TOTAL KNEE REPLACEMENT

S H PALMER, M CROSS.

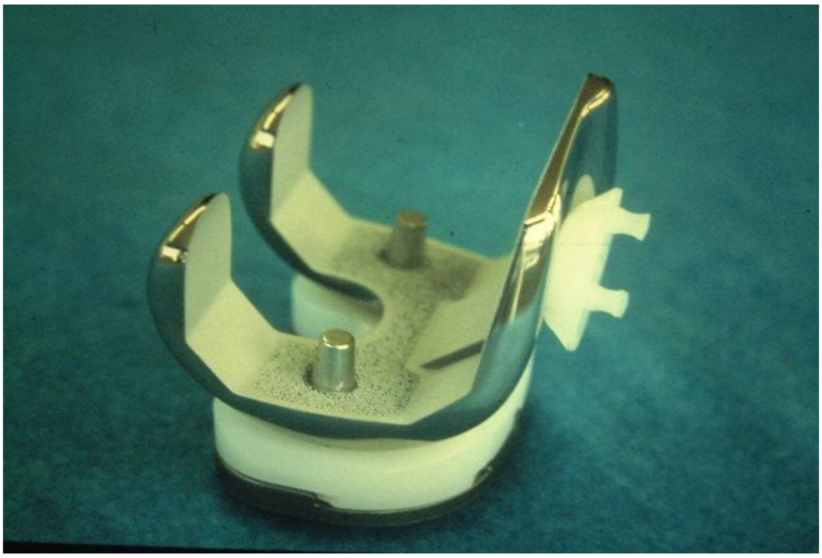

Figure1: Total Knee Replacement before implantation

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Introduction> Total knee replacement in some form has been around for over 50 years. The complexities of the knee joint only began to be understood 30 years ago and because of this total knee replacement was initially not as successful as Sir John Charnley's artificial hip. However over the last twenty years there have been dramatic advancements in knowledge of knee mechanics that have led to modifications of design which appear to be durable. As with most techniques in modern medicine the envelope is constantly expanding so that more and more patients are receiving the benefits of total knee arthroplasty.

History> In the 1860's Fergusson reported performing a resection arthroplasty of the knee for arthritis and Verneuil is thought to have performed the first interposition arthroplasty using joint capsule. Other substances were subsequently tried including skin, muscle, fascia, fat, and even pig bladder!

The first artificial implants were tried in the 1940s as molds fitted to the femoral condyles following similar designs in the hip. In the next decade tibial replacement also was attempted but both designs had problems with loosening and persistent pain. Combined femoral and tibial articular surface replacements appeared in the 1950s as simple hinges. These implants Failed to account for the complexities of knee motion and consequently had high failure rates.

In 1971 Gunston importantly recognized that the knee does not rotate on a single axis like a hinge but rather the femoral condyles roll and glide on the tibia with multiple instant centres of rotation. His poycentric knee replacement had early success with its improved kinematics over hinged implants but failed because of inadequate fixation of the prosthesis to bone.

The highly conforming and constrained Geomedic knee arthroplasty introduced in 1973 at the Mayo Clinic ignored Gunston’s work and a “kinematic conflict” arose. Other designs followed, either following Gunston’s principle in attempting to reproduce normal knee kinematics or allowing a conforming articulation to govern knee motion.

The Total Condylar prosthesis was designed by Insall at the Hospital for Special Surgery in 1973. This prosthesis concentrated on mechanics and did not try and reproduce normal knee motion. Ranawat et al. reported a survivorship of 94% at 15-year follow-up which is the most impressive reported to date (1). The component was subsequently altered to artificially introduce normal kinematics to improve range of motion of the component. At the same time a prosthesis with more natural kinematics was developed at the Hospital for Special Surgery relying on the retained cruciates to provide knee motion.

The argument as to whether knee ligaments should be preserved or sacrificed goes on to this day. Long term follow up studies do not show any significant differences although gait appears to more normal if ligaments are preserved, especially when walking up and down stairs. One theoretical way of incorporating normal kinematics and maximal conformity is with mobile tibial bearings. Current mid-term follow up studies of these prostheses have so far shown encouraging results.

Definition of problem> Patients with painful, deformed and unstable knees secondary to degenerative or inflammatory conditions need a prosthesis that will provide reproducible relief of pain and improvement in function. The morbidity and complications from the procedure should be minimal. The complexities of a normal knee joint however are not reproducible with modern techniques and the patient should understand that they will not have a “normal knee”. The prosthesis should be durable requiring the patient to undergo one definitive procedure in their lifetime although in the younger patient this may simply be unrealistic.

Frequency> Approximately 130,000 knee replacements are performed every year in the United States of America.

Etiology> Osteoarthritic destruction of the knee is the commonest reason for total knee replacement. This is a disease of synovial joints characterized by degenerative and reparative processes and is seen in 40 percent of 40-year-old's on radiographic examination. However only 50 percent of these will be symptomatic. Osteoarthritis may be primary or secondary. Mechanical derangement such as previous meniscal or cruciate ligament damage, pyogenic infection, ligamentous instability, and fracture into a joint are among the common causes of the secondary type. Other causes of cartilage destruction include rheumatoid arthritis, haemophilia, the seronegative arthritides, crystal deposition diseases, pigmented villonodular synovitis, avascular necrosis and the rare bone dysplasias.

Figure 2: X-ray demonstrating post-traumatic osteoarthritis

Recent studies into risk factors for severe osteoarthritis of the hip and knee have revealed that siblings of individuals undergoing joint replacement are between 3 and 5 times likely to require similar surgery as an age matched control (2). This means that genes contribute around 30% of the overall risk for severe OA. Laboratory based studies have shown that chromosome 11 is linked to severe OA of the hip and chromosome 2 to severe OA of the knee. The precise genes involved are as yet unknown.

Pathophysiology> The exact cause of the degenerative process in primary osteoarthritis is unknown. It may represent a defect in cellular (chondrocyte) repair processes. Osteoarthritic cartilage contains increased amounts of water, alterations in the type of proteoglycan, type 2 collagen abnormalities and increased levels of the cathepsins, metalloproteinases, interleukin 1 and others as a complex cascade of enzymatic process. Changes in the synovium include synoviocyte hyperplasia, an increased leukocyte population in the membrane and fluid, occasional giant cells, neovascularisation with increased vessel permeability and altered matrix and cellular cytokine formation.

Clinical Presentation>> The clinical history in a patient with arthritis of the knee is dominated by pain. This predominantly occurs on weight-bearing but in the end stages may be constant and unrelieved by rest. Night pain is a particularly disabling symptom that demands urgent attention. The pain may be localised to one compartment or maybe diffuse. Other symptoms include stiffness, swelling, locking and giving way. It is useful to try and quantify the level of pain on a simple scale (e.g mild, moderate, severe or a numerical scale of 1 to 10) and to assess how the patient's activities of daily living (ADL) are affected. The patient should be asked questions on maximum walking distance, recreational sporting ability and aspirations, stair climbing (which often gives clues about patellofemoral disease), the need for walking aids, the ability to dress and perform self-care and the ability to perform activities that require knee flexion. Some patients may have considerable interference with social interaction, sexual function and sleep deprivation and may experience exhaustion and even depression from their disease.

Various structured outcomes evaluation can be used to try and quantify disability from dysfunction of the knee and are useful as research tools in follow-up studies of total knee replacement. These include general health status measures such as the Medical Outcomes Short Form 36 (SF 36) or specific knee scoring systems such as that used by the Knee Society (3, 4).

The mortality from a total knee replacement is overall less than than 1% but this figure increases with age, male gender and the number of pre-existing medical conditions. Identification and optimisation of such conditions prior to surgery is important to reduce peri-operative complications.

An assessment of the patient's social circumstances is important for organisation of post-operative rehabilitation and placement.

Examination should include assessment of scars or soft tissue defects around the knee. Plastic surgical consultation should be obtained if wound healing is predicted to be a problem. Similarly an accurate assessment of vascular status to the limb should be performed. Chronic local or systemic infection should be identified and treated.

Deficiency of the quadriceps musculature and extensor mechanism should be identified and treated by rehabilitation as this may improve mechanical pain and facilitate post-operative recovery. Range of motion, including fixed flexion deformity, should be measured with a goniometer and recorded. The best predictor of range of motion after total knee replacement is the pre-operative range of motion. This is an important factor when obtaining consent from the patient for surgery.

Figure 3: Patient demonstrating varus deformity of right knee and a valgus deformity of left knee

Integrity of the ligaments should be established as deficiency may require use of a special prosthesis with intrinsic stability.

Other sources of knee and leg pain must be sought and systematically excluded. These include root pain from spinal disease, referred pain from the ipsilateral hip, peripheral vascular disease, meniscal pathology, and bursitis of the knee.

Roentgenographic findings must correlate with a clear clinical impression of knee arthritis

Knee roentgenograms should include a standing anteroposterior view, a lateral view, and a skyline view of the patella. Loss of joint space, cysts, subchondral sclerosis and osteophytes confirm the diagnosis of osteoarthritis.

Figure 4: X-ray of the same patient demonstrating the features of osteoarthritis

Indications >>The primary indication for total knee arthroplasty is to relieve pain caused by severe arthritis. The pain should be significant and disabling. Night pain is particularly distressing and significant. If dysfunction of the knee is causing significant reduction in the patient's quality of life then this should be taken into account. Correction of significant deformity is an important indication but is rarely used as the primary indication for surgery. Roentgenographic findings must correlate with a clear clinical impression of knee arthritis. Patients who do not have significant loss of joint space tend to be less satisfied with their clinical result after total knee arthroplasty. Before surgery is considered all conservative treatment measures should have been exhausted.

Knee replacement has a finite expected survival that is adversely effected by activity level. It generally is indicated in older patients with more modest activities . It is also is clearly indicated in younger patients who have limited function because of systemic arthritis with multiple joint involvement. Young patients requesting knee replacement, especially those with post-traumatic arthritis, are not excluded by age but must be significantly disabled and must understand the inherent longevity of joint replacement. Rarely, severe patello-femoral arthritis may justify arthroplasty because the expected outcome of arthroplasty is superior to patellectomy. Isolated patellofemoral replacement is still undergoing clinical investigation.

Figure 5: Lateral x-ray demonstrating severe patello-femoral osteoarthritis

Deformity can sometimes become the principal indication for knee replacement in patients with moderate arthritis when flexion contracture or varus or valgus laxity is significant. In such cases often a more constrained prosthesis is required leading to greater technical difficulty at operation more uncertain long-term survival.

Contraindications >>Absolute contraindications to total knee replacement include, knee sepsis including previous osteomyelitis, a remote source of ongoing infection, extensor mechanism dysfunction, severe vascular disease, recurvatum deformity secondary to muscular weakness, and the presence of a well functioning knee arthrodesis. Relative contraindications include medical conditions that preclude safe anesthesia,the demands of surgery and rehabilitation. Other relative contraindications include skin conditions within the field of surgery e.g psoriasis, a neuropathic joint and obesity.

Relevant Anatomy.>> Movement of the knee joint can be classified as having six degrees of freedom—three translations: anterior/posterior, medial/lateral, and inferior/superior and three rotations: flexion/extension, internal/external, and abduction/adduction. The movements of the knee joint are determined by the shape of the articulating surfaces of the tibia and femur and the orientation of the four major ligaments of the knee joint: the anterior and posterior cruciate ligaments and the medial and lateral collateral ligaments as a four bar linkage system.

Figure 6: Saggital MRI scan showing the anterior and posterior cruciate ligaments

Knee flexion/extension involves a combination of rolling and sliding called “femoral roll back” which is an ingenious way of allowing increased ranges of flexion. Because of asymmetry between the lateral and medial femoral condyles the lateral condyle it rolls a greater distance than the medial condyle during 20 degrees of knee flexion. This causes coupled external rotation of the tibia which has been described as the screw-home mechanism of the knee which locks the knee into extension.

The primary function of the medial collateral ligament is to restrain valgus rotation of the knee joint with its secondary function being control of external rotation. The lateral collateral ligament restrains against varus rotation as well as resisting internal rotation.

The primary function of the anterior cruciate ligament (ACL) is to resist anterior displacement of the tibia on the femur when the knee is flexed and control the screw home mechanism of the tibia in terminal extension of the knee. A secondary function of the ACL is to resist varus or valgus rotation of the tibia, especially in the absence of the collateral ligaments. The ACL also resists internal rotation of the tibia.

The main function of the posterior cruciate ligament (PCL) is to allow femoral rollback in flexion and resist posterior translation of the tibia relative to the femur. The PCL also controls external rotation of the tibia with increasing knee flexion. Retention of the PCL in total knee replacement has been shown biomechanically to provide normal kinematic rollback of the femur on the tibia. This is also important for improving the lever arm of the quadriceps mechanism with flexion of the knee.

The movement of the patellofemoral joint can be characterized as gliding and sliding. During flexion of the knee the patella moves distally on the femur. This movement is governed by its attachments to the quadriceps tendon, ligamentum patellae and the anterior aspects of the femoral condyles. The muscles and ligaments of the patellofemoral joint are responsible for producing extension of the knee. The patella acts as a pulley in transmitting the force developed by the quadriceps muscles to the femur and the patellar ligament. It also increases the mechanical advantage of the quadriceps muscle relative to the instant center of rotation of the knee.

The mechanical axis of the lower limb is an imaginary line through which the weight of the body passes. It runs from the centre of the hip to the centre of the ankle through the middle of the knee. This is altered in the presence of deformity and must be reconstituted at surgery This allows normalisation of gait and protects the prosthesis from eccentric loading and early failure.

Work up >>
A thorough preoperative medical evaluation of patients undergoing total knee arthroplasty is important to prevent potential complications in the perioperative period. This should be completed in an elective preadmission clinic well before the date for surgery. This allows a careful and unhurried assessment to be performed with adequate time for investigations, specialist anaesthetic and medical opinion and consent. This also allows operating schedules to be reorganised if patients are deferred from surgery.

Most patients who have total knee arthroplasty are elderly with comorbid diseases. Patients must have good cardiopulmonary function to withstand anesthesia and to withstand a blood loss of 1000 to 1500 ml over the perioperative period. A routine preoperative electrocardiogram should be performed in the elderly patient and those patients with ischaemic heart disease, congestive heart failure and chronic obstructive airways disease should be seen by a medical specialist or anaesthetist. Patients with significant peripheral vascular disease should be seen by a vascular surgeon.

A. Lab Studies> Routine preoperative laboratory evaluation should include a full blood count and white cell differential, urea, electrolytes, creatinine and urinalysis to exclude occult urinary tract infection. The routine use of a chest roentgenogram is not usually recommended as a screening tool. However it is indicated in patients with cardiopulmonary disease or in patients with clinical signs identified in the preadmission clinic. Similarly, routine preoperative evaluation of coagulation studies is not necessary except in patients with a history of bleeding or previous liver disease.

B. Imaging Studies> Radiographic views for the assessment of the patient with knee arthritis include the standing anteroposterior (AP) view, the lateral radiograph and the patellofemoral (skyline) view. Long leg films to assess malalignment are helpful for preoperative plannning. Standing AP radiographs with the knee in extension or 45 degrees of flexion can improve the sensitivity of detection of cartilage degeneration.

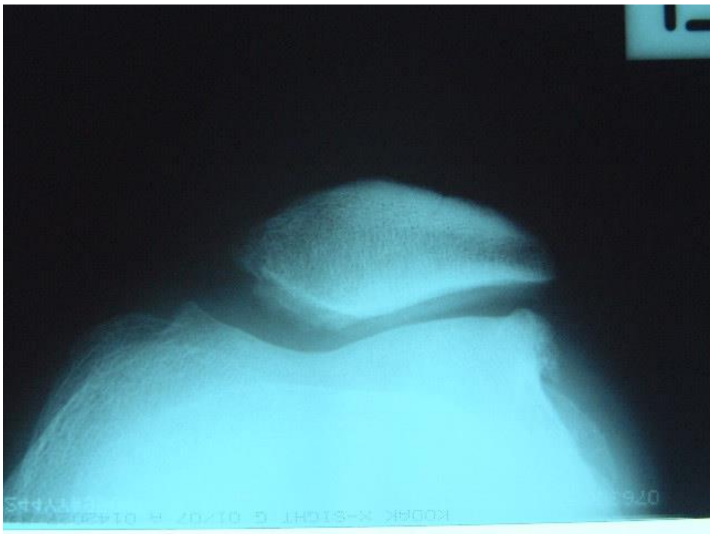

Figure 7: “skyline” view of the patello-femoral joint demonstrating lateral and medial osteophytes and lateral subluxation of the patella

C. Other Tests> More sophisticated imaging modalities in the investigation of knee arthritis are of occasional benefit and include indium white blood cell scanning, computed tomography scanning and magnetic resonance imaging scanning for the assessment of significant bone loss or bone infection.

Procedures> There are a number of operative procedures that should be considered in patients with degenerative disease of the knee. Arthroscopic debridement is sometimes indicated in mild degenerative joint disease with mechanical symptoms and recurrent persistent effusions. Proximal tibial valgus osteotomy should be reserved for patients with medial tibiofemoral compartment disease, stable collateral ligaments, and a correctable varus deformity of the knee joint.

Figure 8: X-ray demonstrating a proximal tibial valgus osteotomy created to off-load the medial compartment of the knee.

Similarly a distal femoral varus osteotomy can be considered for patients with lateral tibiofemoral compartment disease, stable collateral ligaments, and a valgus deformity of the knee joint.

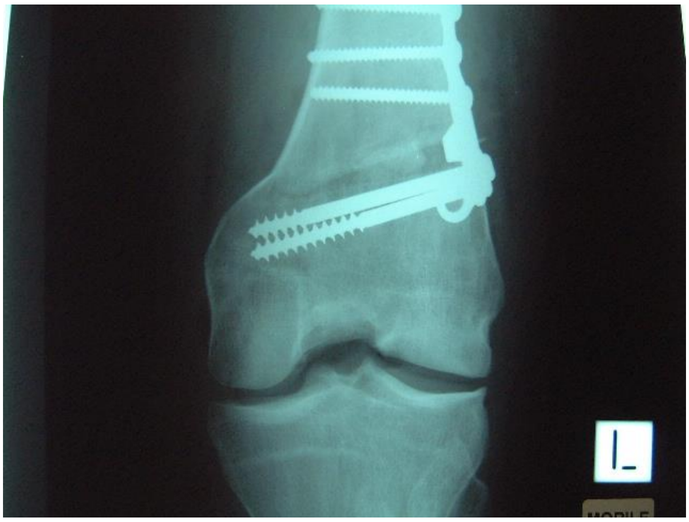

Figure 8: X-ray demonstrating a distal femoral varus osteotomy.

These procedures restore the mechanical axis of the lower limb and off-load the diseased compartment. They are generally reserved for young, high-demand patients because of concerns with the durability of total knee replacement in this patient group. Unicompartmental knee replacement or hemiarthroplasty can be used in low-demand younger patients with unicompartmental disease or in elderly, nonobese patients with unicompartmental disease of the knee joint.

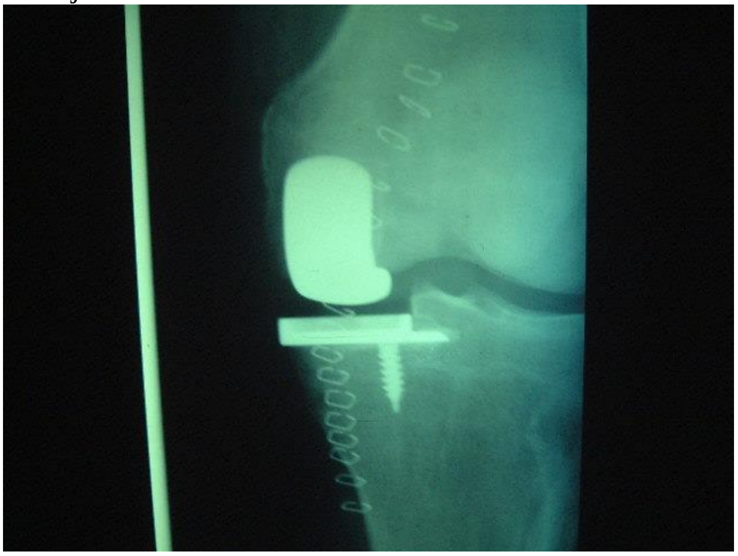

Figure 9: X-ray demonstrating a medial unicompartmental replacement. Note relative preservation of lateral joint compartment.

Arthrodesis or fusion of the knee is rarely performed but should be considered in patients with chronic sepsis, younger patients with tricompartmental disease (e.g following trauma) who require stability and durability and in patients with a deficient extensor mechanism. Total knee arthroplasty is performed in patients with symptomatic advanced degenerative changes in one or more compartments of the knee joint.

Histology>> Macroscopic examination shows a spectrum of changes in the articular cartilage from softening and fibrillation through to complete cartilage destruction, subchondral bone thickening, cysts and osteophytes. Microscopic examination shows chondrocyte proliferation into embryonic and dedifferentiated forms in the deeper zones, fibrocartilage formation with capillary infiltration, loss of proteoglycan ground substance with altered staining characteristics, chondrocalcinosis and synovial hyperplasia

Treatment.

Medical therapy> Initial management of most patients with osteoarthritis should be non-operative and may include non-steroidal anti-inflammatory medications, analgesics, bracing, orthoses, shoe modifications, weight loss and ambulatory aids such as a walking stick (held in the opposite hand). Activity modification also may be necessary. Home health care-assistive devices for daily living (e.g. toilet extenders, safety rails, bath seats) may help the patient cope with their disability and should be prescribed after consultation with an occupational therapist. Knee rehabilitation under the supervision of a physiotherapist should include strengthening and range-of-motion exercises, gait training and patient education.

Joint aspiration and intra-articular steroid injection may be used to improve synovitis. Osteoarthritis in the knee usually progresses slowly thus affording opportunities for non-operative treatment. Responses to non-operative treatment, however, are varied and unpredictable because none of the treatment is specific for the disease. Because of the progressive nature of the disease, many patients with osteoarthritis of the knee eventually require operative treatment

Surgical therapy> The aim of total knee replacement is to resurface the deficient and damaged tibiofemoral joint surfaces with metal components and provide a low-friction articulation with a polyethylene bearing. If significant patellofemoral disease is present then this joint can also be resurfaced although the need for this is rather variable. The mechanical alignment and soft tissue balance around the knee should be anatomically restored for optimum function and longevity of the knee replacement.

Preoperative details> The patient should have completed an informed consent for surgery and fully understand the risks and possible complications of the procedure. They should have had all medical conditions optimised before surgery and be free of intercurrent infections. Two units of blood should be available for perioperative transfusion either from the blood bank or preferably as pre-donated blood. Full medical and surgical back-up must be available in case unforseen complications occur.

The selection of regional or general anesthesia is decided following discussion preoperatively between the anaesthetist and the patient with some input from the surgical team. This decision is affected partly by the medical condition of the patient although cardiovascular outcomes, cognitive function and mortality rates of regional and general anesthesia have not been proved to be significantly different. Patients who have epidural anesthesia have been shown develop fewer perioperative deep vein thromboses. Whether this has any overall positive benefit to the patient is not known. Another benefit of epidural anesthesia is the presence of an indwelling catheter for 48 to 72 hours postoperatively for pain control thus avoiding the need for excessive amounts of centrally acting analgesics. Side effects of continuous postoperative epidural analgesia include pruritis, urinary retention, nausea, vomiting, and rarely the formation of an epidural hematoma.

Antibiotics and anti-thrombotic prophylaxis are given approximately 30 minutes before the incision is made and mechanical anti-thromboembolic devices (e.g stockings, foot pumps) are used intra-operatively. The patient is set up on the operating table in a supine position after preoperative cleaning of the leg.

Figure 10: A patient on the operating table before sugery.

A thigh tourniquet is generally used to aid surgical exposure although should be avoided in patients with a history of previous deep vein thrombosis or significant vascular disease. The operation should be performed in a laminar flow operating theatre with meticulous attention to detail to prevent contamination of the operation site.

Intraoperative details> The knee joint is usually approached anteriorly through a medial parapatellar approach although a lateral or subvastus approach is used by some surgeons. Osteophytes and intra-articular soft-tissues are then cleared. Bone cuts in the distal femur are made perpendicular to the mechanical axis usually using an intramedullary alignment system which is then checked against the centre of the hip. The proximal tibia is cut perpendicular to the mechanical axis of the tibia using either intra or extramedullary alignment rods. Restoration of mechanical alignment is important to allow optimum load sharing and prevent eccentric loading though the prosthesis. Sufficient bone is removed so that the prosthesis will recreate the level of the joint line. This allows the ligaments around the knee to be balanced accurately and prevents alteration in patella height which can have a deleterious effect on patellofemoral mechanics. Because of preoperative deformity some ligaments around the knee will have become contracted These are carefully released in a step-wise fashion to balance the soft-tissues around the knee and allow optimum knee kinematics.

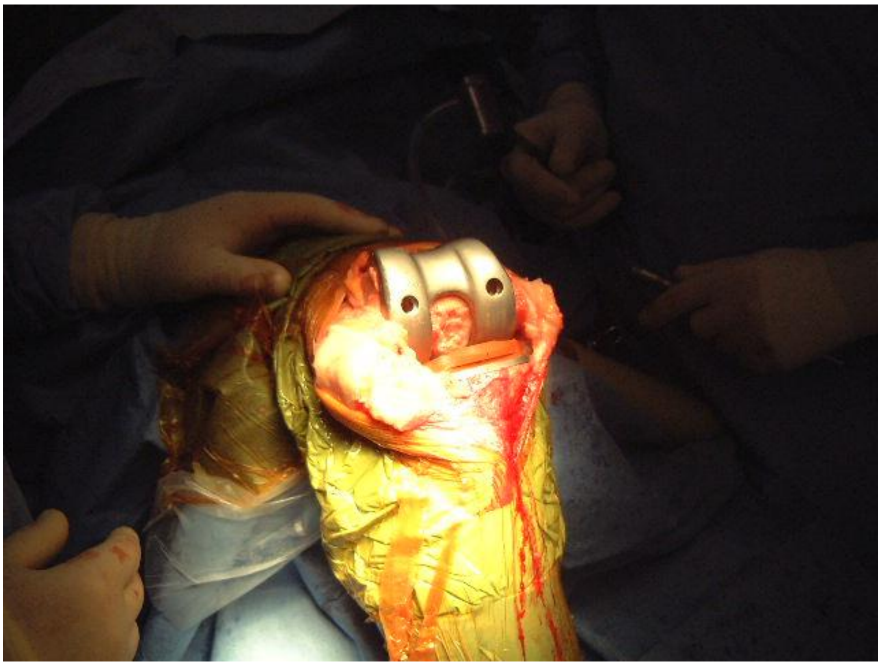

Figure 11: An intraoperative photograph showing the trial components with the patella everted.

Patello-femoral tracking is assessed with trial components in situ and balanced if necessary with a lateral release or medial reefing procedure. If the patellofemoral joint is significantly diseased then this can be resurfaced with a polyethylene button. It is essential that the original width of the patella is recreated.

Once the definitive components have been selected they are cemented into place with poly-methylmethacrylate cement. If an uncemented system is being used, press-fit and bony ingrowth provides the short and long term fixation of the component. The tourniquet should be deflated prior to closure to allow accurate haemostasis and the knee joint is usually drained and dressed in extension. The foot pulses are checked at the end of the procedure.

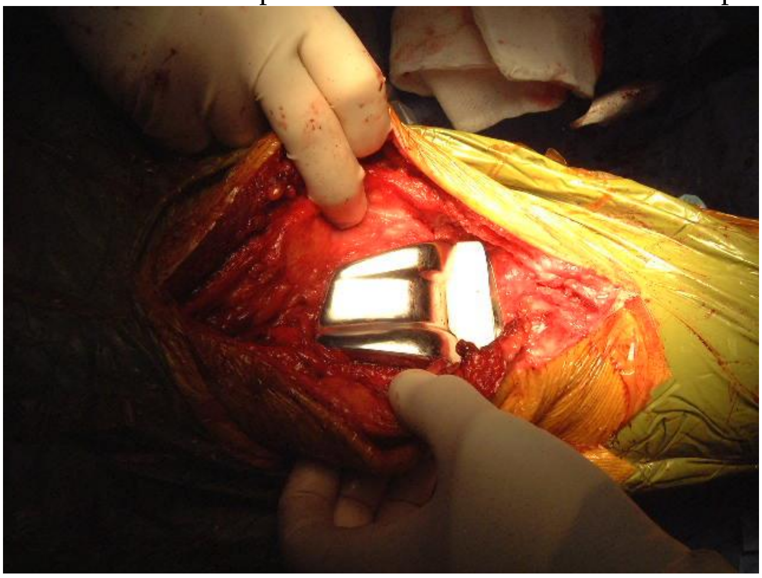

Figure 11: The definitive components in situ.

Postoperative details> The patient is recovered and usually observed for a 24 hour period in a high dependancy ward. Adequate hydration and analgesia are essential in this time of high physical stress. Analgesia is provided by continuation of the intra-operative epidural, patient controlled intravenous analgesia or oral analgesia. The patient begins knee movement and exercises at this early stage which are continued back on the ward until discharge. The drains are usually removed within 24 hours and the patient is encouraged to walk on the second post-operative day. Continual improvement is usually seen and discharge occurs between seven and 14 days. This is only recommended once wound healing is satisfactory, knee flexion of 90 degrees has been achieved, the patient is considered to be safe and supported in their home environment and there are no complications. Thromboprophylaxis is often continued at home for a period of time. The first outpatient review is usually between six weeks and three months.

Figure 11: Satisfactory knee flexion 6 weeks postoperatively.

Follow up>>Follow up depends on the surgeon, the patient and the health-care system. A typical example would be a surgical follow-up appointment at six weeks, three months, six months, one year, two years, five years, 10 years and thereafter as appropriate. This is modified for each patient according to their age, degree of activity and the presence of complications.

Complications>>

THROMBOEMBOLISM

This includes deep vein thrombosis (DVT), with subsequent life-threatening pulmonary embolism (PE). Predisposing factors for an increased risk of DVT include age over 40 years, female sex, obesity, varicose veins, smoking, past history of DVT, diabetes mellitus, and coronary artery disease. The overall incidence of DVT after total knee replacement without any prophylaxis has been reported to range from 40% to 88%. Most of these are calf thromboses. The risk of fatal PE however is the important figure and varies between 0.1% and 1%. Many current methods of DVT prophylaxis are available and are used, including mechanical compression stockings or foot pumps and pharmaceutical agents including low-dose warfarin, low-molecular-weight heparin, and aspirin. Many studies show evidence of reduction of rates of DVT but how this affects overall death rates from PE is unclear at this time, with many of the current studies concluding after only 10 days. It is probably prudent to use a multifactorial approach to prevention of DVT to include intraoperative foot pumps, an epidural, a pharmaceutical agent, antithromboembolic stockings, adequate hydration, early mobilisation of the patient and regular postoperative surveillance.

INFECTION

Prevention of infection in total knee replacement begins in the preoperative examination of the patient in order to exclude intercurrent infection. In the operating room, personnel should be kept to the smallest number and traffic in and out of the room should be kept to a minimum. The use of vertical laminar flow in operating theatres, the use of prophylactic antibiotics, ultraviolet light, body exhaust systems to prevent bacterial shedding and meticulous and expeditious surgery all help to reduce infection to less than 1% of operations.

Factors relating to a higher rate of infection after TKA include rheumatoid arthritis, skin breakdown, prolonged wound drainage (more than 6 days), previous knee surgery, use of a hinged knee prosthesis, obesity, concomitant urinary tract infection, steroid use, renal failure, diabetes mellitus, malignant disease, and psoriasis.

Treatment of the infected total knee replacement is often laborious and time consuming and a disaster for the patient. The risk is minimised by a theatre team obsessed with detail on a day-to -day basis backed up by good nursing skills on the ward and vigilance by the surgeon in the post-operative period.

PATELLOFEMORAL COMPLICATIONS

Patellofemoral complications include patellofemoral instability, patellar fracture, patellar component failure, patellar clunk syndrome, and extensor mechanism tendon rupture. All have been cited as the common reasons for re-operation. These can be avoided by attention to detail, meticulous technique and the avoidance of component malposition.

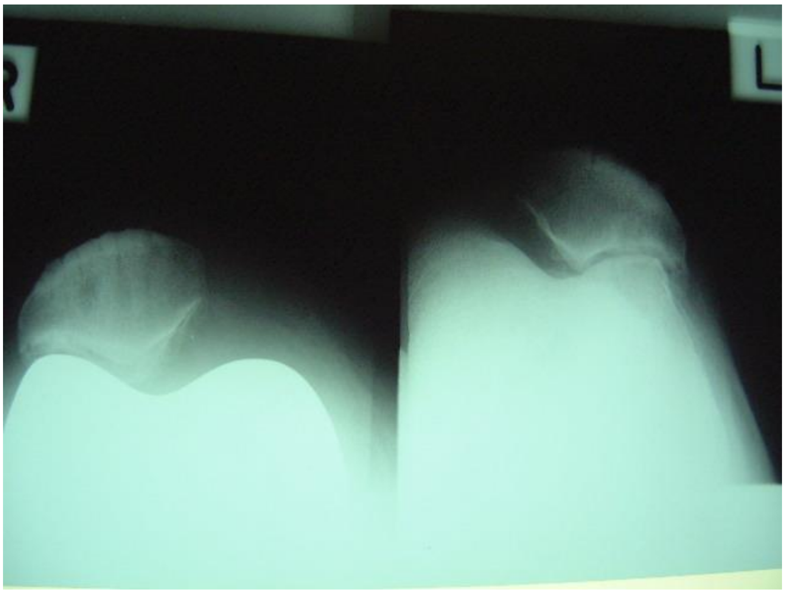

Figure 12: Skyline views of both knees showing lateral patella tilt and subluxation in both knees. This patient required a patello-femoral resurfacing procedure and realignment because of persistent anterior knee pain in the post-operative period.

NEUROVASCULAR COMPLICATIONS

Arterial thrombosis after total knee replacement is a rare (0.03-0.17%) but devastating complication, frequently resulting in amputation. Several authors have recommended performing TKA without the use of a tourniquet in patients with significant vascular disease. Such patients should undergo a vascular surgery consultation prior to their knee replacement.

Peroneal nerve palsy is the commonly reported nerve palsy after total knee replacement. It usually occurs in the correction of combined fixed valgus and flexion deformities, as are often seen in patients with rheumatoid arthritis. 50% undergo spontaneous recovery and 50% undergo partial recovery with conservative treatment. Some good results have been obtained with surgical decompression

PERIPROSTHETIC FRACTURES

Supracondylar fractures of the femur are not common after total knee replacement (0.2% to 1%) They are seen if the anterior femoral cortex is notched and weakened during surgery and in patients with osteoporosis, rheumatoid arthritis, poor flexion, revision arthroplasty, and in neurological disorders. Treatment is with internal fixation or revision total knee arthroplasty. Tibial fractures are uncommon .

Outcome and Prognosis>> Most patients seem satisfied with their knee replacements and if relief of pain is the main indication for surgery then this should indeed be the case. Satisfactory knee function is usually restored after total knee replacement and the majority is able to return to low impact sporting activity (7). Long term studies confirm satisfactory functional scores and show 91% to 96% prosthesis survival at 14- to 15-year follow-up (1,5,6). There does not appear to be any difference between PCL-retaining and PCL-substituting designs. Cementless designs do not have the same length of follow up but studies showing 10-12 years report 95% prosthesis survival (8).

Future and Controversies>>Cemented total knee replacements will remain the gold standard for total knee replacement but the use of uncemented designs with bioactive surfaces such as hydroxyapatite are showing promising midterm results.

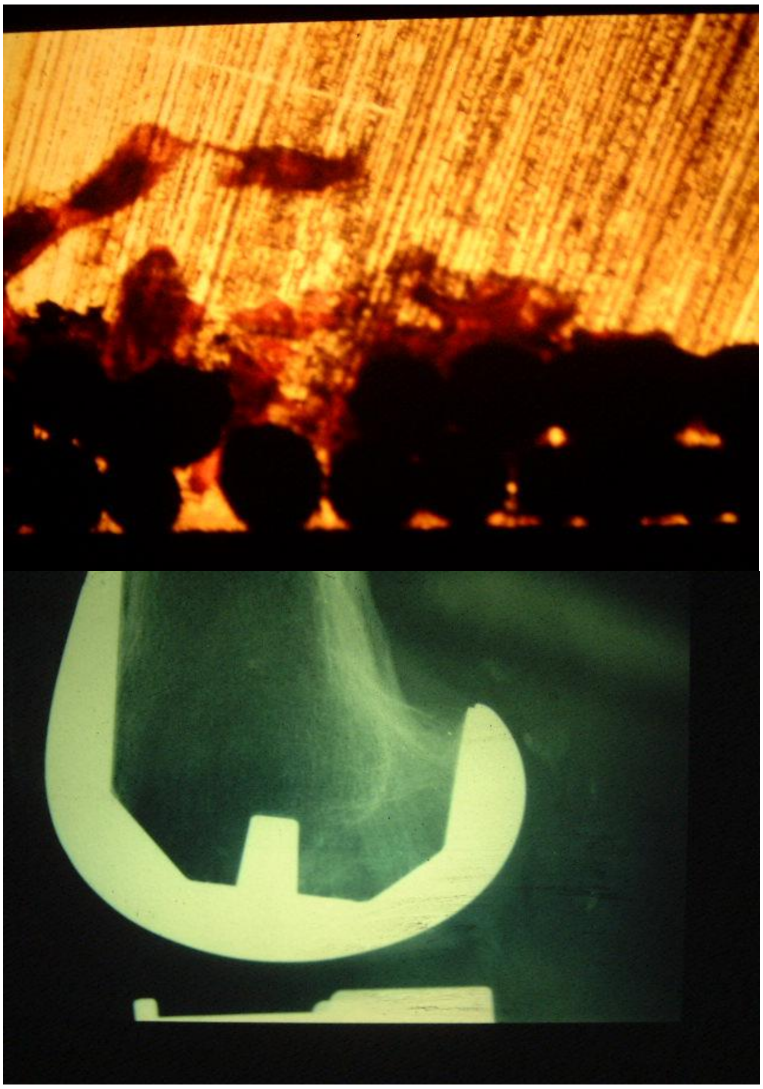

Figure 13: Top picture is an electromicrgraph showing incorporation of bone (red) onto the surface of the hydroxyapatite. Bottom picture shows an x-ray of an uncemented, hydroxyapatite coated total knee replacement. There are no gaps in the bone-prosthesis junction indicating incorporation of the bone onto the prosthesis.

Research into mobile bearing knee replacements continues. Such prostheses appear to demonstrate an attractive way of overcoming the constraint versus conformity conflict inherent in any artificial knee replacement.

Section 9 - Pictures/Test Questions Outline>
A. Pictures>
B. 2 CME Questions >
C. 4 T/F Pearls of Wisdom>>

Section Bibliography:> Please include a minimum of 5 references.>>

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Section Pictures:> An unlimited number of images can be uploaded into these section.Instructions are included at the beginning of section 9.>>