodeses had been performed between February 1987 and July 1988.

Two oblique screws are passed from the anterior surface of the tibia through the talus and a posterior screw from behind the posterior malleolus. It had since been found that the anterior screws on their own may be adequate, and that if one wished to fix the subtal joint, then the screw could also be driven across it. Washers are frequently required with the large cancellous screws because the bone is very soft. Postoperatively, all patients are immobilised in a plaster splint for 12 weeks with partial, progressing to full, weight-bearing by 12 weeks.

In this small series, fusion occurred in all patients. Two patients subsequently required removal of metal, one because of wound breakdown and one because of prominence of a screw on the planter aspect under the os calcis. The advantage of the technique was simplicity combined with early weight-bearing.

Radiological assessment of the rheumatoid wrist after excision of the distal ulna – C. J. McCullough and A. N. Stirrat (Harrow) reported on 52 rheumatoid wrists which had been assessed at a mean of three years after distal ulnar excision.
79% had a satisfactory subjective result. The wrists were graded radiologically before operation and at final review, and the carpal height ratio was measured. At review the grade of 48% of the wrists had deteriorated: 13 had advanced to radioulnar dislocation (grade 3) and one to radiocarpal dislocation (grade 4). In grade 2 wrists, there was a greater incidence of erosion of the ulnar aspect of the radial articular surface in those which progressed to grades 3 and 4 postoperatively, suggesting an at-risk group within grade 2. The carpal height ratio was reduced in 80% of wrists operated on secondarily. In wrists in grades 2 and 3 who had destruction of the intercarpal joint, their carpal height ratio was less than 2 mm. All wrists in this group had deteriorated, and there was 72% destruction of the intercarpal joint.

Their study confirmed that poor clinical results were more commonly found in those wrists that had deteriorated radiologically in the postoperative period. Satisfactory clinical results were recorded in 79% of operated wrists, despite a deterioration in radiological grade evident in 48%. Excision of the distal ulna with synovectomy of the distal radioulnar joint and relocation of extensor carpi ulnaris remains an established procedure in the treatment of the rheumatoid wrist.

Monoclonal antibody therapy in rheumatoid arthritis: a clinical and immunological study – B. Kircham (London) reported that T cells played a central role in the immunopathology of rheumatoid arthritis (RA), and the therapeutic value of modifying their function was explored. An anti-T cell monoclonal antibody, RFT2 (CD7), was used in an open study of six RA patients with active disease, unresponsive to conventional treatment. The CD7 antigen is found on 70 to 80% of peripheral blood T lymphocytes and highly expressed in the rheumatoid synovial membrane.

RFT2 (6 mg) was given intravenously for 14 consecutive days. Two patients had improvements in disease activity assessed by the Ritchie index and visual analogue scales for pain, stiffness and well-being. ESR and CRP were unchanged and no serious side effects occurred. Analysis of peripheral blood lymphocyte subsets showed a 50% to 60% drop in the number of T cells within an hour of the first infusion, with fluctuating but often subnormal levels thereafter. The proportion of T cells binding RFT2 fell from 70% before infusion, to 5% at one hour and remained consistently low throughout treatment, indicating modulation of the CD7 receptor from the T cell surface. However, the decrease in numbers of T lymphocytes also indicated that some T lymphocytes with mouse immunoglobulin on their surface, were probably taken up by the fixed reticuloendothelial system (liver, spleen).

All patients developed an immune response to the 'foreign' mouse protein and antimouse Ig antibodies were detected by the tenth or eleventh day. Synovial biopsies taken before and during treatment in four patients indicated that CD7 modulation also occurred in the synovial membrane. This study demonstrates that mouse monoclonal antibodies can be given to patients who are not heavily immunosuppressed without serious side effects, and that RFT2 may have therapeutic potential.

Effects of design and technique on the clinical results of total knee replacement – P. Walker (Stanmore) reported that condylar knee replacement utilised a sequence of jigs and fixtures to provide accurate alignment and a close fit of the components to the bone. Variables of design and technique had an effect on the clinical outcome. Based on the literature, the percentage of cases revised for clinical loosening, at five to 10 years, varied between 2% and 30%. Hinges, both fixed and lax, show only slightly more loosening than the prostheses of condylar design, but the nature of the failure in the former was much more serious and they were more prone to infection.

In the normal knee under conditions of weight-bearing, the joint surfaces provide approximately half of the stability. The laxity characteristics, more lax about mid flexion and firmer at the extremes, are a function of the surface shapes and the soft tissues. For a knee replacement to reproduce these effects, the tibial surface must be dished in the sagittal plane. A flat tibial surface allows much more flexion, while a concave surface restricts flexion. However, a flat surface is undesirable on the basis of stability. Posterior tilting of the tibial component usefully increases flexion, while an anterior concave surface has the opposite effect. Technical variables had been investigated in a computer model and were presented in graphic and artistic fashion.

Preliminary observations on the CT scan appearances of painful planovalgus rheumatoid and non-rheumatoid feet – I. G. Winson, C. J. M. Getty et al (Sheffield) reported on a study which had been undertaken to demonstrate the range of pathology seen in the painful planovalgus foot and the alterations of foot pressure seen as a consequence. Fifty-one patients were presented, 17 suffering from rheumatoid arthritis with 31 affected feet and 34 patients suffering from degenerative arthritis with 38 affected feet. The patients were studied clinically, by plain radiography, CT scan and by pedobarography.

CT scanning demonstrated a wide range of pathology in both groups of patients. Of particular interest were the 29 feet where tibialis posterior lesions were suspected (17 in patients with rheumatoid arthritis and 12 in non-rheumatoid disease). In the non-rheumatoid group, 10 abnormal tendons were noted on the CT scan, with minor degrees of degenerative arthritis in the hind foot, but in three of these 10 there was severe tarsometatarsal arthritis. In the rheumatoid group, 13 abnormal tendons were noted and extensive erosive changes occurred in 10 of these feet.

Pedobarographic studies in 47 affected feet showed that the maximum load was on the first metatarsal heads and of these, 25 were abnormally high. A further 35 affected feet had maximum pressure under the second metatarsals and of these, 21 were abnormally high. The authors believe this establishes a link between hind foot valgus and the abnormal pressures seen on the medial side of the forefoot.

Some aspects of shoulder replacement for arthritis – F. H. Beddow (Liverpool) reported that prosthetic replacement of the shoulder had many technical problems and attention was drawn to two of these.

1. Glenoid erosion. Simple radiographic examination was an inadequate method of assessing glenoid erosion in very stiff, rheumatoid shoulders, but CT scanning had proved an invaluable method of determining the amount of glenoid available for component fixation. CT scans had been performed on 23 rheumatoid shoulders at various levels with a regular pattern of erosion, and on a smaller number of normal controls. In those with erosion, the average width of the glenoid articular surface was about one-third greater than normal, but less than half was supported by medullary bone; the remainder consisted of very thin unsupported osteophyte, mainly posteriorly.

2. Irreparable rotator cuff. An irreparable rotator cuff was found in 25% of the cases subjected to shoulder replacement. An unconstrained shoulder prosthesis had been preferred for the past 10 years, and in cases of irreparable rotator cuff, upward migration of the humeral component had been dealt with by the addition of a subacromial high density polyethylene buffer. Over a nine-year period, it had not
been necessary to revise any of the subacromial buffers for loosening, and pain relief had been excellent. However, it had not been possible to produce sufficient stability to allow the deltoid to elevate the arm beyond 90° against gravity.

**Total replacement of the shoulder joint at Guy's Hospital** – *D. Dempster and M. Laurence* (London) demonstrated patients whose shoulder joints had been replaced. The surgical technique was described with peroperative photographs and radiographs. Sixty-seven cases had been operated on using Laurence’s prosthesis to replace both the glenohumeral joint and the rotator cuff, over a period of 11 years. The average period of follow-up was 4.7 years, several having been lost to follow-up by the ravages of time in the elderly, and intercurrent disease. The three points of fixation for the scapular cup (the glenoid, coracoid and acromion) had failed mechanically in two cases, one with neuropathic disease and one following heavy trauma. The range of pure scapulohumeral movement was limited to a mean of 50% in each direction, but a few patients had an excellent range and all had relief of pain. It was clear that this prosthesis had a place when arthritic damage was compounded by loss of the rotator cuff.

The following papers also were presented:

**Arthroplasty or arthrodesis of the ankle** – *W. Souter* (Edinburgh).

**Synovectomy in advanced rheumatoid arthritis of the finger joints** – *R. Tubiana* (Paris).

ANNOUNCEMENTS

JOURNAL OF BONE AND JOINT SURGERY

GRANTS FOR ELECTIVE PERIODS OF STUDY

The following students have been awarded grants in respect of elective study of orthopaedic surgery: Mr Mark Hulyer of the University of Newcastle upon Tyne to the Hospital for Sick Children, Toronto, Canada; Mr Russell Curtis of the University of Newcastle upon Tyne to Auckland Hospital, New Zealand; Mr Christopher Lisle of the University of Sydney, Australia to Orthopaedisk Hospital, Arhus, Denmark; and Mr Naim-Ul-Haq Hasanie of the University of Manchester to Saint Francis Medical Centre, Peoria, Illinois, USA.

UNIVERSITY OF STRATHCLYDE

A series of courses for physicians, surgeons and therapists will be held from January to September 1990. The subjects will include: gait analysis (January 17 to 19); prosthetics and orthotics (January 22 to 26) and fracture bracing (September 3 to 7).

For further information please contact Professor J. Hughes, Director, National Centre for Training and Education in Prosthetics and Orthotics, University of Strathclyde, Curran Building, 131 St James’ Road, Glasgow G4 0LS.

NATIONAL OSTEOPOROSIS SOCIETY

The Society, together with the Royal National Hospital for Rheumatic Diseases, Bath, have organised their second conference to be held at the Guildhall, Bath, on June 25 to 27. The theme of the conference is: ‘Practical aspects of normal and osteoporotic bone’.

Those wishing further information and details should contact the National Osteoporosis Society, PO Box 10, Radstock, Bath BA3 3YB.

INTERNATIONAL

SYMPOSIUM OF SPORTS INJURIES

The sixth international Jerusalem symposium of sports injuries will be held in Jerusalem on January 8 and 9.

For further details and information please contact: Dr G. Mann, MD, Unit for Sports Medicine, Cosell Center for Physical Education, Hebrew University, Jerusalem 91904, Israel.

EGYPTIAN ORTHOPAEDIC ASSOCIATION

The spring meeting of the Association will be held in Hurghada by the Red Sea on March 13 to 17. The programme will include many social activities.

For further information and for those intending to submit papers (a prior short abstract of which is necessary), please contact: Dr S. El-Bayoumi, 94 Ahamed Orabi Street, Agouza, Cairo, Egypt.

CENTRE FOR IMPLANT SURGERY

The Centre, in conjunction with the Department of Orthopaedic Surgery of the Bnai-Zion Medical Centre (Rothschild) in Haifa, are arranging their 12th international annual symposium to be held on April 3 to 5, in Haifa, Israel. The subjects to be addressed are ‘Metabolic bone disease’ and ‘Bone tumours’.

For full details please contact David G. Mendes, MD, Director (or, Amir Juhn, MD), Centre for Implant Surgery, PO Box 4940, Haifa, Israel.

PELVIC/ACETABULAR FRACTURE MANAGEMENT

The fourth annual Toronto pelvic and acetabular fracture management course, a ‘hands-on’ course, will be held at the University of Toronto, Ontario, Canada, on April 4 to 10.

For further information and details please contact: Dr Marvin Tile, Room A333, 2075 Bayview Avenue, Toronto, Ontario, Canada M4N 3M5.

ROYAL AUSTRALASIAN COLLEGE OF SURGEONS

An instructional course on ‘Disorders of the foot and ankle’ is to be held in Wellington, New Zealand, on May 14 and 15, in the same week as the scientific meeting of the Royal Australasian College of Surgeons.

For further information please contact: Mr B. L. Krause, Boulcott Clinic, 666 High Street, Lower Hutt, New Zealand.

SEMINAR ON FRACTURES IN CHILDREN

The first Swedish International Seminar on Fractures in Children will be held in Stockholm, Sweden, from May 30 to June 1.

For full details and further information please contact the seminar co-ordinator, Elisabeth Astrand at the Institute of Medical Postgraduate Education, PO Box 656, S-751 27, Uppsala, Sweden.

STUDY OF THE LUMBAR SPINE

The International Society for the Study of the Lumbar Spine have arranged their 17th annual meeting for June 13 to 17, in Boston, Massachusetts, USA.

For further information and submission of abstracts, please contact Dr Sam Wiesel at Sunnybrook Medical Centre, Room A3009, 2075 Bayview Avenue, Toronto, Ontario, Canada M4N 3M5.
UNIVERSITY OF ZURICH

The seventh course of percutaneous spine surgery with discoscopy will be held on June 21 and 22, at the Department for Orthopaedic Surgery Balgrist, Medical School, University of Zurich, Switzerland.

The symposium and workshop (with limited places) will feature percutaneous intervertebral surgery (nucleotomy/spondylodesis) with discoscopic control. For further information please contact: Dr A. Schreiber, MD, Professor and chairman, Orthopädische Universitätsklinik Balgrist Forchstrasse 340, CH-8008 Zurich, Switzerland.

NATIONAL UNIVERSITY HOSPITAL, SINGAPORE

A postgraduate course in orthopaedics will be held from July 16 to 20 at the Department of Orthopaedic Surgery of the National University Hospital, Singapore.

The course is sponsored by the School of Postgraduate Medical Studies of the National University. For further details please contact: Education Secretary, Department of Orthopaedic Surgery, National University Hospital, Lower Kent Ridge Road, Singapore 0511, Republic of Singapore.

GORDON RESEARCH CONFERENCE

The 1990 Gordon Research Conference on Bioengineering and Orthopaedic Science will be held at the Proctor Academy, Andover, New Hampshire, USA, on August 6 to 10. The emphasis will be on the theme of structure, remodelling and repair of connective tissues and cellular control and molecular mechanics.

For full details and information please contact: Alan J. Grodzinsky, Massachusetts Institute of Technology, 38-377, Cambridge, Massachusetts, USA 02139.

INTERFACES 90

A sponsored conference will be held at the Codivilla-Putti Research Centre of the Istituto Ortopedico Rizzoli in Bologna on September 9 to 14. The main topics listed for discussion are in biomechanics, biomaterials, implant surgery and related sciences.

For registration and full details please contact: K. R. Williams, Department of Basic Dental Science, University of Wales College of Medicine, Heath Park, Cardiff CF4 4XW, Wales.
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One unicompartmental knee stands alone

When it comes to deciding which unicompartmental knee to use, one unicompartmental knee stands out from the rest - The Robert Brigham Uni-Condylar Knee. Since the introduction of its original design in 1974, clinical evidence has accumulated to demonstrate its success.

- "Recovery and rehabilitation following operation is less prolonged and less complicated than with tibial osteotomy."1
- At three to five year follow-up of 50 cases, it was found that no revisions had been required.2
- At an average review of five and a half years, "...92 per cent of the knees...had a good or excellent result."3
- The Uni-Condylar Knee "...is an attractive alternative for the treatment of unicompartmental osteoarthritis."3
- Patients can achieve an average flexion of 120°.4

This success is based on the design of its components and instrumentation. In addition to being designed to allow considerable range of motion the prosthesis has a tab in the femoral component for enhanced rotational stability and a titanium alloy tibial tray to provide optimal support for the UHMWPE component. The straightforward, easy-to-use instrumentation is designed to give accurate, reproducible bone cuts. Used with suitable patient selection, it is an excellent first choice which will also retain your freedom of action for the future.

As an alternative to tibial osteotomy, in the elderly, unicompartmental knee arthroplasty offers much faster post-surgical rehabilitation without the complications of non-unions.

As an alternative to other unicompartmental knees, The Robert Brigham Uni-Condylar Knee stands alone.

References
2. Clinical data - Brigham and Women's Hospital, Boston, MA

Further information may be obtained from the Customer Services Department at

Johnston Johnson
ORTHOPAEDICS LIMITED

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