CJOS

Vol [2008] 2.2

Clinical Journal of Orthopaedic Surgery

Vasu Pai

Editor

Orthopaedic Surgeon

New Zealand

www.bonefix@co.nz

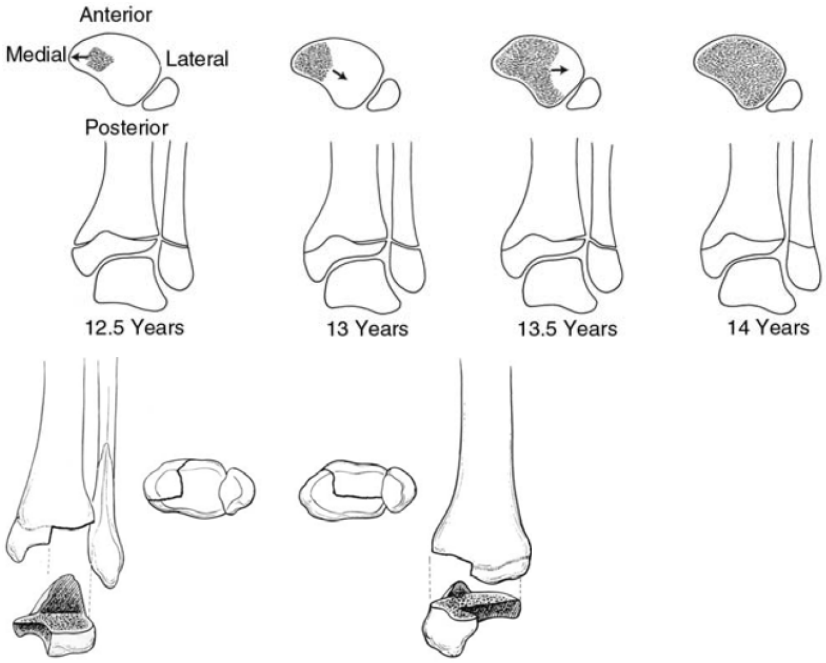
CONTENTS

1.Triplane fracture in Children. J Am Acad Orthop Surg 2007;15:738-747

1. It is the result of the characteristic asymmetric closure of the distal tibial physis over a period of approximately 18 months [at puberty]

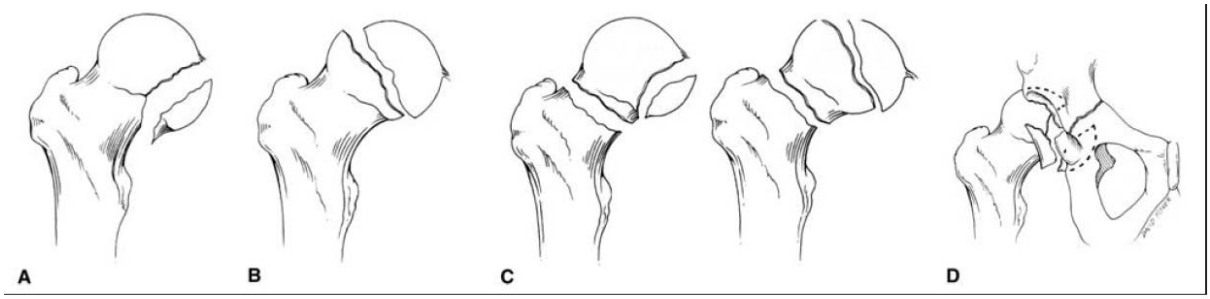
It has several variations and represents 5% to

2. 10% of pediatric intra-articular ankle injuries
3. The fracture typically presents in children aged 12 to 15 years
4. Displaced fractures are treated with open reduction and internal fixation performed through an anterolateral approach or an anteromedial approach
5. Intra-articular reduction to within 2 mm is required for optimal treatment of these unique pediatric ankle fractures.
6. The distal tibial epiphysis is the II most common site of epiphyseal second only to the distal radius.
7. This closure proceeds from central to anteromedial to Posteromedial and, finally, to the lateral portion of the epiphysis
8. Stabilization of the anteromedial epiphysis by the presence of a medial hump (ie, Kump's hump)15 or by local fusion of the growth plate is a key determinant in both triplane and juvenile Tillaux fractures.
9. Radiographic views of the ankle demonstrate a Salter Harris type III fracture on anteroposterior X rays and a Salter Harris type II fracture on lateral radiographs
10.Fibula is fractured in 50% of triplane fractures
11. The characteristic "Mercedes-Benz" three-pointed star configuration has been noted on CT scans of classic triplane fractures
12. Nondisplaced triplane (<2 mm displacement) and extra-articular fractures can be managed with immobilization in a long leg cast.
13. Residual fracture displacement after reduction was the most important determinant of premature physeal closure. This occurs in 45% of cases
14. Although premature physeal closure may occur with triplane fracture, significant shortening does not develop because these injuries typically occur near skeletal maturity
15.At an average of 5 years,the patients with residual displacement >2 mm demonstrated degenerative changes between 6 and 9 years


Anterior
Medial
Lateral
Posterior
12.5 Years
13 Years
13.5 Years
14 Years

2. Fracture head of Femur. J Am Acad Orthop Surg 2007;15:716-727

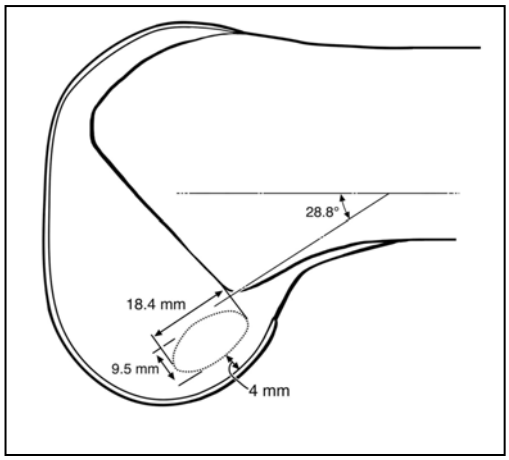
1. 10% of posterior hip dislocations have been reported to be associated with femoral head fracture.
2. The primary blood supply for the femoral head, particularly the weight-bearing portion, is the terminal branches from the deep branch of the medial femoral circumflex artery (MFCA).
3. It is easy to damage this deep branch of the MFCA during the posterior approach to the hip
4. The preferred approach to fixation of most femoral head fractures is the anterior approach to the hip.
5. Radial capsulotomy at the level of the acetabulum with a vertical extension generally provides adequate exposure. In this approach, the hip is not dislocated, and fracture reduction can be accomplished under direct visualization. External rotation, extension, and slight abduction of the hip will facilitate access to the fracture.
6. Small or comminuted fragments, or fragments not within the weight-bearing portion of the head, can be excised without compromising outcome.
7. The anterior approach to the hip has been reported to be a risk factor for the development of heterotopic ossification.
8. A study of 32 femoral head fractures recently reported indicated that, overall, 56% of patients had an excellent/good result, 16% a fair result, and 28% a poor outcome.



The Pipkin classification. **A,** Type I, femoral head fracture inferior to the fovea centralis. **B,** Type II, fracture extended superior to the fovea centralis. **C,** Type III, any femoral head fracture with an associated femoral neck fracture. **D,** Type IV, any femoral head fracture with an associated acetabular fracture. (Adapted with permission from Stannard JP, Harris HW, Volgas DA, Alonso JE:

3. ACL reconstruction. Am. J. Sports Med. 2008; 36; 176

The ACL femoral insertion



Tibial attachment

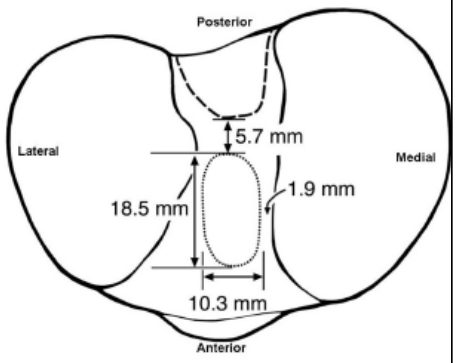


Figure 3. The oval-shaped tibial insertion of the anteric
ciate ligament (ACL) in the transverse plane. Based or
from Heming et al,[42] the distance from the posterior cr
ligament (PCL) notch to the posterior fibers of the AC
5.7 mm. The length was 18.5 mm, and the width wa
mm. The closest point from the medial aspect of the ins

Because a vertical tibial tunnel will place a femoral tunnel high in the notch and a more oblique tibial tunnel will place a femoral tunnel lower in the notch, the implication was that a femoral tunnel in the distal femoral footprint would produce better results.

A goal is to place the tibial tunnel central in the footprint, provided impingement does not occur. A tunnel centered in the tibial ACL insertion would be 7 mm anterior to the PCL or 15 mm in front of PCL notch

Cadaveric studies have found that grafts centered in the ACL footprints provide a better restraint to anterior translation than grafts placed vertically. Whether acceptable kinematics requires 1-bundle or 2-bundle grafts has not been resolved

Future for tendon bone healing:

Future techniques to improve tendon-to-bone healing may include use of cytokines to provide important signals for tissue formation and differentiation, gene therapy techniques to provide prolonged presence of an important molecule for healing, the use of stem cells to provide a population of undifferentiated cells, and the use of transcription factors to direct nuclear gene expression.9 Commercially available systems to create a platelet-rich plasma or platelet gel from autologous blood also provide a method to deliver serum-derived cytokines. Techniques to inhibit expression of molecules that might inhibit healing (such as MMPs or proinflammatory mediators) also hold promise. Finally, modulation of the mechanical environment may have profound effects on the cellular and molecular events at the healing tendon-bone interface.

4. UKA. JAAOS. Volume 16, Number 1, January 2008

Resurgence in UKA

Has advantages lower perioperative morbidity and earlier recovery.

Both clinical outcome and kinematic studies have indicated that successful UKA functions closer to a normal knee.

Recent reports have demonstrated success in expanding the classic indications of UKA to younger and heavier patients. Both fixed- and mobile-bearing implants can yield excellent clinical outcomes at >10 years, but with different modes of long-term failure.

Proper execution of surgical technique remains critical to optimizing outcome.

Long-term studies are needed to appropriately define the role of less invasive unicompartmental surgical approaches as well as the role of computer navigation.

Several studies directly compare patient perception and outcome after UKA to other common surgical alternatives, such as high tibial osteotomy (HTO) and TKA.

In a a randomized, prospective study of survival analysis at 10 years: showed a survivorship of 77% for UKA and of 60% for HTO.

In a comparative study in patients who underwent TKA on one side and UKA on the contralateral side, Laurencin et al3 demonstrated that more patients preferred the UKA side because it felt like a normal knee and had better function.

Kinematic study: UKA more closely resembles normal knee function than does TKA

Traditional Indications

A diagnosis of unicompartmental osteoarthritis or Osteonecrosis in either the medial or lateral compartment; age >60 years with a low demand for activity; weight <82 kg (181 lb); minimal pain at rest; range of motion (ROM) arc >90° with <5° flexion contracture; and an angular deformity <15° that is passively correctable to neutral.

Ritter et al12 noted that only 6.1% of knees met these anatomic qualifications for UKA and only 4.3% also met clinical standards ideal for UKA.

Expanding Indications

Recent studies have reported excellent results even as these traditional indications are expanded.

1.Some of the broadened criteria relate to patient demographics such as **age and weight.** Pennington et al14 reported on a retrospective series of UKA patients aged □60 years (range, 35 to 60 years) with a survivorship of 92% at 11 years.

Tabor et al15 published a series noting comparable survival and clinical outcomes of UKA in obese patients (body mass index [BMI] >30) at up to 20 years compared with nonobese patients.

2.Traditionally, the presence of **Patellofemoral arthritis or an ACL** knee considered a contraindication for UKA. However, Price etal17 proposed that evidence of degenerative change of the patellofemoral joint, either radiographically or by direct inspection intraoperatively, may be ignored if the patient does not specifically have anterior knee pain.

Increased failure rates also have been demonstrated in mobile meniscal bearing prostheses implanted in functionally ACL-deficient knees because of instability and a propensity for Meniscal bearing dislocation

Fixed-bearing Versus Mobile-bearing Design

Fixed-bearing tibial components can be either all polyethylene or metal backed.

The disadvantage of the meta backed design is that either a thinner polyethylene liner or a larger tibial cut is needed to accommodate the metal backing.

An alternative implant design philosophy is a tibial component with a mobile meniscal bearing.
Whereas the most successful fixed-bearing designs incorporate round-on-flat or slightly dished geometries, mobile-bearing UKA components such as the Oxford are fully congruent.
This minimizing point tibial contact forces and stress at the implant fixation interface.

Clinical Results: Fixed Versus Mobile Bearing

Berger et al13 recent ly reported results of a modular fixed-bearing, metal-backed tibial component.An overall survival of the implant of 96% at a minimum 10-year follow-up
92% of patients had an excellent or good outcome.
Of interest, thickness of the polyethylene insert was as thin as 3.5 mm, with no degradation in clinical outcome or increased rate of failure reported in patients treated with thinner polyethylene. The most common cause of revision in the mobile-bearing group was dislocation of the polyethylene, a complication unique to this group, especially early in the learning curve.

Failure Mechanisms: Implications for Surgical Technique

1. Progression of adjacent compartment arthrosis (26%) and other mechanical problems (15%).
Technique: once adequate implant fixation has been achieved, component positioning and alignment and soft-tissue balancing are essential to obtaining success

Femoral component impingement on the patella occurred in a distinct subset of 28% of cases and was associated more frequently with lateral UKA and anterior placement of the femoral component.

Squire et al35 reported progression of contralateral compartment degeneration in 46% of 136 knees at 11 years in their series.However, Berger et al13 reported that, at a 10- to 13-year follow-up, only 18%.

The average preoperative deformity in this series was 8º of varus from the mechanical axis, and the average postoperative alignment remained in 2º of mechanical varus. To prevent overcorrection, the authors recommend not performing a formal medial collateral ligament release and inserting a polyethylene insert that allows 2mmof joint laxity in full extension and flexion.

Minimizing Failure: Component Positioning and Alignment

1.The tibial component should be implanted perpendicular to the long axis of the tibia in the coronal plane.
2. Increased cancellous bone stresses when the tibial component was placed in varus.
3.With regard to the sagittal plane placement of the tibial component, a tibial slope of <7º to protect the ACL from degeneration and rupture, mitigating against late AP instability of the knee.
4. The femoral component should be placed perpendicular to the tibial component in the coronal plane..

5. Instability of TKA. JBJS 90A: 184-94

1. Instability after TKA is a cause of failure and a reason for 10% to 22% of revisions

2. The first step in confirming the diagnosis and understanding the causes is clinical and includes:

a. Accurate and complete history, including the reason for the original TKA

b. The presence of any preoperative deformity or contracture,

c. Previous knee procedures, the specifics of the operative technique ; The type of prosthesis;

d. The postoperative rehabilitation program; whether the patient sustained any trauma

e. Complete physical examination

Varus-valgus laxity in extension, in 30_ of flexion, and in 90_ of flexion.

Anteroposterior laxity : flexion laxity [anterior or posterior drawer test]

3. Analysis of a complete set of radiographs is necessary: aligment

There are 3 types of instability

Extension instability,

Flexion instability,

Genu recurvatum.

Extension Instability

Symmetric extension instability occurs when the extension space is not adequately filled by the thicknesses of the components. This may be due to excessive bone removal from the distal part of the femur or from the proximal part of the tibia.

Excessive bone removal from the proximal part of the tibia affects the space Use a thicker insert

Managing excessive bone removal from the distal part of the femur is more challenging.

A thicker tibial insert will not solve this problem. Using a thicker tibial insert elevates the joint line and excessively tightens the flexion space. Marked elevation of the joint line limits knee flexion, adversely affects patellar function, and contributes to so-called midflexion instability. Instability due to over resection of the distal part of the femur is treated by adding distal femoral augments, which are available in most contemporary revision total knee systems.

Asymmetric extension instability is much more common than symmetric extension instability. It is typically related to a preoperative angular deformity of the knee and is caused by persistent or iatrogenic ligamentous asymmetry after the knee is replaced.. The most common mistake leading to asymmetric instability is undercorrection of a fixed angular deformity,

In such cases, the varus deformity progressively recurs and the arthroplasty ultimately requires a revision.The medial collateral ligament should never be deliberately and improperly stretched by the retractors.

In valgus knee, only minimal laxity of the MCL should be accepted.Insall et al. originally advocated a sequential lateral ligamentous release technique. Their original description was of a sequence of releases starting with the lateral collateral ligament and continuing with the Popliteus tendon and the lateral head of the gastrocnemius

The most appropriate treatment for a ligamentous injury is surgical reapproximation of the ligament with use of

Krackow-pattern sutures. The repair can be augmented with use of the hamstring tendons that are left attached distally but freed at the Musculotendinous junction with a tendon-stripper. A constrained condylar implant may be used to add stability. This implant essentially acts as an external splint but clearly is not required in every case of iatrogenic collateral ligament injury.

Flexion Instability

Flexion instability is seen most often in patients in whom the total knee prosthesis is well aligned axially and well fixed. Historically, this problem has been under diagnosed in patients with a cruciate-retaining knee implant. The laxity is due to inadequate filling of the flexion space with the implant or disruption of the posterior cruciate ligament.The manifestations of flexion instability range from a vague sense of instability to frank dislocation. This variability depends in part on whether a posterior stabilized or cruciate-retaining implant is in place. Assessment of the knee in 90° of flexion should be part of the routine physical examination of any patient with pain at the site of a TKA.

Dislocation after a posterior stabilized total knee arthroplasty is a rare but dramatic and disconcerting problem for patient and surgeon alike. Most current posterior stabilized designs have increased the so-called jump distance that is needed for the cam to ride over the post before dislocating, and dislocation rates are now much lower than 0.5%.

The most common activity that leads to a dislocation is marked knee flexion plus a varus stress.
The first episode of dislocation should be treated with closed reduction, a trial of bracing, and avoidance of the activity that induced the dislocation. Recurrent dislocation should be addressed with insertion of a thicker polyethylene insert (if there is room in the extension space) or by conversion to a constrained condylar implant. With the modular wedges and augments available in contemporary total knee arthroplasty revision systems, obtaining good balance of the flexion and extension spaces by upsizing the femoral component is consistently possible.
Flexion instability is an under recognized cause of poor results after a cruciate-retaining total knee arthroplasty. Typically, this instability occurs in knees in which the prosthesis is well aligned, well fixed, and stable to varus-valgus stress in extension. These patients report a sense of knee instability without giving-way, recurrent swelling of the knee, and pain and tenderness about the knee. Usually, physical examination reveals a substantial posterior sag or drawer (best seen with the patient sitting relaxed), a knee effusion, and multiple areas of soft-tissue tenderness in the Retinacular and pes anserinus regions.

In PCR TKR

Flat tibial liner (in the sagittal plane) offers no inherent resistance to posterioranterior translation and may contribute to flexion instability. If the total knee component is undersized, the posterior condyles of the femur will appear overresected compared with those on the preoperative radiograph.

Nonoperative treatment, including quadriceps and hamstring strengthening.

Operative management with a tibial polyethylene exchange alone is one option, but poor and unpredictable results have been previously described2

A revision to a posterior stabilized total knee arthroplasty is preferred. That procedure allows identification of the cause of instability and addresses it directly so that the knee can be balanced in flexion and extension

Recurvatum instability

The best management is prevention, and recurvatum seldom develops postoperatively in a knee that does not hyperextend at the end of the procedure,

Recurvatum before total knee arthroplasty occurs in <1% of patients and is most typically seen in those with neuromuscular disease

A patient with marked quadriceps weakness is at particular risk for progressive recurvatum deformity after total knee arthroplasty. However, rotating-hinge prostheses can have a valuable role in cases such as these (Fig. 8).

6.Multimodal Thromboprophylaxis for Total Hip and Knee Arthroplasty Based on Risk Assessment By Lawrence D. DorrJBJS 89A::2648

Retrospective review: 1179 consecutive total joint arthroplasties.
Low risk TJR: [N=1046 operations] : Managed with aspirin, dipyridamole, or clopidogrel bisulfate as well as intermittent pneumatic calf compression devices.
High risk: [N= 133 operations]Managed with LMWH or warfarin and intermittent calf compression.

All patients were mobilized from bed within 24 hours after surgery, and all underwent Ultrasonography at the time of hospital discharge. All of the patients were followed for six months postoperatively.
The prevalence of asymptomatic and symptomatic distal and proximal deep venous thrombosis, symptomatic and fatal pulmonary emboli, overall mortality, and bleeding complications was determined.

Results:
Overall, there were no fatal pulmonary emboli,
Symptomatic pulmonary emboli (prevalence, 0.25%),
Clinically symptomatic deep venous thrombi (0.4%).
Asymptomatic deep venous thrombi (5.2%) were found with use of routine postoperative Doppler ultrasound scans.
Nonfatal pulmonary emboli (prevalence, 0.3%) were detected in association with the 1046 procedures in the low risk group, and none were detected in association with the 133 operations in the high-risk group.

Clinically symptomatic deep venous thrombosis was detected in association with four (0.38%) of the 1046 operations in the low-risk group and one (0.75%) of the 133 operations in the high-risk group ($p = 0.93$).

Asymptomatic distal deep venous thrombosis was detected in association with thirty-seven (3.5%) of the 1046 procedures in the low-risk group and four (3.0%) of the 133 operations in the high-risk group.

Wound hematomas occurred only in patients being managed with warfarin or low-modular-weight heparin ($p = 0.0001$).

Conclusions: A multimodal thromboembolic prophylactic regimen is consistent with protecting patients while limiting adverse clinical outcomes secondary to thromboembolic, vascular, and bleeding complications.
Eight hundred and one (82.6%) of the 970 patients underwent surgery with a combination of epidural anesthesia and supplemental general anesthesia to provide sedation.

Intraoperatively, patients wore an elastic TED hoon the uninvolved leg. Postoperatively, physical therapy was begun on the day of surgery or the following morning.

The high-risk factors were
1. A history of a DVT within the previous five years
2. Congestive cardiac failure

3. Atrial fibrillation with cardiac disease and use of Coumadin preoperatively
4.Thrombophilia, including factor V Leiden, prothrombin disorders, protein-C and S deficiency, antithrombin disorders, or hypercoagulabilitystates (five patients, five procedures).
High-risk patients were managed postoperatively with enoxaparin (40 mg per day) or Coumadin (with a target international normalized ratio of 2 to 2.5) and the same intermittent pneumatic compression regimen as was used for low-risk patients. They were initially managed with aspirin for twenty-four to forty-eight hours, at which time the anticoagulation drug was initiated and aspirin was discontinued.
Enoxaparin was continued for ten days, and then the patient was again placed on aspirin for one month.
Coumadin was continued for six weeks or as prescribed for medical conditions.

Patients who had deep venous thrombosis during the study and were being managed with low-molecular-weight heparin were converted to warfarin and continued to receive that agent for three to six months; patients who were already receiving warfarin continued to receive that agent for 3 M

Comparison of our data with historical data showed that our multimodal treatment was just as effective, and at least as safe, as regimens involving the use of chemical anticoagulation drugs alone

Both aspirin and low-dose warfarin are more protective against proximal clots than they are against distal clots, so we believe that the combination of either of these drugs with intermittent pneumatic compression is protective against clots while providing safety from bleeding
The present study suggests that THR and TKR patients can be managed effectively and safely without following American College of Chest Physician guidelines.

7.TendinosisInsertional TFoot Ankle Clin N Am 12 (2007) 597–615

Young patients, who are usually highly active in sports.
An orthotic to lift the heel may be of benefit and casting is seldom required

The clinical picture of pain, swelling, and impaired function is best referred to as Achilles tendinopathy .

Differential diagnosis of Posterior heel pain

Insertional tendinopathy
Retrocalcaneal bursitis
Pump bumps
Os trigonum
Flexor hallucis longus
Seronegative arthropathy

Relavant Anatomy

1. The fibers of the conjoint tendon rotate through 90_ as they progress distally, such that the medial fibers proximally become the most posterior fibers distally at the insertion
2. The tendon inserts onto the middle third of the posterior surface of the tuberosity of the os calcis.
3. The poor blood supply to the noninsertional region of the Achilles tendon is implicated in the pathophysiology of tendinopathy and rupture
4. Distal to the insertion of the Achilles tendon, the os calcis gives attachment to the fascia that runs in continuity with the plantar fascia.

Insertional tendinopathy

Posterior heel pain
There is often calcification within the central portion of the Achilles insertion.
From the middle third of the os calcis on a lateral radiograph
Histology and histochemical studies have shown that an insertional tendinopathy is characterized by mucoid degeneration, necrosis, hemorrhage, and calcification

Haglunds deformity

Lateral side of posterosuperior par of the tuberosity.
Confusion arises because a Haglund deformity may also be seen in up to 60% of patients with insertional Achilles tendinopathy. This does not mean that all patients presenting with pump bumps have insertional tendinopathy
Look for gastro shortening

Treatment:

Orthotics and shoes
To avoid recurrence of the problem, the patient must fully understand that he or she must continue to be careful with choice of shoes even after the swelling and tenderness resolve.
Retrocalcaneal bursitis can be managed along similar lines. There may be some benefit from anti-inflammatory

medication or gel, but steroid injection should be avoided wherever possible.
Stretching:Stretching regimens for noninsertional tendinopathy are extremely effective, with 90% of patients responding when the stretches are performed properly
Extracorporeal shock wave lithotripsy is increasingly being evaluated as treatment for chronic soft tissue complaints, including plantar fasciitis, tennis elbow, and rotator cuff injuries. The results are promising.

Open procedures

Nonoperative treatments were successful in 89% of cases.
Open procedures:Maffulli and colleagues [53] treated 21 patients for calcific tendinopathy through a central posterior incision and tendon-splitting approach.

Johnson and colleagues reviewed 22 patients treated for insertional calcific tendinopathy by tendon detachment, debridement, and reattachment with suture anchors.
When the tendon was detached, a proximal V-Y plasty was Insertional tendinopathy alone.
The satisfaction rate was 82%. Twenty patients resumed normal daily activities within 3 months. Only 13 were able to resume sports activities, however, and 9 patients reported persisting pain.
Flexor hallucis longus tendon transfer. This reconstructive option is useful in cases of insertional tendon rupture or after extensive debridement. Wong and Ng [55] report good results with all patients able to perform a singleleg heel rise. In this series, all patients were older than 50 years.
Plantarflexion weakness of approximately 30% was noted as the only disadvantage. This did not have significant functional consequences.
Complete detachment of the Achilles tendon insertion with sutureanchor repair is safe and reliable.
At least 50% of the attachment can be released without the need for suture-anchor repair and without the need for postoperative cast immobilization.

8.Factors Affecting Results of Ulnar Shortening for Ulnar Impaction Syndrome. CORR465:215

Although ulnar shortening osteotomy is the most frequently performed operation for ulnar impaction syndrome, little attention has been given to detect certain preoperative factors affecting clinical outcomes of this procedure.
Retrospectively reviewed 51 patients (53 wrists) with ulnar impaction syndrome
The minimum follow up was 12 months
A long duration of symptoms and workers' compensation predicted worse clinical scores.

Ulnar impaction syndrome is a complex of symptoms resulting from excessive compression of the ulnar head against the triangular fibrocartilage complex (TFCC) and the ulnar carpal bones. It usually is associated with positive ulnar variance, degenerative changes of the TFCC, ulnocarpal chondromalacia, and lunotriquetral ligament attenuation or tear. These etiologic conditions lead to symptoms, including ulnar wrist pain, limited range of motion of the wrist, and diminished grip strength.

Ulnar shortening osteotomy has been a widely accepted procedure for achieving this purpose.
The diagnosis of each patient was made on the basis of treatment history and findings as follows:
(1) ulnar wrist pain that was worsened by forearm pronation and ulnar deviation;
(2) tenderness just distal to the ulnar head;
(3) ulnar wrist pain by axial stress during passive supination-pronation with the wrist in maximum ulnar deviation (positive ulnocarpal stress test);
(4) plain radiographs showing positive ulnar variance with or without cystic changes of the lunate; and (5) arthroscopic findings showing degenerative changes (Class II) of the TFCC according to Palmer's classification.
All patients had been treated with nonsteroidal antiinflammatory medications and splinting for more than 3 months. Surgery was performed for patients without responses to these nonoperative treatments. Preexisting distal radioulnar joint (DRUJ) arthritis was considered a contraindication to this procedure.

Arthroscopic procedures were performed ;
Débridement of the TFCC wear or tear to a stable margin
Ulnar shortening osteotomy was performed. The distal ulna was approached through a longitudinal incision between the extensor carpi ulnaris and the flexor carpi ulnaris. A six-hole small dynamic compression plate was placed on the surface of the ulna as distal as possible. The three most proximal screw holes then were drilled and the screws were inserted to determine the osteotomy site. Only the most proximal screw remained and the plate was swung away from the osteotomy site. Parallel transverse osteotomies were performed to remove an appropriate segment of the bone. The length of the removed segment equaled the amount of positive ulnar variance measured on the preoperative radiograph. The plate was swung back in place and the two proximal screws were reinserted.

The main causes of inferior clinical outcomes in patients receiving workers' compensation and a long persistence of symptoms cannot be statistically proven. However, in patients receiving workers' compensation, some social factors or high physical demands on the surgically treated wrist seem to be the main causes. The patients with a long persistence of symptoms may be attributable to the severity of clinical symptoms and to

pathologic changes in the wrist. Our data indicate patients receiving workers' compensation with more than 6 months' duration of symptoms may not respond favorably to this procedure.

Pevious clinical studies also showed 20% to 40% of patients treated with this procedure exhibited radiographic evidence of DRUJ osteoarthritis after 2 to 3 years. Our data confirm these results. However, we found no relationship between such radiographic changes and clinical results.

9.**Metal against Ceramic.**Sophie Clin Orth 465:23-32

The performance of novel ceramic-on-metal bearing couples has been compared with metal-on-metal and ceramic-on-ceramic bearing couples in laboratory and short-term clinical studies.

Laboratory studies compared ceramic-on-metal with metal-on-metal and ceramic-on-ceramic bearings with diameters of 28 and 36 mm under standard conditions and under adverse conditions with head loading on the rim of the cup. In the laboratory studies, friction, wear, and ion levels were lower in ceramic-on-metal bearings compared with metal-on-metal, with results similar to ceramic-on-ceramic couples. Under adverse conditions and rim loading, all bearings showed increased wear with lower wear and absence of stripe wear in ceramic-on-metal compared with metal-on-metal bearings.

Clinical studies compared metal ion levels in ceramic-on-metal with metal-on-metal, ceramic-on-ceramic, and ceramic-on-polyethylene bearings in a randomized prospective study. Short-term studies in 31 patients at 6 months revealed lower metal ion levels (cobalt and chromium) in those with ceramic-on-metal compared with metal-on-metal bearings.

The size, morphology, and biologic reaction to any wear particles released are also important. Wear particles generated by MOM THAs are in the nanometer size range; therefore, the number of wear particles they produce exceeds the number produced in UHMWPE THAs despite the low wear rates of MOM bearings. There is considerable discussion about the potential dissemination of these particles around the body and their biologic effects on cells and tissues. Metal particles disseminate throughout the body and have been found in lymph nodes, liver, spleen, and bone marrow Little is known about their long-term systemic effects. In attempts to reduce metal wear and ion release, larger head sizes have been used, which have the additional advantage of increased stability and range of motion.

Ceramic-on-ceramic (COC) hip prostheses have been used clinically for a number of years. The wear rates of retrieved prostheses are generally much lower than that of UHMWPE bearings and on the order of 1 mm^3 per year. However, occasional cases of higher, more severe wear have been reported. Under ideal conditions in vitro, extremely low wear rates of 0.05 mm^3/Mc have been reported. However, when microseparation (when the head separates from the cup during the swing phase and relocates in the stance phase after rim contact) was included in hip simulator testing, elevated wear rates and stripe wear were observed in vitro (1.2 mm^3/Mc) similar to that observed on explants. The use of COC bearings is currently limited as a result of concerns regarding possible fracture and rim chipping of the liner.

A ceramic femoral head on a metal acetabular insert has the potential to reduce metal wear and ion release compared with MOM bearings and additionally uses larger diameter femoral heads than COC bearings. A preliminary research study of ceramic-on-metal (COM) bearings by Firkins et al demonstrated reduced wear with 28-mm alumina-ceramic heads on metal inserts in comparison to MOM (approximately 0.01 mm^3/Mc compared with 1.62 mm^3/Mc).

The study was part of an ongoing randomized, prospective, single-center trial comprised of four groups. Patient information was provided, questions and concerns answered, and informed consent obtained. All patients received a cementless stem with a titanium substrate fully coated with hydroxyapatite and a titanium alloy cementless cup coated with porous beads and a thin layer of hydroxyapatite (Corail® and Pinnacle™, respectively). Patients were then selected to have a COC, COP, MOM, or COM bearing surface.

A 10-station Prosim hip simulator (Simulator Solutions, Manchester, UK) was used in this study; this has been used previously in testing metal-on-polyethylene hip arthroplasties in which clinically relevant wear rates were reported.

Clinical Ion Level Measurements: The full randomized prospective trial was comprised of 50 patients per group with a total of 200 in the full trial. Patients were restricted to those undergoing primary THA, and exclusion criteria included patients who had other metal implants. By November 2006, 104 patients had been recruited to the trial and of these, the 31 patients with ion levels measured at a minimum of 6 months are reported here. Recruitment is ongoing and our intent at this point was to provide an early report on a small number of patients who had followup times greater than 6 months and exclusively considering the metal ion levels. A full report on the patient outcomes, radiographic appearance together with radiographic wear measurements for polyethylene bearings, and a full analysis of metal ion level for all patients will be given at a later date.

RESULTS

Hip simulator testing under microseparation conditions showed wear was greater ($p < 0.05$) in MOM compared with COC or COM. The overall mean wear rate of MOM was more than six times that of COM (1.57 mm^3/Mc compared with 0.23 mm^3/Mc). The contact of the head against the rim of the cup on relocation during the stance phase of the walking cycle caused a pattern of stripe wear on the heads in the MOM and COC implants but not with COM implants. The metal cups showed wear of the rim of the cup at the point where contact of the head occurred. This occurred irrespective of the type of head (either metal or ceramic) that was articulating with the cup (ie, MOM and COM bearings). The wear pattern appeared as beveling of the cup at the contact (the join between the chamfer and spherical edge of the cup) and was much more pronounced in the cups paired with metal heads (MOM bearings) compared with cups paired with ceramic heads (COM bearings).

Trends in friction factors for Delta were very similar to Forte; the friction factor for the MOM bearing was higher ($p < 0.05$) than COC and COM at all of the swing phase loads tested. In testing with different lubricants at a swing phase load of 100 N, the friction factor of the MOM bearings in 100% serum was lower ($p < 0.05$) compared with that in 25% and in water. However, for the COC and COM bearings, this trend was reversed and as the protein concentration decreased (ie, from 100% serum to 25% [v/v] serum to water), the friction factor also decreased . The friction factor of the MOM bearings was higher ($p < 0.05$) in all lubricants compared with the COM and COC.

The combination of in vitro and clinical assessment of COM THAs has enabled a substantial assessment of their performance. However, in vitro hip simulator studies were limited to 5 million cycles in which steady-state wear had been reached. Additionally, in vivo ion level measurements are in early stages of clinical evaluation and the number of patients remains small.

The COM bearing combinations showed reduced friction, wear, and metal ion release in the laboratory studies and an indication of reduced metal ion levels in the early short-term clinical studies.

Bearings 28 mm in diameter were tested in friction studies in the following combinations: MOM, COC, and COM with both Forte and Delta ceramics. The COM and COC had lower friction than the MOM. All material combinations showed increasing friction as the swing phase load increased as previously reported by Williams et al.29 Theoretical modeling has indicated this is because an increased swing phase load reduces the fluid film thickness in the stance phase and hence the amount of asperity contact, which then increases the friction. When the protein concentration was increased (water less than 25%; serum less than 100% serum), the friction of the 28-mm MOM implants decreased. It has previously been proposed 31 this is the result of the proteins acting as solid-phase lubricants and therefore the friction is reduced more when more proteins are present. In COM and COC bearings, this was not the case, because increasing protein concentration (water less than 25%; serum less than 100% serum) increased the low level of the friction factor measured. It is proposed this was caused by proteins adhering to the surfaces and needing to be sheared to enable motion between the head and cup. The COM bearings demonstrated similar friction characteristics as the low-friction COC bearings. The protein interactions and tribochemical film formation that has been proposed for MOM bearings 10,31 and reflected in the different behavior of MOM in different concentrations of protein did not seem to occur in COM THAs. Both the Forte and Delta ceramics behaved in similar ways.

Hip simulator tests of 28- and 36-mm diameter bearings, which include Forte and Delta in the COC or COM combination, showed lower wear than MOM. MOM-bearing couples showed higher wear in the initial stages of testing (bedding-in wear, up to 3 million cycles; Fig 3). Bedding-in wear has been reported in other in vitro hip simulator tests and also clinically. The volume of bedding-in wear in regard to MOM hip arthroplasties is related to the geometry (diameter and clearance) of the components. Hu et al 15 used a geometric model to analyze the change in contact area and its relationship to the volume of wear during the bedding-in process and subsequent long-term wear. During the bedding-in process, the contact area gradually increases to an optimal value, and the wear rate reduces as the contact stress reduces and the lubrication conditions improve. During the bedding-in phase in MOM bearings, a nanocomposite tribochemical layer is formed, which reduces the subsequent steady-state wear rate.31 In this simulator testing, ideal repetitive walking cycles were applied leading to ideal lubrication conditions. In vivo, there are a range of activities and cup positions; therefore, wear seen clinically may higher.

No obvious period of bedding-in wear was observed in hip simulator tests with COC or COM couples; hence, the authors postulate these bearings are less dependent on the lubrication regime in comparison to MOM. It is predicted the long-term wear of COM would remain low in vivo as a result of the lack of sensitivity with regard to the lubrication regime.

Firkins et al 13 have previously reported a lower wear rate with 28-mm COM (Forte) bearings in comparison to MOM under standard conditions. This reduction in wear of COM compared with MOM may have several likely causes. Differential hardness may lead to reduced adhesive wear. This reduction in adhesive wear may also avoid “squeaking” of the bearing observed in MOM surface arthroplasties.12

Smoother surfaces may also reduce wear. Experimentally 9 and theoretically 17 a reduction in the surface roughness of metal bearings reduced wear as a result of improvements in lubrication conditions.

A study by Yan et al 32 demonstrated an important element of MOM wear is the result of corrosive wear. This element is reduced in a COM bearing as a result of insulating properties of the ceramic head.

Analysis of the bovine serum lubricant from the 36-mm diameter standard condition hip simulator tests for levels of chromium, cobalt, and molybdenum ions was performed. The MOM serum Co, Cr, and Mo ions levels were all lower in steady-state wear in comparison to bedding-in. This is in agreement with previous in vitro studies 25 and clinical studies 5,19 in which elevated ion levels were reported during the early stage of increased wear. The COC and COM bearings did not produce different levels of ions during bedding-in and steady-state wear. The levels of Co, Cr, and Mo ions released throughout testing remained low and less than MOM. The reduction in metal ion release observed in this simulator study would be considered advantageous in clinical use. There have been many reports 5,19,24 of elevated ion levels in patients with MOM (THA or surface replacement) prostheses; CoCrMo particles have the potential to induce deoxyribonucleic acid damage or cause host hypersensitivity.6,28 However, no in vivo studies have conclusively demonstrate a link between MOM hip arthroplasty and an increase in the incidence of cancer.22

To date, there is limited clinical data on the COM bearing couple. The only previous report known to the authors concluded this combination was not suitable for clinical use. No details were given on the exact nature of the bearing surface components, which will, from lubrication theory, be affected by such factors as surface finish and diametric clearance.

The clinical data in this series at this stage comprise of small numbers of patients with relatively short followup times. However, in contrast to the earlier report, the results are encouraging, no unforeseen problems were observed with the COM bearing couple, and there are indications the improvements seen in the laboratory may be reflected in improved clinical performance as measured by reduced cobalt and chromium ion levels. There was one outlier in both the MOM and COM cohorts and these will require further investigation to determine whether the elevated metal ion levels were indeed related to component positioning. When the outliers are removed from the analysis, the mean ion levels in patients with COM bearings are much lower (and similar to COP and COC) and the difference between the ion levels in COM and MOM is greater. This is consistent with laboratory studies. Malpositioning of components can result in the head contacting and loading the rim of the cup. When cup rim loading was simulated in vitro, the wear of both COM and MOM increased. However, the percentage reduction in wear (and therefore ion levels) of COM in comparison to MOM was less than found under standard conditions. Cup position and avoidance of head rim loading is important in both COM and MOM and indeed COC bearings. It should also be borne in mind that although the early data suggest a reduction in metal ion levels with this COM combination compared with MOM, the longer-term performance remains to be determined.

10.**TKR infection. Current Orthopaedics (2007) 21, 314–319**

The reported rate of infection following TKR is 1%–2.5%.

It has been estimated that surgical treatment of infections following TKR requires 3–4 times the resources of the hospital and surgeon compared with a primary TKR and twice the resources of aseptic revision TKR.3

Treatment options are:

_1. Long-term antibiotics, _2. Open or arthroscopic debridement with retention of prosthesis, _3 One stage revision, _4. 2 stage revision, _5. Arthrodesis, _6. Resection arthroplasty, and _7. Amputation.

Types of infection

1.Superficial infection [The Centre forDisease Control (CDC]

Table 1 Criteria for superficial infection (Centre for Disease Control).

Criterion	Definition
1	Purulent drainage from the superficial infection
2	The superficial infection yields organisms from the culture of aseptically aspirated fluid or tissue, or from a swab and pus cells are present
3	At least two of the following symptoms and signs of inflammation: pain or tenderness localised swelling redness heat and (a) the superficial infection is opened by a surgeon to manage the infection, unless the incision is culture-negative or (b) a clinician's diagnosis of superficial incisional infection

The diagnosis of superficial infection is often unreliable; the reliability of the third criteria (Table 1) for superficial infection has been challenged recently because of low interobserver agreement, arising from the lack of objectivity in judging tenderness, redness, localised swelling and heat.5

2. Deep infection

Table 2 Classification of deep infections.[4]

	Type I	Type 2	Type 3	Type 4
Timing	Positive intra-operative culture	Early postoperative infection	Acute haematogenous infection	Late(chronic) infection
Definition	>2 positive intra-operative cultures	Infection within one month after surgery	Haematogenous seeding of site of previously well functioning prosthesis	Chronic indolent clinical course; infection present for >1 month
Treatment	Appropriate antibiotics	Debridement and salvage of prosthesis	Debridement with salvage or removal of prosthesis	Removal of prosthesis

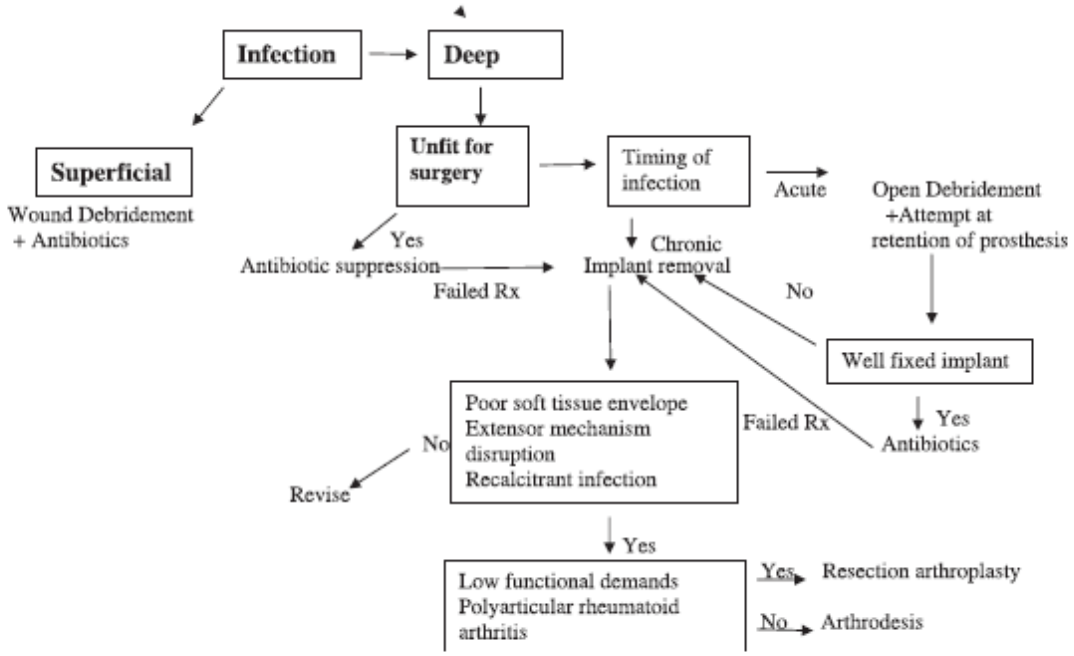


Figure 1 Treatment algorithm for infected TKR.

Pain is the most common presenting symptom of an infection of a knee arthroplasty. It typically occurs while the patient is at rest or wakes the patient at night.
It is usually not aggravated by weight-bearing, although component loosening giving rise to such pain may be a sequel of infection

Fever during the first 5 days of the postoperative period is physiological due to the inflammatory process.

T**he local temperature** around a newly replaced knee can remain elevated for up to 6 months postoperatively.

Serous discharge in the first few days following surgery should be addressed with caution. Persistent discharge from the wound beyond 7 days is a serious problem as a superficial discharge may often arise from a deep source of infection.

Investigations

A full blood count, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP) and plain radiographs.
Wound swabs are discouraged as they complicate the clinical situation by yielding skin contaminants.6 Empirical use of antibiotics is also condemned by many authors as it leads to multi-drugresistant infection and it may mask the clinical features of infection long enough to preclude the option of early debridement and prosthetic salvage.
CRP and ESR are non-specific inflammatory markers. Both may be elevated in inflammatory, infectious and neoplastic processes.10 CRP usually peaks between 5 and 7 days. following surgery and then gradually decreases. Any peak after this period should increase the suspicion of infection but it must be noted that it remains elevated for as long as 6 weeks in non-rheumatoid patients.

Spangehl et al. (1999) have observed that when both the measurements are normal is 0%. When ESR >30 mm/h and CRP >10 mg/L, the probability of infection rises to 0.83.

Joint aspiration

Joint aspirate should be sent for Gram staining, and cultured for anaerobic and aerobicbacteriae and fungi. Gram staining has a sensitivity of as low as 12%, but a specificity of 98.8.4

The most common organisms reported are Staphylococcus(s) aureus, coagulase-negative Staphylococcus, methicillin-resistant S. aureus,S. epidermidis and Pseudomonas aeruginosa.

White cell count with the differential cell count should also be performed on the aspirate. A sensitivity of 75%,specificity of 96% and accuracy of 90% is noted with knee aspirates in diagnosing infection prior to revision.

Radionuclide imaging

Radioisotope scans are not particularly useful in the acute postoperative period.6 111In-labelled white blood cells in combination with 99mTc-sulphur colloid marrow imaging is superior to other scans in the assessment of infection in total joint replacement, with a reported sensitivity, specificity and accuracy of 100%, 91% and 95%, respectively

Antibiotic therapy

Empirical antibiotic treatment for suspected periprosthetic infection should be guided by the class of the infection and the findings of Gram-staining. Until final culture results are available, acute haematogenous infections should be treated initially with a combination of cefazolin and gentamicin.

All chronic and acute post-operative infections with Gram positive bacteria and all cases in which a Gram stain fails to identify bacteria should be managed with vancomycin. Infections with Gram-negative bacteria should be managed with a third- or fourth-generation cephalosporin.

Long-term antibiotic suppression alone is an option in selected patients. This treatment should be considered only when all of the following criteria are met:

1. it is not feasible to remove the prosthesis, most often because of a medical condition that precludes an operative procedure,
2. the microorganism is of low virulence,
3. the microorganism is susceptible to an oral antibiotic,
4. the antibiotic can be tolerated without serious toxicity,
5. the prosthesis is not loose.15

12. Long-term results of simultaneous fixed bearing and mobile-bearing total knee replacements performed in the same patient. Kim JBJS Br , BJS [Br]2007;89-:1317-23

Compared the results of 146 patients who received an anatomic modular knee fixedbearing total knee replacement (TKR) in one knee and a low contact stress rotating platform mobile-bearing TKR in the other. There were 138 women and eight men with a mean age of 69.8 years (42 to 80). The mean follow-up was 13.2 years (11.0 to 14.5).

The assessment scores of both rating systems pre-operatively and at the final review did not show any statistically significant differences between the two designs of implant. In the anatomic modular knee group, one knee was revised because of aseptic loosening of the tibial component and one because of infection. In addition, three knees were revised because of wear of the polyethylene tibial bearing. In the low contact stress group, two knees were revised because of instability requiring exchange of the polyethylene insert and one because of infection.

The radiological analysis found no statistical difference in the incidence of radiolucent lines at the final review (Student's t-test, $p = 0.08$), most of which occurred at tibial zone

The Kaplan-Meier survivorship for aseptic loosening of the anatomic modular knee and the low contact stress implants at 14.5 years was 99% and 100%, respectively, with a 95% confidence interval of 94% to 100% for both designs.

We found no evidence of the superiority of one design over the other at long-term follow up. Collier et al3 analysed the risk factors for osteolysis after a TKR. Men were 3.6 times more likely to have osteolysis than women. Knees in which the base plate had a grit blasted proximal surface were 2.6 times more likely to be affected by osteolysis than those treated by a polished surface base plate. Knees with an insert which had been gamma-irradiated in air were 4.0 times more likely to have osteolysis than those with an insert which had been gamma-irradiated in nitrogen. The risk of osteolysis increased by a factor of 1.5 with an increase of one year in the shelf age of the insert.

13. **Unexpected Positive Intraoperative Cultures and Gram Stain in Revision THR . Orthopedics.2007: 30, 1051-4**

No method to determine aseptic versus septic failure provides 100% sensitivity and specificity.
In cases where preoperative suspicion is low and the septic workup is negative, intraoperative cultures can still be positive. The importance of unexpected positive results is unknown.

We investigated the incidence of positive intraoperative gram stain and cultures in 103 revision total hips. Seven positive gram stains or cultures were observed. No subsequent infections were observed.

Unexpected positive culture results or gram stain in an otherwise low suspicion revision total hip arthroplasty should be treated as significant. It is now recommended that multiple cultures be obtained and that a single isolate may not be a significant finding.

A negative preoperative evaluation, and are assumed to be free of infection, 6.8% had a positive intraoperative gram stain or culture at the time of revision.surgery.

The current study elucidates the natural history of a positive intraoperative culture in revision THA with a low preoperative level of suspicion for infection. In the series by Padgett suggested that the hip of the 30% with positive cultures subsequently developed an infectious complication. We report no subsequent late infections in any patient undergoing revision surgery in the group, including those with positive cultures.
The current study has several drawbacks. It is retrospective. Permanent pathologic analysis was not performed. Culture specimens were obtained by deep implant swabs, a method that has been challenged. Despite these shortcomings, the current study demonstrates the incidence of unexpected positive intraoperative gram stain or culture in a low-suspicion revision.
We recommend 6 weeks of culture specific intravenous antibiotics for any unexpected positive culture or oral antibiotics for a positive gram stain. Additionally, only single swab cultures were obtained. Multiple cultures, including fluid and soft tissue, should be taken in any revision surgery. Single positive cultures may then be able to be more easily regarded as non-significant and perhaps 6 weeks of antibiotic therapy can be avoided in these cases. We did not withhold antibiotics on any patient with positive cultures, and cannot therefore comment on the effects of doing so or electing to use a different antibiotic treatment strategy.

This study determined the incidence of positive intraoperative cultures in a series of revision THA with presumed aseptic loosening and infection ruled out. Additionally, the significance of a positive intraoperative culture and the use of perioperative treatment of a positive culture are evaluated.

Single positive cultures may then be able to be more easily regarded as non-significant and perhaps 6 weeks of antibiotic therapy can be avoided in these cases. We did not withhold antibiotics on any patient with positive cultures, and cannot therefore comment on the effects of doing so or electing to use a different antibiotic treatment strategy.

14. Copeland surface replacement of the Shoulder J Bone Joint Surg [Br]2007;89-B:1466-9.

The results of Copeland surface replacement shoulder arthroplasty using the mark III prosthesis in patients over 80 years of age.
End-stage arthritis of the shoulder is a source of significant pain and debilitating functional loss in the elderly. An arthroplasty offers good relief of pain and may allow the patient to maintain independence. The risk benefit ratio of shoulder replacement may be felt to be too high in an elderly age group, but there is no published evidence to support this theory. We have assessed whether the procedure was as reliable and safe as previously seen in a younger cohort of patients.

Between 1993 and 2003, 213 Copeland surface replacement arthroplasty procedures were performed in our unit, of which 29 (13.6%) were undertaken in patients over the age of 80. This group of patients was followed up for a mean of 4.5 years (2.1 to 9.3). Their mean age was 84.3 years (81 to 93), the mean operating time was 40 minutes (30 to 45) and the mean in-patient stay was five days (2 to 21). There were no peri-operative deaths or significant complications.
The mean Constant score adjusted for age and gender, improved from 15.1% to 77%. Copeland surface replacement shoulder arthroplasty may be performed with minimal morbidity and rapid rehabilitation in the elderly.

Technique

The operation was performed using a minimally invasive technique through the anterosuperior approach described by Neviaser .. This has the advantages of a smaller wound and easier access to the glenoid through the rotator interval, and to the posterior and superior cuff for reconstruction. An acromioplasty and excision arthroplasty of the acromioclavicular joint are carried out if indicated and to further improve the exposure. The details of the exposure and operating technique have been described previously. To expose the glenoid, the humeral trial component is left in situ to protect the head of humerus from damage by subsequent retraction. An extensive capsulotomy is made around the glenoid. Adequate exposure is provided by retraction of the humeral head posteroinferiorly using a Bankart skid (Biomet) or Fukuda (Biomet) retractor. The rotator cuff was intact in 13 shoulders, 12 with OA and one with AVN and deficient and torn in the remainder. A rotator cuff repair was carried out on seven patients. In a further six patients from the rotator cuff arthropathy group, a repair was attempted. The mean operating time was 40 minutes
The percentage of Americans aged over 65 years is expected to increase from 12.6% of the total population today to 20% by 2030.Many reports of hip and knee replacement in the octogenarian patient have shown significant improvement in pain and function.. However, there has been no account of the outcome following shoulder replacement. An increased rate of complications has been reported in elderly patients undergoing elective arthroplasty of the lower limb, but our complication rate was similar to that experienced in younger patients.
Reaming of the medullary canal and the use of bone cement is not necessary. Surface replacement, unlike the use of stemmed implants, avoids a focal stress riser at the distal tip of the implant. This is of particular relevance in patients with generalised osteopenia.

15.Medium- and long-term performance of 11 516 uncemented primary femoral stems from the Norwegian arthroplasty register J Bone Joint Surg [Br] 2007;89-B:1574-80

Primary uncemented femoral stems reported to the Norwegian arthroplasty register between 1987 and 2005 were included in this prospective observational study. There were 11 516 hips (9679 patients) and 14 different designs of stem. Kaplan-Meier survival probabilities and Cox regression were used to analyse the data.

With aseptic loosening as the end-point, all currently used designs performed excellently with survival of 96% to 100% at ten years. With the end-point as stem revision for any cause, the long-term results of the different designs varied from poor to excellent, with survival at 15 years ranging between 29% and 97%.

Follow-up for longer than seven years was needed to identify some of the poorly-performing designs. There were differences between the stems; the Corail, used in 5456 hips, was the most frequently used stem with a survival of 97% at 15 years. Male gender was associated with an increased risk of revision of 1.3 (95% confidence interval 1.05 to 1.52), but age and diagnosis had no influence on the results. Overall, modern uncemented femoral stems performed well. Moderate differences in survival between well-performing stems should be interpreted with caution since the differences may be caused by factors other than the stem itself.

The group 1 stems in our study all performed well with regard to fixation; this agrees with other reports. When the endpoint was revision for any reason, the best performing uncemented designs had a survival exceeding 95% at ten to 15 years. Although there were differences among the designs, all group 1 implants had a survival at ten years exceeding 90%.

Some implants, now discarded, performed poorly. In an early report from the register, Biofit, Femora and Harris-Galante implants showed high rates of failure at 4.5 years;17 these poor results were confirmed in the present study at long-term follow-up.

However, the ability of registers to detect small differences between the best performing designs is questionable. Since confounding factors other than age, gender,and diagnosis are not considered, small differences, although perhaps statistically significant, must be interpreted with caution.

Approximately 300 to 400 Corail stems comprising almost 50% of the total numbers, were implanted each year. For the other designs, this number was much lower, with possible adverse effects on survivorship. Familiarity with the Corail implant, therefore, may have contributed to its good survivorship and the importance of subtle differences in the results, although statistically significant, must not be overestimated

The Norwegian arthroplasty register is continually updated as new implants and modifications appear. In general, the impact of changes of design on survival cannot be assessed with certainty until long-term follow-up of the altered component is available.

The well-performing stem designs were all titanium alloys with rough or coated surfaces but differed in other aspects. Some were straight and others anatomical, fit and fill or flat-tapered. Some had an HA-coating on a blasted surface, some were porous-coated and some had HA on porous coating. It thus seems that more than one design philosophy allows good performance of the uncemented stem.

In conclusion, designs of femoral stem in current use all performed well, some excellently, with follow-up to 19 years. Survival of the implants was excellent when the endpoint was revision for aseptic loosening. When the endpoint was revision for any cause, there were differences among the stems.

15. Metal ion levels after metal-on-metal Ring total hip replacement. J Bone Joint Surg [Br]2007;89-B:586-90.

Despite early failure of the Ring and other metal-on-metal THRs, some have survived into their fourth decade. The reasons for this may include a polar bearing with sufficient clearance and good orientation of the component avoiding impingement. The absence of polyethylene and subsequent osteolysis together with wear rates between 40 and 100 times lower than those of metal-on-polyethylene bearing surfaces have renewed interest in the all-metal THR..

Metal-on-metal bearing surfaces have two wear phases. The first occurs within the first year of life or one million cycles while the bearing surfaces bed in.14 During this period surface carbides are shed with resultant third-body abrasive damage which is later partially or totally polished out of the main bearing zone. After this, levels of wear decrease to a steady state.15 The initial volumetric wear rate is up to five times greater than the subsequent long-term wear rate of the self-polished bearing surfaces.

Our data have shown that the levels of cobalt and chromium are approximately five and three times, respectively, those of normal. They are comparable with those from patients with modern metal-on-metal resurfacing

THRs at least one year after insertion and therefore in the steady-state phase of wear. We refer here to ratios rather than to exact figures since there appears to be a variation in the concentrations of metal ions in the various studies. The levels may be elevated, to a less degree, in metal-on-plastic bearings22 and this elevation may be attributed to the couple between the head and neck of a modular femoral component. It has not been seen in the Stanmore THRs in our study which were of a monoblock design.

The Ring implants in our series remained well-fixed with no radiological evidence of loosening. The activity levels of patients with these metal-on-metal THRs are low, but this may be explained by their age. This is supported by the low WOMAC pain subscale scores.

Whole-blood analysis may be a better measure of this exposure since it includes both intra- and extracellular compartments in which metal ions are transported.

Metal ions arising from wear and corrosion are released into the circulation and excreted through the kidney. Metal particles are in the nanometre range24 which may explain the wide distribution of these particles throughout the body

Cobalt-chromium prostheses may cause increases in aneuploidy and chromosomal translocations in peripheral blood lymphocytes. In vivo studies have shown perivascular infiltration of lymphocytes into the peri-prosthetic tissue surrounding a cobalt-chromium alloy metal-onmetal articulation.

These findings give rise to concern about the potential for malignant change after the insertion of metal-on-metal .However, data from the Finnish Cancer registry6 showed an incidence of cancer in line with that of the general population when considering mainly metal-on-polyethylene prostheses. Similar findings were reported for the McKee-Farrar metal-on metal THR after follow-up for 28 years.

Although these Ring metal-on-metal articulations were implanted at a relatively young age, few of the patients

retain these prostheses because of revision of the implant or morbidity and mortality. This is not surprising since most of the patients would now be in their tenth decade of life.

Our study is unique in demonstrating the levels of metal ions in well-fixed primary Ring metal-on-metal THRs with follow-up beyond 30 years albeit at a single point in time. These implants continue to release metal ions at levels which are comparable with those of modern metal-on metal THRs in the steady-state phase of wear.

.

16. A Minimally Invasive Surgical Technique for Augmented Reconstruction of the Lateral Ankle Ligaments with Woven Polyester Tape J Foot Ankle Surgery. Vol 46,6, 2007:416-423

Although stabilization of the lateral ankle ligament complex (LALC) with augmented techniques is known to be successful, it is associated with a number of complications. We hypothesize that successful stabilization of LALC can be achieved with a woven polyester tape implant via a minimally invasive procedure, as an alternative to tenodesis. Four men with chronic instability of the ankle underwent a minimally invasive surgical stabilization of LALC with a woven polyester tape. This tape was passed through the distal fibula to the base of the fifth metatarsal and then back to the fibula once more before being tied. The foot was immobilized in a neutral position for 2 weeks. Partial weight bearing with a walking stick began on the same day, and physiotherapy began for 10 weeks.

Evaluation was performed at a mean follow-up of 24.5 months postoperatively. Preoperatively, all patients had a chronically unstable index ankle both functionally and clinically. At a mean of 24.5 months postoperatively, functional stability for all patients was normal (Sefton grade 1). Subjective ankle performance grades were normal in all cases, and all patients felt the outcome was excellent. Objective measurement with clinical stress testing showed anterior drawer and inversion tests to be the same as the contralateral ankle in all patients. However, each displayed limited inversion of the ankle. No complications such as wound dehiscence, infection, pain, or nerve injury were observed after the procedure. All were able to return to their preinjury activity level within 3 months. Stabilization of LALC may be simply and successfully achieved with a woven polyester graft as an alternative to tenodesis.

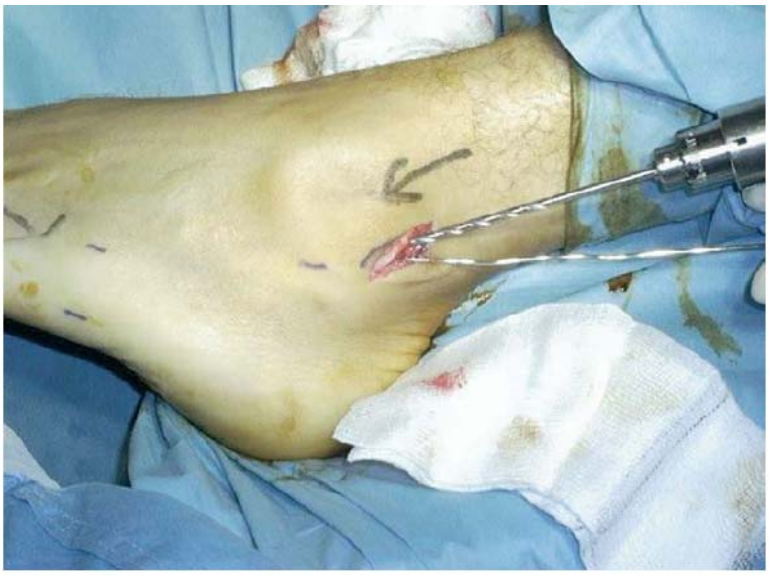


FIGURE 1 After sterile preparation of the skin, the tip and posterior border of the lateral malleolus were both identified and marked. The dorsal and plantar palpable edges of the fifth metatarsal were also identified and marked. A 2.5-cm-long incision was made running parallel to the posterior border of the lateral malleolus, just proximal to its tip down to the bone. By means of a 3.6-mm drill bit, a hole was drilled through the fibula at the level of the ankle joint directed posteroanteriorly and obliquely in a distal direction aiming toward the previously marked base of the fifth metatarsal. Once the far cortex of the fibula was penetrated, the drill was retracted. A second hole parallel to the first but 1.5 cm distal was also drilled (not shown).

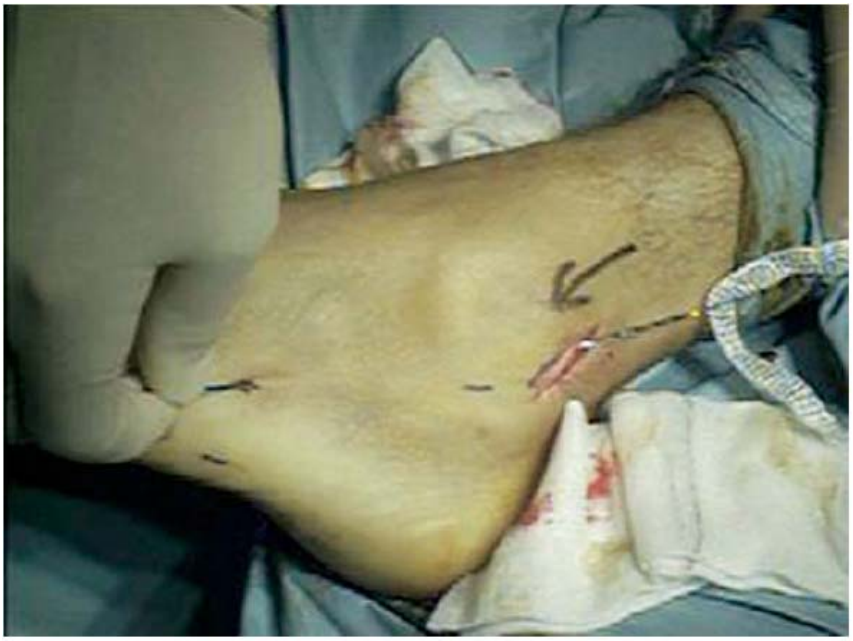
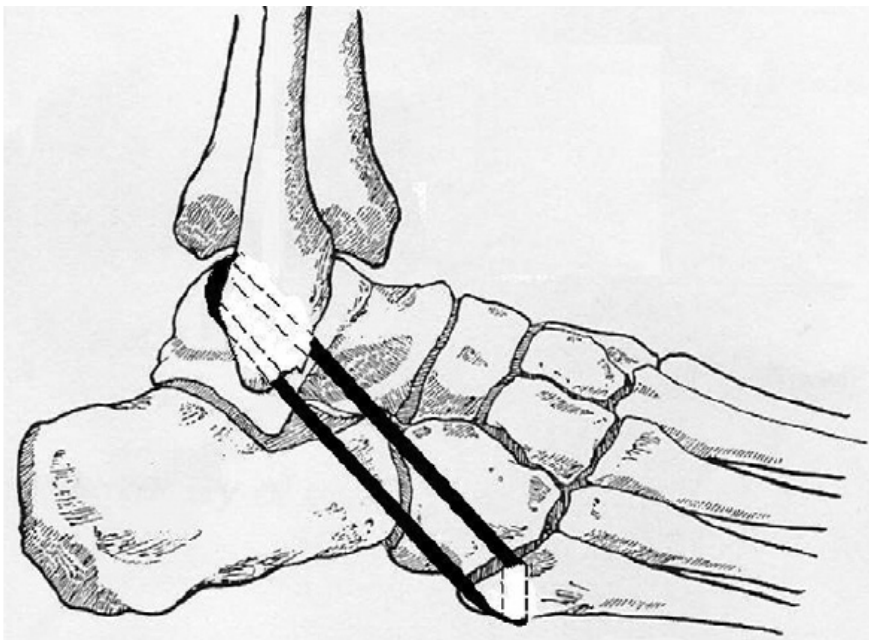


FIGURE 2 A woven polyester tape was mounted on a flexible-eyed probe and passed through the proximal hole posteroanteriorly. The probe was then guided subcutaneously to the marked dorsal aspect of the base of the fifth metatarsal, where its tip was felt underneath the skin. A stab incision was then made to allow the probe and tape to exit through the skin.



17.Controversies and Techniques in the Surgical Management of Patellofemoral Arthritis. Heckman J Bone Joint Surg [Am] 89-A;12 2007 :2788

At 90° of flexion, only the superior region of the patella is in contact with the distal aspect of the trochlear groove5. After 120° of flexion, only the most medial and lateral aspects of the patella come into contact with the femoral condyles.

The articular cartilage of the patella is the thickest of any in the body

Estimates of the forces through the patella range from 1.5 times body weight at 30° of flexion to six times body weight at 90° of flexion.

Aglietti et al.11 described a normal Q angle of 17° in females and 14_ in males.

As the knee is flexed past 30°, the patella engages the middle of the femoral sulcus13. Lateral subluxation of the patella in terminal extension is known as the ‘‘J sign.’’

The patellar McConnell tape technique can be useful when excessive lateral patellar translation and tilt

Arthroscopic lateral release: This procedure is frequently utilized and is most effective for treatment of isolated lateral patellar tilt.

Isolated patellofemoral arthritis occurs in up to 10% of patients who have osteoarthritis of the knee.

The use of TKR to treat severe isolated patellofemoral arthrosis that is recalcitrant to therapeutic measures has been well established for older patients

The correct placement of the tibial component is rotational alignment of the middle of the component’s anterior border with the tibial crest or the medial one-third of the tibial tubercle.

The combined amount of internal rotation of the femoral and tibial components is directly proportional to the severity of patellofemoral instability: 1° to 4° should be used when there is lateral tracking and patellar tilting; 3° to 8°, when there is patellar subluxation; and 7° to 17°, when there is early patellar dislocation

Treatment

1.Physio

2.Antiinflammatory

3. The patellar McConnell tape technique can be useful when excessive lateral patellar translation and tilt are part of the clinical presentation.

Surgical

1.Arthroscopic debridement

When a patient presents with mechanical symptoms and a loose body is suspected or confirmed on imaging studies, an arthroscopic d´ebridement may be warranted. A chondroplasty may also temporarily relieve discomfort

2.Arthroscopic Lateral Retinacular Release

This procedure is frequently utilized and is most effective for treatment of isolated lateral patellar tilt. When clinical and radiographic examinations confirm excessive lateral tilt, lateral facet arthritis may ensue (Fig. 1). Release of the lateral retinacular structures may decrease pressure on the lateral facet and decrease pain.

3. Lateral Patellar Facetectomy

In patients with long-standing Patellofemoral disease, excessive lateral tilt and/or translation may lead to the formation of a large lateral osteophyte visible on the Merchant radiograph

4.Proximal Soft-Tissue Realignment

Proximal soft-tissue realignment procedures have also been advocated as a way to unload the lateral facet and improve patellar tracking.

5.Distal Realignment

a.Osteotomy for Realignment and/or Resurfacing

Tibial tubercle transfer is recommended for treatment of patellofemoral arthritis in patients in whom unloading of discrete areas of patellar and femoral disease can lead to clinical success.

This procedure, known as the Maquet osteotomy, is designed to unload the more distal areas of the patella and decrease overall forces within the joint itself. It is particularly effective in younger patients with distal patellar articular degeneration

b.Medial Tibial Tubercle Transfer

This operation, known as the Elmslie- Trillat procedure, is a direct medial transfer procedure. It is effective for controlling instability and lateral tracking2

c.Anteromedial Tibial Tubercle Osteotomy [Fulkerson]

6.Autologous Cartilage Resurfacing

Autologous chondrocyte implantation may be indicated for the management of focal chondral defects in the knee of a young patient. The procedure may be considered when an intact joint space has been documented on radiographic examination

The patients were surveyed, and 71% were satisfied with the outcome, 16% were neutral, and 13% were dissatisfied.

7. Patellectomy

Patellectomy has been performed for over a century as one of the surgical treatments of severe anterior knee pain26,37. Its popularity has waxed and waned over time, with mixed results and opinions regarding its effectiveness.

One of us (J.P.F.) found that patellectomy provided adequate pain relief but with permanent loss of knee extensor power17. In the end, the results had deteriorated with time in the majorityof patients. The operation should be viewed as a salvage procedure, and the surgeon should warn the patient against unrealistic expectations concerning the outcome. Historically, the best results have been noted in patients with severe arthrosis of the patellofemoral joint.

8.Replacement [Patellofemoral Arthroplasty]

Patellofemoral arthroplasty can work well in patients of normal stature with isolated patellofemoral disease and no secondary gain issues.

Isolated patellofemoral arthritis occurs in up to 10% of patients who have osteoarthritis of the knee.

The Lubinus prosthesis was reported to have a 50% failure rate at eight years i
The Avon patellofemoral arthroplasty was a second-generation design:: results are better

9. Total Joint Arthroplasty

The use of total knee replacement to treat severe isolated patellofemoral arthrosis that is recalcitrant to therapeutic measures has been well established for older patients.

There is evidence of Retinacular release in these patients, which are as high as 68%, a threefold increase compared with the rates associated with standard TKA

Positioning of the femoral and tibial components is of supreme importance. Valgus angulation of the femoral component will increase the Q angle and produce a laterally directed muscle vector. This alignment error is more common in patients with degenerative arthritis who have a preoperative valgus deformity of >10_ combined with loss of bone stock of the distal part of the lateral femoral condyle

The current literature seems to favor patellar resurfacing. Multiple studies have demonstrated success with patellar resurfacing, with good relief of pain and good overall outcome. However, other studies have shown success without insertion of a patellar component. Ideally, a patient treated without patellar resurfacing should have no patellar arthritis

18.Arthroscopic Debridement for Grade III and IV Chondromalacia of the Knee in Patients Older Than 60 Years. Bekerom. J Knee Surg. 2007;20:271-276

ABSTRACT: Arthroscopic debridement has been used to treat patients with degenerative knee osteoarthritis, although there is sometimes conflicting evidence documenting its efficacy. This study evaluates the success of arthroscopic debridement in elderly patients with grade III and IV chondromalacia of the knee as measured by patient satisfaction and the need for additional surgery. From December 1998 to August 2001, a total of 102 consecutive cases of knee arthroscopy in 99 patients >60 years were performed. Average follow-up was 34 months (range: 7-104 months). Patients were asked about their satisfaction using a visual analog scale, and the presence of meniscal lesions during arthroscopy and the treatment for these lesions were evaluated. Knees also were assessed for articular surface degeneration using Outerbridge's classification for chondromalacia. The need for and type of additional surgery was evaluated. During arthroscopy, meniscal lesions requiring a partial meniscectomy were found in 95 knees.

Chondromalacia was found in 92 knees; 53 knees had grade I or II chondromalacia and 39 knees had grade III or IV chondromalacia. Additional surgery was performed in 17 knees. Mean patient satisfaction score was 73 (range: 50-100) in the 39 knees with grade III or IV chondromalacia after arthroscopic debridement was performed. These fi ndings suggest arthroscopic debridement in elderly patients has a place in the treatment algorithm for grade III or IV chondromalacia of the knee.[J Knee Surg. 2007;20:271-276.]

19.Syndesmotic screw. The Journal of Foot & Ankle Surgery , 2007)46(6):456–463

1. The use of syndesmotic screws in the presence of low fibular fractures, obligatory fixation appears to have no beneficial effects
2. Second, there is no indication for a syndesmotic screw in low fibular fractures when the lateral and medial malleoli are anatomically repaired and the deltoid ligament remains intact. However, when the posterior malleolus is fractured, the posterior syndesmotic ligament may remain intact and attached to the fragment, and it is usually necessary to fixate substantial posterior malleolar fragments to obtain a stable syndesmosis.

3.Third, in regard to syndesmotic ruptures associated with high 5 cm proximal to the tibiotalar interface) fibular fractures, anatomical reduction and stable fixation of the fibula is essential to the maintenance of a stable mortise

4. In the case of a fracture in the proximal third of the fibula, ORIF of the fibula is generally contraindicated because of the risk of peroneal nerve injury. If medial stabilization is obtained by fixating a medial malleolar facture, or there is no medial injury present,the syndesmosis may not require surgical fixation despite the presence of a high fibular fracture.

5.Finally, in regard to the decision to repair, and the choice of the method of syndesmotic stabilization, preoperative planning is essential but not sufficient to determine the necessity for syndesmotic fixation. Intraoperative testing (hook or external rotation tests) under fluoroscopy should be performed after reduction and fixation of the medial and/or lateral and/or posterior malleolar fractures and/or associated ligaments. Such testing can be performed with a bone clamp or hook to pull the fibula in a lateral and/or posterior direction, or by means of external rotation of the foot in the ankle mortise or the

modified Cotton test. Whenever the structural integrity of the tibiofibular syndesmosis is in doubt, syndesmotic fixationshould be performed.

II. FREE PAPER Popliteal Cyst After Failed Total Knee Arthroplasty

Vasu Pai MS, D[orth], National board [Orth], FICMR, FRACS[Orth], MCh[Orth], Vishal Pai MB Chb

ABSTRACT

A symptomatic popliteal cyst after total knee arthroplasty is rare. We present a case of a large popliteal cyst 5 years after TKA with symptoms of severe calf pain and swelling mimicking a primary tumor. The symptomatic cyst was excised completely in a first-stage operation, and the severely worn TKA was corrected by a second-stage surgical procedure. The patient in this report was pain free and had satisfactory range of knee motion 7 years after the index revision TKA, without recurrence of effusion or popliteal cyst formation.

Key words: Popliteal cyst, total knee arthroplasty, polyethylene wear.

INTRODUCTION

The popliteal cyst, first described by Adams[1] and named by Baker[2] Most often patients with cysts are asymptomatic or may present with calf tightness or calf pain during activity. Popliteal cysts may present with symptoms identical to thrombophlebitis and have been termed pseudothrombophlebids [3,4]. Popliteal cysts occur most frequently as a result of intra-articular knee pathology. Meniscal pathology, rheumatoid arthritis, and a wide variety of granulomatous diseases have been associated with popliteal cysts [5,6,7].

A popliteal cyst after total knee arthroplasty (TKA) is a rare occurrence, and there were only 2 reports in the literature[8,9]. We report a case of a large popliteal cyst resulting from a failed TKA, with symptoms of severe calf pain and functional disability and mimic primary soft tissue malignancy. The symptomatic cyst was excised completely in a first-stage operation and the severely worn TKA was corrected by a second- stage revision TKA.

CASE REPORT

A 74-year-old woman underwent TKA of the right knee (Miller Galante I, Zimmer, Warsaw, IN). for osteoarthritis 6 years ago. The postoperative position of the component and the alignment of the leg were satisfactory. The postoperative course was uneventful, until 5 years after surgery when the patient began to develop progressive pain and swelling over the back of the knee.

As the swelling increased in size within six months, she was referred back to our hospital for further investigation. On clinical examination of the right knee there was moderate pain and crepitation with knee motion. Range of motion of the knee was abnormal (range, 20°—95°). There was a large multilobulated, fluid-filled mass in the popliteal area extending medially. The mass was moderately tender, but no local heat was noted. The neurovascular status was intact.

Further investigation was carried out. Serum laboratory analyses (complete blood count, CRP, ESR, and liver function test were within normal limits.

Radiographs of the right knee showed a large soft tissue shadow in the popliteal and distal femur area.. Doppler examination of the right lower extremity was negative for deep venous thrombosis, and it showed a cystic lesion

containing fluid in the right popliteal region consistent with a popliteal cyst. Prosthesis alignment apparently appeared fine without any obvious osteolysis.

Aspiration of the cyst as well as joint revealed black stained fluid and culture of the fluid was negative for any organism or any urate cysts.

The large dissecting popliteal cyst was excised first because of severe pain and calf swelling from the cyst, rather than from the failed TKA. The patient was placed in the prone position, and the dissecting popliteal cyst was excised through a posterior approach [Fig 1]. During the operation, the cyst was found in the popliteal area, extending proximally to the distal femur and distally to the proximal calf. The popliteal cyst communicated with the prosthetic knee at the posteromedial aspect of the knee. The cyst was multilobulated [Fig 1] with a well-defined thick cystic wall containing blackish fluid filled. Microscopic examination revealed fibrous tissue with metallosis and foreign body reaction of the cyst wall. Polarized light microscopic examination showed numerous refractile extracellular polyethylene particulates throughout the cyst. Complete pain relief was achieved by the cyst removal. The postoperative course was uneventful.

Revision TKA was performed 6 weeks later. The patient underwent removal of a severely worn polyethylene tibial tray and patellar component and subtotal synovectomy of the knee [Fig 2,3]. There was extensive metallosis with synovial hypertrophy. A cemented revision TKA was performe.

At 8 years' follow-up, the knee was doing well, without recurrence of effusion or popliteal cyst formation

DISCUSSION

A dissecting popliteal cyst after TKA is a rare occurrence, and there are only 2 reports in the literature[8,9] In 1992, Dirschl[8] reported 4 cases with dissecting popliteal cysts as the presenting symptom of a malfunctioning TKA. Three patients had a revision procedure because of prostheses loosening or severe polyethylene wear of a tibial tray. The popliteal cysts were not excised. In 1983, Pavlov[9] described 2 patients with rheumatoid arthritis, who presented 2 and 3 years after surgery with symptoms mimicking thrombophlebitis. Arthrography showed popliteal cysts dissecting into the thighs of both patients. There was no loosening of either prosthetic knee. Both patients were treated nonoperatively.

The patient in our case developed a popliteal cyst six years after the primary TKA. The clinical manifestations mimic those of thrombophlebitis or a soft tissue sarcoma. The venous duplex Doppler test excluded the diagnosis of deep venous thrombosis or the sarcoma. The diagnosis of a popliteal cyst was established.

The black discoloration is due to metal debris staining the synovium as well as cyst wall and is a sign failure of TKA due to non-intentional metal on metal articulation secondary to complete poly loss.

The previous cases [8,9] in the literature concerning popliteal cyst formation after TKA were managed solely by component revision without addressing the cyst itself. The small dissecting popliteal cysts were not excised because of symptoms without deterioration. Dirschl and Lachiewicz[8] recommended correction of the intra-articular pathology first, with excision of the popliteal cyst performed at a later date if symptoms persisted. We performed a 2-stage procedure on this unique patient because of severe pain in the right calf associated with a

large dissecting popliteal cyst. The first-stage operation was complete excision of the popliteal cyst. Posterior pain relief was achieved by cyst removal. The second-stage operation was revision TKA to replace the damaged knee prosthesis.

Popliteal cysts after failed TKA usually contain fluid filled with polyethylene and metal debris . Polyethylene particulates from the wear of a total joint implant have been found to result in the failure of total joint arthroplasties [10,11,12]. Such a large cyst could occur and complicate the revision. Complete excision of the popliteal cyst not only resulted in complete symptom relief, but also prevented cyst recurrence and eliminated the polyethylene debris—induced factor of prosthesis loosening. In this circumstance, we believe that separate cyst excision was a good idea.

CONCLUSION

This case report illustrates what can develop when a total knee implant has failed and is allowed to shed large amounts of debris into the joint. Regular follow-up examinations of a joint prosthesis are crucial. This case report illustrates the possible implications of severe chronic effusions in joint implants. In this patient with a symptomatic popliteal cyst after failed TKA, We performed excision of the popliteal cyst first and correction of the intraarticular pathology at a second-stage procedure. The patient in this report was pain free and had satisfactory range of knee motion 5 years after the index revision TKA, without recurrence of effusion or popliteal cyst formation.

REFERENCES

1. Adams R: Chronic rheumatoid arthritis of the knee. Dublin Journal of Medical Science 17:520, 1840

2. Baker WM: On the formation of synovial cyst in the leg connection with disease of the knee joint. St. Bartholomew's Hospital Reports 13:245, 1887

3. Gibbons D, Phillips M, Prossor IM: Ruptured popliteal cyst simulating deep vein thrombosis with false positive radiofibrinogen uptake. Postgrad Med J 5 1:735, 1975

4 Childress HM: Popliteal cyst associated with undiagnosed posterior lesions of the medial meniscus. J Bone Joint Surg Am 36:1233, 1954

5. Jayson MIV, Dixon AJ: Valvular mechanisms in intra-articular cysts. Ann Rheum Dis 29:415, 1970

6.. Kates A, Pinder I, Coomes EN: Popliteal and calf cysts in rheumatoid arthritis treatment by anterior synovectomy. Ann Rheum Dis 31:9, 1972

7. Perri JA, Rodman GP, Mankin JM: Giant synovial cysts of the calf in patients with rheumatoid arthritis. J Bone Joint Surg Am 50:709, 1968

8. Dirschl DR, Lachiewicz PF: Dissecting popliteal cyst as the presenting symptom of a malfunctioning total knee arthroplasty. J Arthroplasty 7:37, 1992

9.Pavlov H, Steinbach L, Fried SH: A posterior ascending popliteal cyst mimicking thrombophlehitis following total knee arthroplasty (TKA). Clin Orthop179:204, 1983

10.Christensen OM, Christiansen TG, Johansen T: Polyethylene failure in a PCA unicompartment knee prosthesis. Acta Orthop Scand 61:578, 1990

11. Lindstrand A, Ryd L, Stenstrom A: Polyethylene failure in two total knees, wear of thin, metal-hacked PCA tihial components. Acta Orthop Scand 61:575, 1990

12. Santavirta 5, Koikka V. Eskola A, et al: Aggressive granulomatous lesion in the cementless total hip arthroplasty. J Bone Joint Surg Br 72:980, 1990

Fig 1

Exploration of the popliteal cyst in the right knee through a posterior approach showing dark metal stained cyst wall

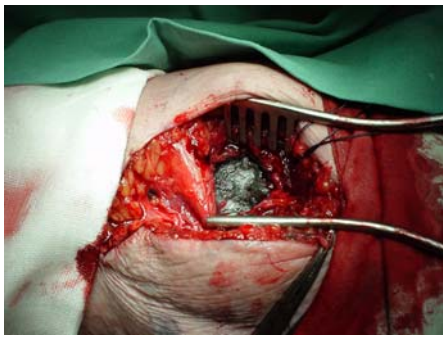


Fig 2

Exploration of the joint at second stage of surgery, through an anterior approach showing dark stained extensive synovial proliferation

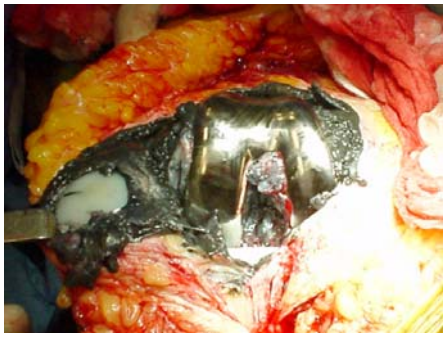


Fig 3

Retrieved prosthesis: metal backed patella, tibial tray and poly showing extensive wear, and femoral component

III. **PYOGENIC BONE INFECTION**

ACUTE OSTEOMYELITIS

Organism causing haematogenous Osteomyelitis

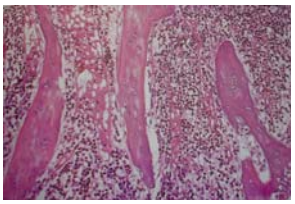
< 4 months	Staph Aureus
	Group A streptococci [not common as reported]
> 4 months	Stap Aureus
IV drug abuse	Staph, Pseudomonas
Post fixation[ORIF]	Staph Aureus
Nail puncture	Pseudomonas
Diabetic foot	Polymicrobial
Prosthetic infection	Staph Aureus and Staph Epidermides

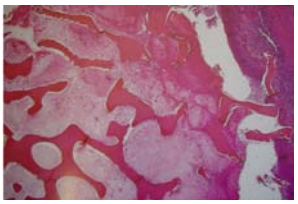
Histopathology

Acute inflammatory cells (PMNC) and fibrin

Bone destruction is yet to be evident

Osteocytic death





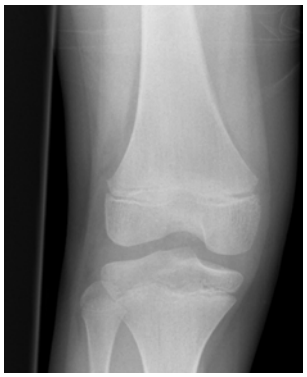
Septic screen

PMNC	>12,000 cells/cu mm
ESR	>30 mm/hour
CRP >	>10 units
Blood culture	Positive

CRP more sensitive than ESR and is commonly used. CRP comes down on 5th day and ESR in 6 weeks

Radiological

First 10 days	Soft tissue shadow may be present
Bone changes	Patchy osteopenia at 10 days
Later:	Faint periosteal reaction at 14 days
[> 2weeks]	Destructive lesions [cortical destruction]
>3 wks	Sequestrum, Involucrum [chronic]



Bone scan

Bone scan: Tc 99m

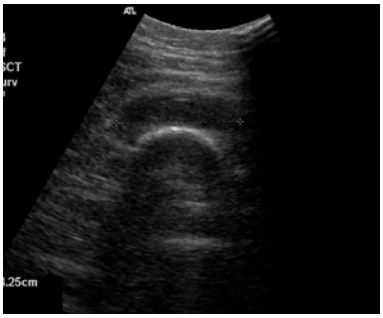
I phase	Flow phase	5 sec
II	Pool phase	5 minutes
III	Bone image	3 hours
IV	Delayed phase	24 hours

Note: Woven bone Vs Lamellar (woven Tc99 is bound even at 24 hrs; where as in Lamellar for the first 4 hour)

With the advent of MRI, Bone scan is not used often

Ultrasound

Ultrasound examination determines subperiosteal abscess . Appearance of Sandwich is seen, with pus on the either side of the periosteum. Elevation of the periosteum more than 2 mm is significant. It also shows the swelling of the over-lying muscle or subcutaneous. It could be detected within 24 hours of the onset.



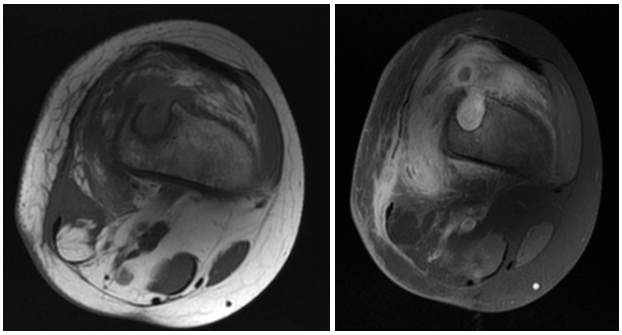
MRI

More sensitive. MRI is commonly used.

T1 low signal

T2 high signal in infection

Gad enhancement is positive



TREATMENT

Usually treatment is started on the clinical and blood investigation.

If no response within 24 hours then MRI is indicated which accurately depicts the amount of destruction, site of abscess, relation to the growth plate and helps in planning surgical approach.

Drug of choice IV Flucloxacillin 2 g qid [50 mg/kg wt] x 1 week

Mild allergy to penicillin: Cephazole

Severe allergy to penicillin: Vancomycin or clindamycin

Surgery if no clinical response by 24-hours

Culture and antibiotic (age/medical condition): Appropriate

IV 1-2 weeks and oral 3-5 wks (depending on response and hematological changes)

Protected weight bearing [weak bone may fracture]

Serial blood test: CRP

Repeat surgery if symptoms not settling

Technique

Tourniquet can be used but no exsanguinations.

Exposure periosteum at site of maximal tenderness. .Longitudinal periosteal incision.

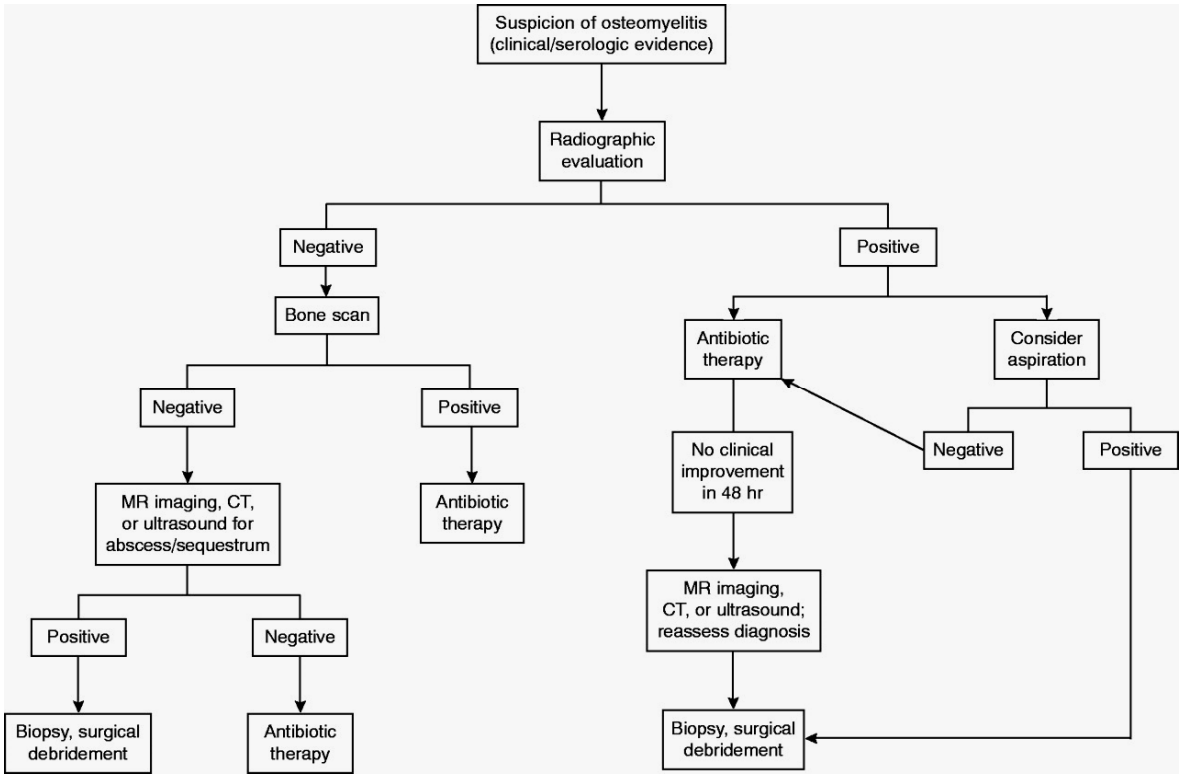
Pus drained and a through wash out is given.

Removed any devitalised tissue.

?drilling metaphysis of debatable benefit as pus is already out.

But if pus present on drilling, a small window and curettage.

Flow Chart



Internal fixation and infection

1. Septic screen
2. Culture swab
3. Surgical drainage
4. When fixation is good: Do not remove implant as instability outweighs foreign body
5. Gentamycin beads is useful
6. Repeat wash out after 48 hours and repeat beads
7. Clinical and hematological improvement means wound is ready for closure

   Either delayed or flap
8. Continue antibiotics for 6 wks
9. When fixation is inadequate, removal of the plate and then stabilization with an external fixation [Ilizarov] or

   Other external fixator

   In case of nailing, an over-reaming and an exchange nailing is indicated
10. When there is loss of tissue cover over the metal: exposed metal:

    Consideration for early removal is essential as eradication of the infection not possible.

    Then stabilize fracture in a cast or external fixation

CHRONIC OSTEOMYELITIS

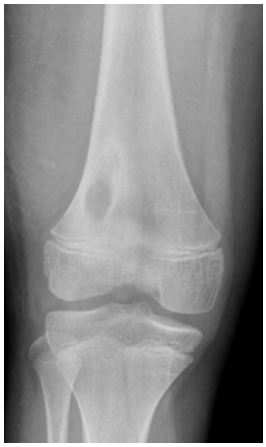
20% of acute Osteomyelitis can become Chronic Osteomyelitis. Uncommon these days because of early aggressive management.

Problems: Recurrent infection
Chronic fistula
Squamous cell Ca 1% (30 yrs)
Pathological fracture
Amyloidosis

Pathogenesis: Infection occurs in the metaphysis. The pus travels through the Haversian and Volkmann's canal to become subperiosteal. Lifting the periosteum, the cortical bone dies become infected dead bone "sequestrum". The new reactive bone formed is called " Involucrum". Sometimes "cloaca" forms in the bone and pus is drained out of the bone. Pus can come out of the skin through a Sinus.

In children, the periosteum is loosely fixed, extensive stripping occurs causing massive involucrum.. Sometimes a localized infection occurs due to less virulent staphylococcus "Brodies abscess"

X ray Site and extent,
Destruction of bone
Sequestrum [my need CT]
Implant



Bone scan: usually not required

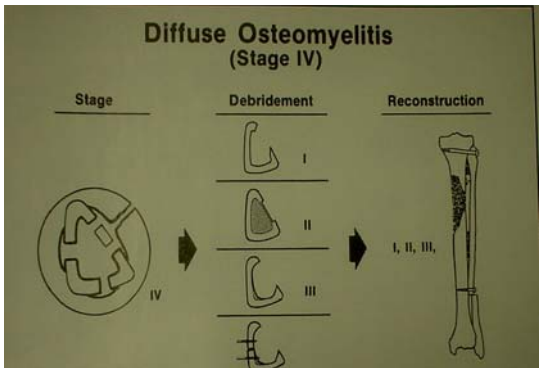
CT or Tomogram: for small sequestrum

IV Disulphine blue (Vascularized tissue becomes blue)

Culture: Deep culture is more important than from the sinus

The Cierny-Mader classification [OM = Osteomyelitis]

Type I Medullary Osteomyelitis
Type II Superficial Osteomyelitis
is confined to the bone surface.
Type III Localized Osteomyelitis involves the cortex and medulla
Type IV Diffuse Osteomyelitis. Requiring intercalary bone resection and bone stabilization.



Type A Good immune and Good local vascularity
Type B End-stage renal failure, malignancy, diabetes, HIV
Type C So severe that the morbidity of the treatment exceeds the disease

Traditional treatment

I. Cortical de-roofing

II. Decortication

III Saucerization: Use of high speed burr: until punctate bleading [Paprika sign]

IV Gentamycin beads

V Reconstruction: Soft tissue procedure

Bone transfer

VI Stabilization of the skeleton

Ilizarov or Orthofix.

VI IV antibiotics

Alternate treatment

1.Papineau

Initial thorough debridement and leave the wound open

Daily saline dressing for 3 weeks.

After 5 days autograft

Skin graft after 3 months

2. Amputation and prosthesis

GENTAMYCIN BEADS

Factor influencing elution

1. Cement porosity

2. Concentration of antibiotic

[Tobra 3 g/40 g of PMMA, Vanco 3 g; Cefazol 6 g]

3. Type of antibiotic

4. Size of the bead

Infected healed fracture

1. Infected but healed fracture tibia with plate and infection:

Removal of plate and sequestrum and septopal in addition to IV antibiotics as required

2. Infected IM nail: Removal of nail, Ream and introduce septopal nail in the marrow if fracture has healed.

3. Infected Nonunion:

Debridement, external fixation, Septaphal beeding, IV antibiotics

After 6 weeks, remove septopal and bone graft or Ilizarov

SEPTIC ARTHRITIS

Definition: Acute infectious joint disease, leading to destruction of articular cartilage.

Epidemiology

50% < age 3

Age < 1 year – hip

> 1 year– knee

Causes

Haematogenous

Intra-capsular metaphysis [infection from metaphysis into the joint]

e.g. prox. femur, humerus

Common organisms	<6 months	Staphylococcus Aureus Streptococcal A [not considered very common
	Children <3	Staphylococcus Aureus,Coliforms
Haemophilus Influenzae		Rare after vaccination With Varicella Streptococcal
Children >3		Staphylococcus Aureus
Young adult		Neisseria gonorrhoeae
Adults		Staphylococcus Aureus,
IV abusers		Gram Negatives
>50		Staphylococcus Aureus
		Gram Negatives,
		Streptococcal agalactasia

Polyarticular septic arthritis

1. Gonococcal
2. Lymes
3. Bacterial endocarditis
4. Virus: Rubella, HIV
5. Sapho syndrome

D/D: leukaemia

Collagen joints

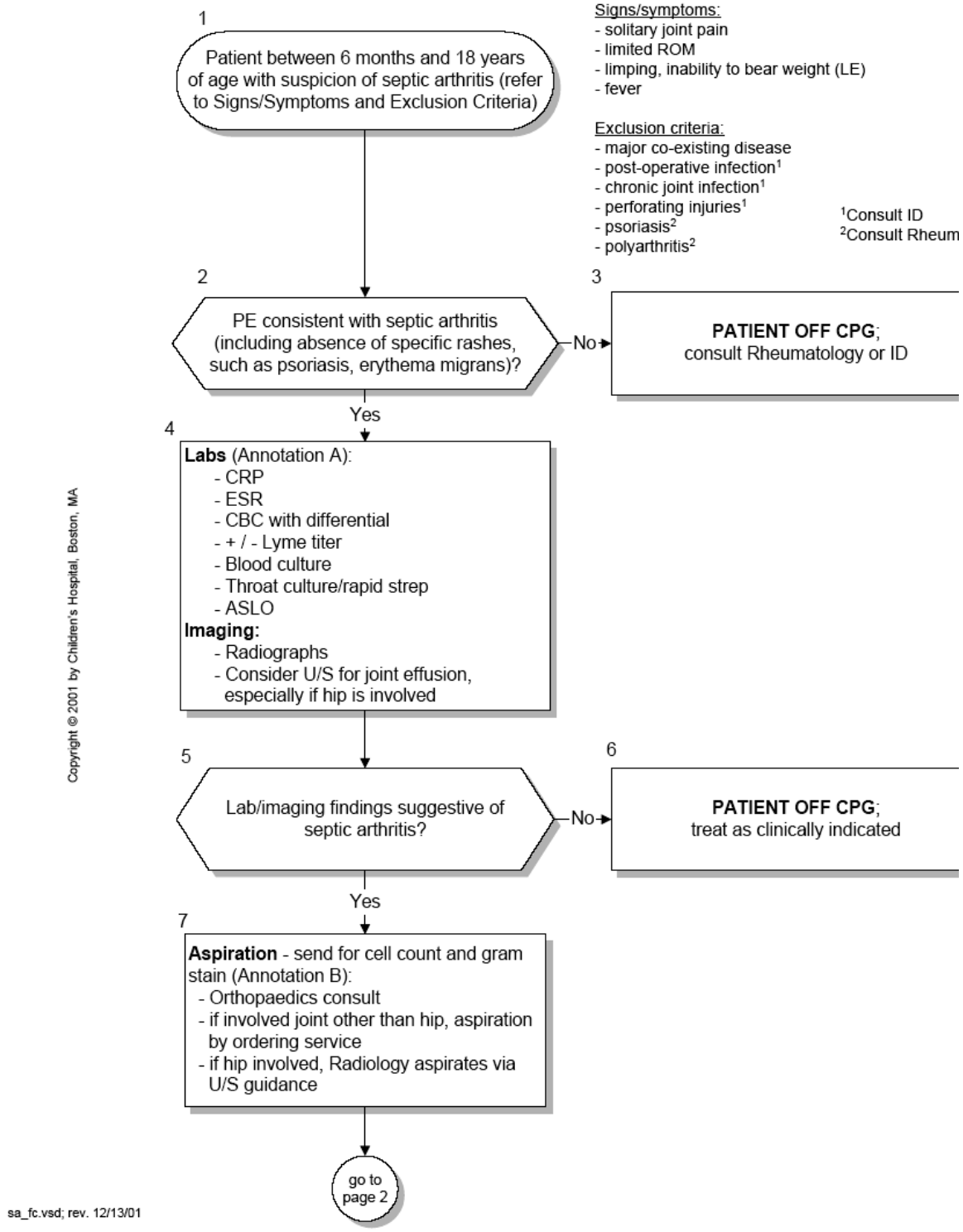
Treatment

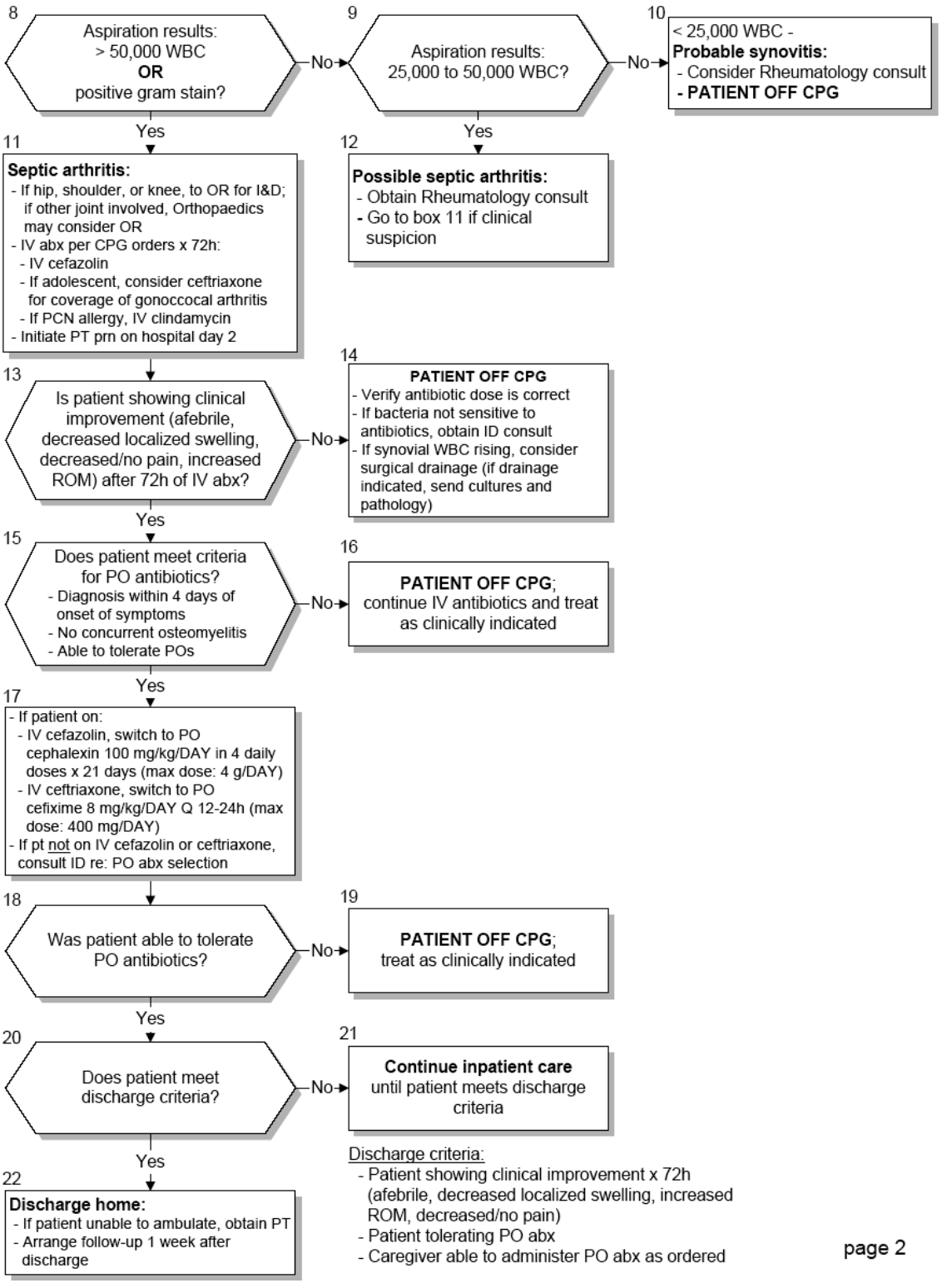
Aspiration and joint washout [open or arthroscopic]

Culture and sensitivity and IV antibiotics for 2 weeks and then oral antibiotics for further 2 weeks]

Initial rest and early mobilisation

SEPTIC ARTHRITIS CPG ALGORITHM




8
Aspiration results:
> 50,000 WBC
OR
positive gram stain?
No
9
Aspiration results:
25,000 to 50,000 WBC?
No
10
< 25,000 WBC -
Probable synovitis:
- Consider Rheumatology consult
- PATIENT OFF CPG
Yes
11
Septic arthritis:
- If hip, shoulder, or knee, to OR for I&D; if other joint involved, Orthopaedics may consider OR
- IV abx per CPG orders x 72h:
- IV cefazolin
- If adolescent, consider ceftriaxone for coverage of gonoccocal arthritis
- If PCN allergy, IV clindamycin
- Initiate PT prn on hospital day 2
Yes
12
Possible septic arthritis:
- Obtain Rheumatology consult
- Go to box 11 if clinical suspicion
13
Is patient showing clinical improvement (afebrile, decreased localized swelling, decreased/no pain, increased ROM) after 72h of IV abx?
No
14
PATIENT OFF CPG
- Verify antibiotic dose is correct
- If bacteria not sensitive to antibiotics, obtain ID consult
- If synovial WBC rising, consider surgical drainage (if drainage indicated, send cultures and pathology)
Yes
15
Does patient meet criteria for PO antibiotics?
- Diagnosis within 4 days of onset of symptoms
- No concurrent osteomyelitis
- Able to tolerate POs
No
16
PATIENT OFF CPG; continue IV antibiotics and treat as clinically indicated
Yes
17
- If patient on:
- IV cefazolin, switch to PO cephalexin 100 mg/kg/DAY in 4 daily doses x 21 days (max dose: 4 g/DAY)
- IV ceftriaxone, switch to PO cefixime 8 mg/kg/DAY Q 12-24h (max dose: 400 mg/DAY)
- If pt not on IV cefazolin or ceftriaxone, consult ID re: PO abx selection
18
Was patient able to tolerate PO antibiotics?
No
19
PATIENT OFF CPG; treat as clinically indicated
Yes
20
Does patient meet discharge criteria?
No
21
Continue inpatient care until patient meets discharge criteria
Yes
22
Discharge home:
- If patient unable to ambulate, obtain PT
- Arrange follow-up 1 week after discharge
Discharge criteria:
- Patient showing clinical improvement x 72h (afebrile, decreased localized swelling, increased ROM, decreased/no pain)
- Patient tolerating PO abx
- Caregiver able to administer PO abx as ordered

IV Current Concepts

Multimodal Thromboprophylaxis for Total Hip andKnee Arthroplasty Based on Risk Assessment.

By Lawrence D. Dorr. *J Bone Joint Surg Am.* 2007;89:2648-2657.

Background: Orthopaedic surgeons are increasingly challenged to find a prophylaxis regimen that protects patients from thromboembolism while minimizing adverse clinical outcomes such as bleeding. We used a multimodal approach in which the treatment regimen is selected according to patient risk factors.

Methods: We retrospectively reviewed the records on 1179 consecutive total joint arthroplasties in 970 patients who had undergone primary and revision total hip and total knee replacement. Preoperatively, patients were assigned to one of two deep venous thrombosis prophylactic regimens on the basis of an assessment of their risk factors. Eight hundred and fifty-six patients (1046 operations) were considered to be low risk and were managed with aspirin, dipyridamole, or clopidogrel bisulfate as well as intermittent pneumatic calf compression devices. One hundred and fourteen patients (133 operations) were considered to be high risk and were managed with lowmolecular-weight heparin or warfarin and intermittent calf compression. All patients were mobilized from bed within twenty-four hours after surgery, and all underwent Doppler ultrasonography within the twenty-four hours before hospital discharge. All of the patients were followed for six months postoperatively. The prevalence of asymptomatic and symptomatic distal and proximal deep venous thrombosis, symptomatic and fatal pulmonary emboli, overall mortality, and bleeding complications was determined. Thrombotic events were expressed as a percentage of 1179 operations because some patients had two or more operations.

Results: Overall, there were no fatal pulmonary emboli, three symptomatic pulmonary emboli (prevalence, 0.25%),and five clinically symptomatic deep venous thrombi (0.4%). Sixty-one asymptomatic deep venous thrombi (5.2%) were found with use of routine postoperative Doppler ultrasound scans. There were three deaths (prevalence, 0.25%) that were unrelated to thromboembolism, and there were two nonfatal gastrointestinal bleeding events (prevalence, 0.17%). Wound hematomas occurred in association with five (0.4%) of the 1179 operations. Three nonfatal pulmonary emboli (prevalence, 0.3%) were detected in association with the 1046 procedures in the low risk group, and none were detected in association with the 133 operations in the high-risk group ($p = 0.767$). Clinically symptomatic deep venous thrombosis was detected in association with four (0.38%) of the 1046 operations in the low-risk group and one (0.75%) of the 133 operations in the high-risk group ($p = 0.93$). Asymptomatic distal deep venous thrombosis was detected in association with thirty-seven (3.5%) of the 1046 procedures in the low-risk group and four (3.0%) of the 133 operations in the high-risk group. Asymptomatic proximal thrombosis was detected in association with fourteen (1.3%) of the 1046 procedures in the low-risk group and six (4.5%) of the 133 procedures in the high-risk group ($p = 0.03$). Wound hematomas occurred only in patients being managed with warfarin or low-modular-weight heparin ($p = 0.0001$).

Conclusions: A multimodal thromboembolic prophylactic regimen is consistent with protecting patients while limiting adverse clinical outcomes secondary to thromboembolic, vascular, and bleeding complications.

Level of Evidence: Therapeutic Level III. See Instructions to Authors for a complete description of levels of evidence.

The constituents of an optimal regimen that prevents thromboembolic complications after total hip and knee replacement remain controversial[1]. Symptomatic pulmonary emboli occur in association with all treatments and in the absence of evidence of venous thrombosis[2-6]. With chemical prophylaxis, the threat of postoperative bleeding must be balanced against the risk of thrombotic events[1,7,8]. Today, with better pain management, rapid mobilization of patients postoperatively, and shorter hospital stays[7-10], some authors have questioned whether routine chemoprophylaxis is necessary, especially because of the potential for complications such as bleeding, prolonged wound drainage, and hematomas[1-3,6,8,11].Thus, while the American College of Chest Physicians has concluded that chemical prophylaxis is the recommended safe and effective protection against thrombotic events[12,13], some within the orthopaedic community have challenged these recommendations as being not entirely applicable to patients undergoing total hip and total knee arthroplasty[1]. An ideal deep venous thrombosis prophylactic program would prevent thromboembolic disease while avoiding postoperative bleeding complications. The senior author (L.D.D.) has employed a multimodal program for low-risk patients that involves the use of aspirin as an antiplatelet, antithrombotic drug; intermittent pneumatic compression; early mobilization of the patient; hypotensive epidural anesthesia; and donated antilogous blood.Our program reserves the prophylactic treatment that is associated with the highest risk of bleeding and other complications for patients with the highest risk of venous thrombotic embolism. Patients who are deemed to be at high risk for deep venous thromboembolism receive chemical anticoagulation prophylaxis with low-molecular-weight heparin (enoxaparin; sanofi-aventis, Bridgewater, New Jersey) or warfarin (Coumadin; Bristol-Myers Squibb, Princeton, New Jersey) and the same adjunctive regimen of intermittent pneumatic compression and rapid mobilization. With this program, there have been no known deaths resulting from venous thrombotic emboli associated with primary or revision total hip or knee replacement operations in our practice since 1985. In the current report, we present a retrospective review of a consecutive series of patients who underwent primary and revision total hip and total knee arthroplasty with use of this multimodal thromboprophylaxis approach. Our hypothesis was that this cohort of patients would have no greater risk of death, readmission, and reoperation and would have a lower risk of hematoma and bleeding complication than the historically published risk associated with the use of chemical anticoagulation for all patients.

Materials and Methods

Demographic Characteristics

Nine-hundred and seventy patients underwent 1179 consecutive total hip and knee arthroplasties at our institution between January 2002 and July 2003. The study group included 418 men and 552 women. The procedures included 448 primary total hip arthroplasties, 152 revision total hip arthroplasties, 481 primary total

knee arthroplasties, seventy wo revision total knee arthroplasties, and twenty-six unicompartmental knee arthroplasties. One hundred and ninetyeight patients had multiple operations: 189 patients had two procedures, eight patients had three, and one patient had five. One hundred and twenty-nine patients had two joint arthroplasties under the same anesthetic. The mean age of the patients (and standard deviation) was 64.9 ± 11.9 years (range, 21.8 to 94.7 years). The mean body mass index was 28.9 ± 6.2 (range, 16.1 to 60.6), with a mean weight of 83.9 ± 21.2 kg (range, 36.3 to 180.5 kg) and a mean height of 170.1 ± 11.1 cm (range, 116.8 to 198.1 cm). The outcomes for these patients were reviewed retrospectively, and the institutional review board approved the review of their records. Each patient had signed a consent form for the review of their data. All patients had data available with follow-up to six months. The data from the time of hospitalization were obtained from the hospital chart, and follow-up data to six months were obtained from a review of the office records as well as from telephone responses from those who did not have sufficient office follow-up.

Treatment Regimen

All patients were instructed to stop taking any nonsteroidal anti-inflammatory medications and/or aspirin or warfarin five days before surgery, regardless of whether these medications were being used for the treatment of an unrelated medical condition. Preoperatively, all patients were managed with a multimodal pain-relief program that included the oral analgesic OxyContin (20 mg) (oxycodone CR; Purdue Pharma,Stamford, Connecticut) and Bextra (40 mg) (valdecoxib; Pfizer, New York, New York). Postoperatively, patients were given the oral analgesic regimens of either Darvon (65 mg) (propoxyphene; AAIPharma, Wilmington, North Carolina) or Norco (hydrocodone/acetaminophen; Watson Pharmaceuticals, Corona, California) or Vicodin (hydrocodone/acetaminophen; Abbott Laboratories, Abbott Park, Illinois) or Tylenol (acetaminophen; McNeil PPC, Fort Washington, Pennsylvania) for pain management with the avoidance of parenteral narcotics[14,15]. Each patient received Bextra (10 mg daily) unless medically contraindicated. Eight hundred and one (82.6%) of the 970 patients underwent surgery with a combination of epidural anesthesia and supplemental general anesthesia to provide sedation.

Eighteen patients (1.9%) had epidural anesthesia alone, and 151 patients (15.6%) had general anesthesia alone. The mean anesthesia time was 155.6 ± 41.8 minutes (range, sixty to 415 minutes). Intraoperatively, patients wore an elastic compression thromboembolic disease stocking (TED hose; Kendall,Mansfield, Massachusetts) on the uninvolved leg. The mean duration of hospitalization was 5± 2 days (range, zero to thirty six days). Postoperatively, physical therapy was begun on the day of surgery or the following morning. We did not use continuous passive range of motion machines for patients under going knee replacement. All patients were mobilized from bed within twenty-four hours after surgery, and all patients had a Doppler ultrasound (ACUSONSequoia C512; Siemens,Mountain View, California) examination of the venous system of both lower extremities within the twenty-four hours before hospital discharge. Real-time imaging was obtained from the external iliac vein through the proximal portions of the calf veins. A scan was considered to be negative if it showed complete patency of the lumen. All scans were performed by specialized technicians and were read by experienced radiologists postoperatively.

Patients who had symptoms of pain and swelling consistent with a clinical suspicion of deep venous thrombosis underwent Doppler ultrasonography for diagnostic purposes. Patients who had symptoms suggestive of pulmonary embolism had ventilation-perfusion scans for diagnosis. Preoperatively, patients were divided into

two treatment groups on the basis of their risk for venous thromboembolism.The low-risk group comprised 504 patients (607 procedures) with no risk factors and 352 patients (439 procedures) with low-risk factors. The low-risk factors were cardiac disease (congestive heart failure) that was classified as Class I according to the system of the New York Heart Association[16] (eighty-three patients, 106 procedures), prior deep venous thrombosis that had occurred more than five years previously (fifteen patients, seventeen procedures), inactive malignant disease (eighty-two patients, 105 procedures), current use of hormone replacement therapy (ninety-four patients, 116 procedures), chronic tobacco use (seventy-four patients, ninety procedures), and blood disorders of the sickle-cell trait, polycythemia vera, or thrombocytopenia (four patients, five procedures). Some patients had a combination of these factors. In the low-risk group, 856 patients (1046 procedures) received antiplatelet chemoprophylaxis and were managed with an intermittent pneumatic compression device (Plexi-Pulse foot compression [KCI, San Antonio, Texas] or Flowtroncalf compression [Huntleigh Healthcare, Eatontown, New Jersey]). Eight hundred and fourteen patients (999 procedures) received aspirin, forty-one patients (forty-six procedures) received dipyridamole (Persantine; Boehringer Ingelheim Pharmaceuticals, Ridgefield, Connecticut), and one patient was maintained on clopidogrel bisulfate (Plavix; Bristol-Myers Squibb, Princeton,New Jersey). On the day of surgery, patients were given a 600-mg aspirin suppository in the recovery room and then were given aspirin (Ecotrin; GlaxoSmithKline, Pittsburgh, Pennsylvania) at a dosage of 325 mg orally twice each day postoperatively for one month. Patients who were intolerant of aspirin preoperatively or who had development of intolerance to aspirin postoperatively were converted to treatment with dipyridamole at a dosage of 25 mg three times a day. For all patients, intermittent pneumatic compression devices were applied in the recovery room to both legs, and these remained in place day and night for the duration of the acute hospitalization.All low-risk patients who had the occurrence of a proximal deep venous thrombosis as diagnosed with Doppler ultrasound or who had a pulmonary embolism were converted to chemical prophylaxis (Fig. 1). Patients who had a distal (calf) deep venous thrombosis as diagnosed with Doppler ultrasound One hundred and fourteen patients (133 operations) constituted the high-risk group. The high-risk factors were a history of a venous thromboembolic event that had occurred within the previous five years (thirty-one patients, forty-two procedures), congestive heart failure that was classified as Class II or III according to the system of the New York Heart Association (fifty-two patients, fifty-six procedures), atrial fibrillation with cardiac disease and use of Coumadin preoperatively (sixteen patients, eighteen procedures), recent surgery for the treatment of malignant disease or current adjuvant drug treatment (ten patients, twelve procedures), and thrombophilia, including factor V Leiden, prothrombin disorders, protein-C and S deficiency, antithrombin disorders, or hypercoagulability states (five patients, five procedures). Some patients had a combination of these factors.High-risk patients were managed postoperatively with enoxaparin (40 mg per day) or Coumadin (with a target international normalized ratio of 2 to 2.5) and the same intermittent pneumatic compression regimen as was used for low-risk patients. They were initially managed with aspirin for twenty-four to forty-eight hours, at which time the anticoagulation drug was initiated and aspirin was discontinued. This delay was an attempt to prevent wound hematoma as well as to provide protection against epidural hematoma for patients who had an epidural catheter in place for twenty-four hours for the postoperative administration of pain medication. Enoxaparin was continued for ten days, and then the patient was again placed on aspirin for one month. Coumadin was continued for six weeks or as prescribed for medical conditions.Patients who had deep venous thrombosis during the study and were being managed with low-molecular-weight heparin were converted to

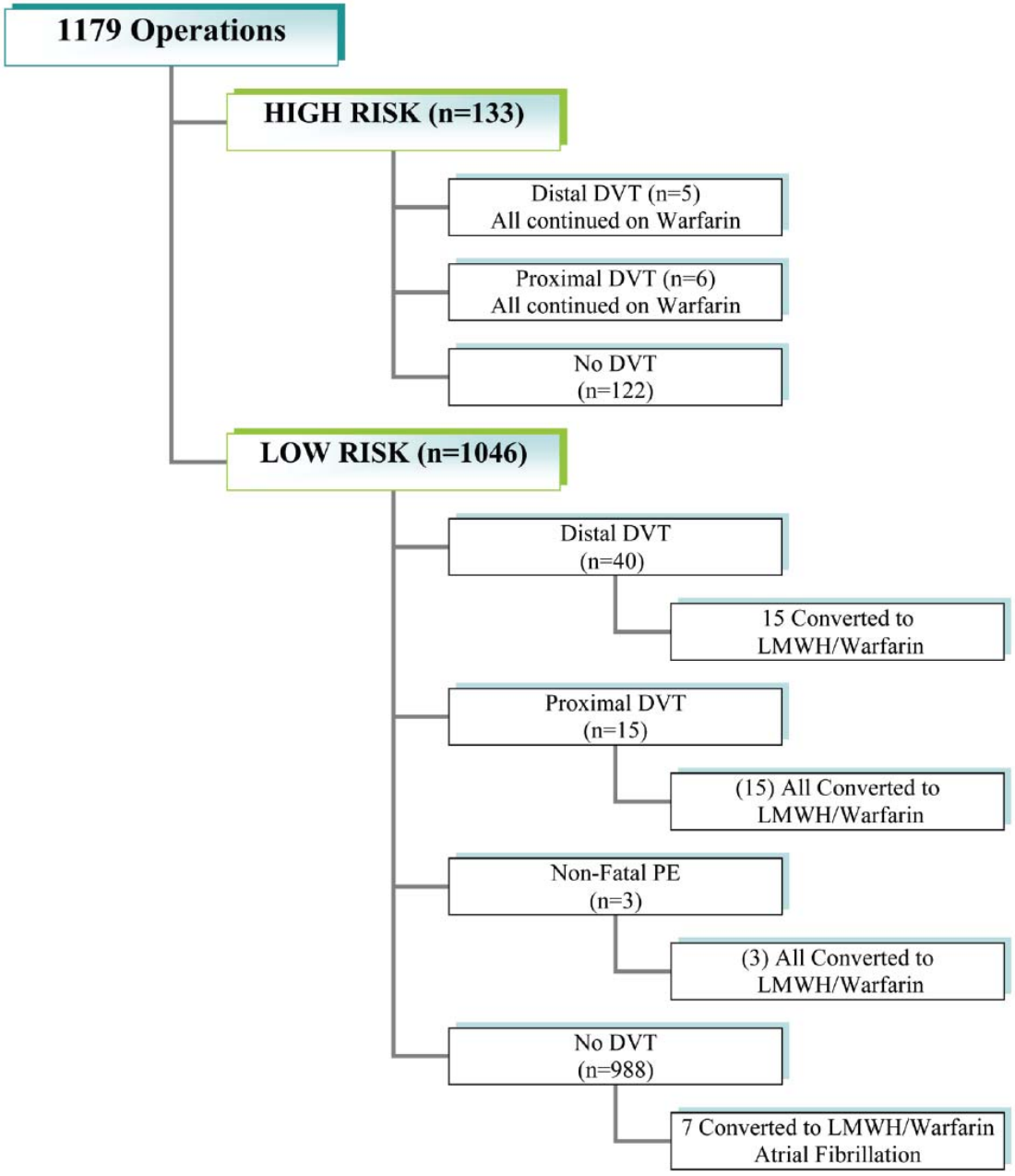


Fig. 1

Treatment flowchart and venous thromboembolic event distribution. DVT = deep venous thrombosis, PE = pulmonary embolism, and LMWH = low-molecular-weight heparin.

TABLE I Prevalence of Venous Thromboembolic Events (VTE) in Low-Risk-Factor Group*

Low-Risk Factor	No VTE	Asymptomatic Distal VTE	Symptomatic Distal VTE	Asymptomatic Proximal VTE	Symptomatic Proximal VTE	Pulmonary Embolism	Total
No risk factors	593	11	2	1	0	0	607
Congestive heart failure	86	10	0	9	0	1	106
Deep venous thrombosis >5 years previously	15	1	0	1	0	0	17
Inactive malignant disease	98	4	1	0	1	1	105
Blood dyscrasias	4	0	0	1	0	0	5
Hormone replacement therapy	108	6	0	2	0	0	116
Tobacco use	84	5	0	0	0	1	90
Total	988	37	3	14	1	3	1046

*N = 856 patients (1046 operations). The results are reported as the number of procedures.

TABLE II Prevalence of Venous Thromboembolic Events (VTE) in High-Risk-Factor Group*

High-Risk Factor	No VTE	Asymptomatic Distal VTE	Symptomatic Distal VTE	Asymptomatic Proximal VTE	Symptomatic Proximal VTE	Pulmonary Embolism	Total
Congestive heart failure	56	0	0	0	0	0	56
Atrial fibrillation/cardiac	18	0	0	0	0	0	18
Deep venous thrombosis ≤5 years previously	33	4	1	4	0	0	42
Malignant disease	12	0	0	0	0	0	12
Thrombophilia (with malignant disease or deep venous thrombosis)	3	0	0	2	0	0	5
Total	122	4	1	6	0	0	133

*N = 114 patients (133 operations). The results are reported as the number of procedures.

warfarin and continued to receive that agent for three to six months; patients who were already receiving warfarin continued to receive that agent for three to six months. Regardless of the treatment group, the rehabilitation protocol encouraged each patient to begin walking out of doors upon return to home. Supervised physical therapy was used only for patients who required it, who were primarily those who had been treated with knee arthroplasty. Patients who had been managed with either a primary total hip or total knee replacement were allowed to be fully weight-bearing upon return to home and were encouraged to advance to a cane as quickly as was safe. Patients who had had a revision operation were mobilized in the same way as patients who had had primary arthroplasty but used two crutches for six weeks with 50% weight-bearing on the involved limb.

Data Collection

All 970 consecutive patients were included in the study. All were followed for at least the first six months postoperatively. Patients who had more than one operation during the course of the study were evaluated separately during each hospitalization, and all operations were considered as separate events.

Results

Symptomatic pulmonary emboli occurred in three patients (three operations; 0.25%) after discharge, at a mean of 45.3 days (range, four to ninety days) postoperatively. All three nonfatal pulmonary emboli were in the low-risk group (p = 0.77) (Fig. 1, Tables I and II). The pulmonary emboli occurred after total knee replacement in two patients (at four days and six weeks postoperatively) and after total hip replacement in one patient (at three months postoperatively). In the entire group, symptomatic and asymptomatic deep venous thrombi (proximal and distal) occurred in association with sixty-six (5.6%) of the 1179 procedures. Fifty-five deep venous thrombi occurred in the low-risk group, and eleven occurred in the high-risk group (p = 0.21) (Fig. 1).Clinically symptomatic proximal or distal deep venous throm-bosis was detected in association with four (0.38%) of the 1046 operations in the low-risk group (Table I) and one (0.75%) of the 133 operations in the high-risk group (p = 0.93) (Table II). Overall, asymptomatic deep venous thrombosis (either proximal or distal) was identified on discharge Doppler ultrasonography in association with sixty-one (5.2%) of the 1179 operations (Tables I and II). Asymptomatic deep venous thrombi occurred in association with fifty-one (4.9%) of the 1046 operations in the low-risk group and ten (7.5%) of the 133 operations in the high-risk group (p = 0.26). Proximal thrombi occurred in association with fifteen (1.4%) of the 1046 procedures in the low-risk group, compared with six (4.5%) of the 133 procedures in the high-risk group; this difference was significant (p = 0.029) (Table III). The occurrence of venous thrombi according to the type of operation is presented in Table IV. Deep venous thrombosis occurred in association with twelve (2%) of 600 hip procedures and fifty-four (9.3%) of 579 knee procedures (p = 0.001).

Treatment

In the high-risk group, the patients with symptomatic and asymptomatic deep venous thrombi were managed with war-farin for six weeks. No venous thromboembolic disease occurred in association with 122 of the 133 procedures (Fig. 1).In the low-risk group, 822 patients (representing 1006 [96.2%] of the 1046 procedures) did not require conversion to anticoagulant chemoprophylaxis (Fig. 1). Overall, thirty-four patients in the low-risk group (representing forty of the 1046 operations) were switched to low-molecular-weight heparin or warfarin because they had development of symptomatic or asymptomatic venous thromboembolic disease (thirty-three procedures) or postoperative atrial fibrillation (seven procedures) (Fig. 1). Symptomatic and asymptomatic patients with distal clots were followed with Doppler ultrasonography seven to twelve days later, and there was no proximal progression or increase in the size of the clot in any of these patients.

Risk Factors and Thrombosis

Overall, there was no significant difference between patients with or without a thrombotic event with respect to gender, body mass index, height, type of anesthesia, prior medications, tobacco use, anesthesia time, duration of hospitalization, primary or revision surgery, bilateral simultaneous or unilateral surgery, or surgeon. The relative risk of development of deep venous thrombosis (as measured with the Lambda coefficient) was strongest for location (knee, 0.964); a history of venous thrombotic embolism (0.959); a history of the medical risks of congestive heart failure, malignancy, or blood dyscrasias (0.956); and a history of thrombophilia (0.948).In the low-risk group, three risk factors increased the odds of development of a venous thromboembolism as compared with the odds when there was no risk factor: congestive heart failure (odds ratio, 7.7; p = 0.0001), inactive

malignant disease (odds ratio, 3.1; p = 0.014), and hormone replacement therapy (odds ratio, 3.2; p = 0.008). Only congestive heart failure (odds ratio, 6.2; p = 0.0005) increased the risk of a proximal deep venous thrombosis. The general Logit loglinear analysis of the low-risk group showed that age was not related to any risk factor and was not itself a risk factor.

In the high-risk group, the only risk factor associated with deep venous thrombosis was a history of deep venous thrombosis that had occurred within the previous five years. Two of the patients with prior deep venous thrombosis also had thrombophilia. No odds ratio could be calculated because there were no patients with no risk factors. There was no identified progression of clots in any of these patients on follow-up Doppler ultrasound.

Complication

Five (0.4%) of the 1179 operations were associated with a wound hematoma, necessitating three reoperations and one readmission. All five hematomas occurred in patients receiving low-molecular-weight heparin (three patients) or warfarin (two patients). Three of the five patients with a hematoma had been converted from treatment with aspirin to treatment with low-molecular-weight heparin, and two were in the high-risk group. Therefore, overall, hematoma developed in association with five (2.9%) of the 173 procedures in patients receiving warfarin or low-molecular-weight heparin. In comparison, none of the 1006 procedures in patients receiving aspirin or dipyridamole were associated with a hematoma (p = 0.0001). Two of the five hematomas occurred in patients managed with total knee replacement, and three occurred in patients managed with total hip replacement. Both patients with a total knee replacement ultimately had reduced range of motion after the hematoma, with a range of 5_ to 95_ in one patient and of 0_ to 85_ in the other patient. All three patients with a total hip replacement had a satisfactory outcome. There were two gastrointestinal bleeding events (prevalence, 0.17%).One occurred in a patient with a history of thyroid carcinoma who was receiving aspirin and ibuprofen (Advil;Wyeth Pharmaceuticals, Collegeville, Pennsylvania), and the other occurred in a patient who was receiving low-molecularweight heparin. Thrombocytopenia developed in one patient (0.1%) who was receiving low-molecular-weight heparin, and the prophylaxis was changed to warfarin. These complications did not

influence the patients' ultimate function.

TABLE V Complications According to Treatment Regimen

Complication	Low-Molecular-Weight Heparin/ Warfarin (173 Procedures*)	Antiplatelet Agents (1006 Procedures)	P Value†
Bleeding complications			
Hematoma	5 (2.9%)	0	0.0001
Gastrointestinal bleeding	1 (0.6%)	1 (0.1%)	0.68
Total	6 (3.5%)	1 (0.1%)	0.0001
Compromised joint function	2 (1.2%)	0	0.01
Thrombocytopenia	1 (0.6%)	0	0.32
Death	1 (0.6%)‡	2 (0.2%)§	0.92

*Includes 133 high-risk procedures and forty procedures in patients who had been converted from treatment with aspirin. †The level of significance was set at $p < 0.05$. ‡Chronic renal disease. §Acute dissecting aortic aneurysm (one patient) and fat embolism (one patient).

TABLE VI Summary of Chemical Anticoagulation Studies 1996 to Present*

Study	Prescribed Prophylaxis	Number of Procedures	Prevalence of Deep Venous Thrombosis *(%)*		Prevalence of Pulmonary Embolism *(%)*
			Overall	Symptomatic	
Our study	Multimodal	1179 total hip and total knee replacements	5.6	0.4	0.25 nonfatal
Warwick et al.[25]†	"No routine chemoprophylaxis"	1162 total hip replacements	N/A	1.89	1.20 nonfatal, 0.34 fatal
Lieberman et al.[21]	Low-dose warfarin	1099 total hip replacements	N/A	0.5 ($p = 1.0$)	1.1 nonfatal ($p = 0.02$), 0.1 fatal
Fitzgerald et al.[19]	Enoxaparin	108 total knee replacements	38.0 ($p < 0.001$)	N/A	0.0
	Warfarin	122 total knee replacements	59.0 ($p < 0.001$)	N/A	0.0
Colwell et al.[18]	Enoxaparin	1516 total hip replacements	2.6 ($p = 0.003$‡)	N/A	0.4 nonfatal ($p = 0.66$), 0.1 fatal
	Warfarin	1495 total hip replacements	2.9 ($p = 0.0002$‡)	N/A	0.6 nonfatal ($p = 0.07$), 0.1 fatal
Pellegrini et al.[7]	Warfarin	1079 total hip replacements	6.1 ($p = 0.66$)	1.2 ($p < 0.0001$)	1 nonfatal ($p = 0.08$), 0.2 fatal
Colwell et al.[17]	Warfarin	960 total knee replacements	21.9 ($p < 0.001$)	1.3 ($p = 0.047$)	0.4 nonfatal ($p = 0.71$)
	Ximelagatran	976 total knee replacements	31.4 ($p < 0.0001$)	0.7 ($p = 0.4$)	0.2 nonfatal ($p = 1.0$)
Francis et al.[20]	Warfarin	190 total hip replacements	26.0 ($p < 0.0001$)	NA§	NA§
	Dalteparin	192 total hip replacements	15.0 ($p < 0.0001$)	NA§	NA§

*Meta-analyses not included. †This study was published in 1995 but is included as a benchmark for a study that involved the use of no prophylaxis at all. ‡These values are significantly better than those in the present study, whereas all other statistical results are equivalent or significantly worse than those in the present study. (The level of significance was set at $p < 0.05$) §NA = not available.

TABLE VII Summary of Multimodal Studies from 1999 to Present

Study	Prescribed Prophylaxis*	Number of Cases	Prevalence of Deep Venous Thrombosis† *(%)*		Prevalence of Pulmonary Embolism† *(%)*
			Overall	Symptomatic	
Present study	Aspirin + intermittent pneumatic compression	1179 total hip and total knee replacements	5.6	0.4	0.25 nonfatal
Lotke and Lonner[23]	Aspirin + intermittent pneumatic compression	3473 total knee replacements	NA‡	0.2 (p = 0.19)	0.26 nonfatal (p = 1.0), 0.06 to 0.14 fatal
DiGiovanni et al.[22]	Aspirin + intermittent pneumatic compression	1021 total hip replacements	8.0 (p = 0.03)	0.85 (p = 0.18)	0.5 nonfatal (p = 0.48)
Westrich et al.[24]	Aspirin + intermittent pneumatic compression	2037 total hip replacements	10.3 (p < 0.0001)	NA‡	2.0 nonfatal (p < 0.0001), 0.04 fatal
Lachiewicz and Soileau[4]	Intermittent pneumatic compression (aspirin at home)	1032 total hip replacements	3.9 (p = 0.073)	0.4 (p = 1.0)	0.7 nonfatal (p = 0.2), 0.09 fatal

*In these studies, high-risk patients were managed with warfarin or enoxaparin. †All statistical values were either equivalent or significantly worse than our data. (The level of significance was set at p < 0.05) ‡NA = not available.

Discussion

Our multimodal treatment was just as effective, and at least as safe, as regimens involving the use of chemical anticoagulation drugs alone[7,17-21,25].

An important aspect of the present study is that it included a consecutive patient population, which represents the usual practice of total hip and total knee replacement surgeons. The advantages of this study population are that it represents the clinical outcome of treatment of ''all-comers,'' it does not exclude high-risk patients (as most randomized chemoprophylaxis studies do), and it does not represent the results for just one operative group, for example, only patients managed with total hip replacement[22,24]. The second important finding of the present study is that the low-risk group had a significantly lower prevalence of proximal deep venous thrombosis and a nonsignificant difference in the prevalence of nonfatal pulmonary embolism when compared with the highrisk group (Table III), without being subjected to the risks of bleeding from chemoprophylaxis.

The first limitation of the present study was that it was not randomized. However, a weakness of previous randomized studies is that they excluded at-risk patients, combined symptomatic and asymptomatic thrombi in the analyses, and did not include clinical outcomes (with the exception of death) for patients with complications, especially hematomas[17-20]. The second limitation was that we studied only antiplatelet drugs for the low-risk group. Pellegrini et al.[7] used low-dose warfarin (international normalized ratio, 1.3 to 1.5) instead of full anticoagulation with warfarin or low-molecular-weight heparin and reported a 0.2% prevalence of fatal pulmonary embolism, a 0.8% prevalence of symptomatic pulmonary embolism, a 1.2% prevalence of bleeding complications, and no deaths as a result of bleeding. Both aspirin and low-dose warfarin are more protective against proximal clots than they are against distal clots, so we believe that the combination of either of these drugs with intermittent pneumatic compression is protective against clots while providing safety from bleeding[2,8,11].

We prefer to use aspirin because it is protective against bleeding[2,3,5,6,26-29], arterial complications[26-30], and heterotopic ossification [8]. It is also less expensive and less cumbersome to use than low-dose warfarin because blood levels do not need to be monitored. The third limitation is that our study cannot be considered to be

conclusive because of its design and the number of patients. However, the present study suggests that total hip arthroplasty and total knee arthroplasty patients can be managed effectively and safely without following American College of Chest Physician guidelines. The studies in Table VII support our findings[4,22-24], and we believe that it is now time to perform a multicenter prospective, randomized study of the efficacy of multimodal prophylaxis.Our data were obtained with use of Doppler ultrasound examinations, which have been validated as an accurate measurement for deep venous thrombosis[13,31,32]. Routinescreening with venous Doppler ultrasonography is controversial, but we found it to be helpful for assessing and then modifying our treatment regimen when it showed proximal deep venous thrombosis. For example, nine patients with New York Heart Association Class-I congestive heart failure (low-risk group) had asymptomatic proximal deep venous thrombi that were discovered on the discharge Doppler ultrasound. Our data suggest that Class-I congestive heart failure can be clinically safely treated as a low-risk factor if routine screening is performed to detect proximal clots. The present study, however, did not address the question of the necessity of treating asymptomatic distal venous clots with conversion to chemoprophylaxis.In a meta-analysis, Imperiale and Speroff reported the prevalence of major bleeding episodes after total hip replacement to be 0.3% in association with no prophylaxis, 0.4% in association with aspirin, 1.3% in association with warfarin, 1.8% in association with low-molecular-weight heparin, and 2.5% in association with unfractionated heparin[3]. Since 1996, studies on the routine use of heparin agents or normal-dose warfarin have shown a total rate of major bleeding events of 1.3% (100 of 7737) (clinical outcomes not reported), with three deaths from bleeding (prevalence, 0.04%)[7,17-21]. Two of the three patients who died were receiving warfarin, and the third was receiving ximelagatran therapy. Fifty-four (54%) of these 100 major bleeding events occurred in patients who were being managed with warfarin, and forty-six (46%) occurred in patients who were being managed with heparin agents. The patients in those studies were considered to be healthy because high-risk patients were excluded. In contrast, four multimodal studies[4,22-24] demonstrated a rate of major bleeding events of 0.2% (fifteen of 7563), with no deaths from bleeding (Table VII). Nine (60%) of these fifteen major bleeding events occurred in patients who were being managed with aspirin, and six (40%) occurred in patients who were being managed with warfarin or enoxaparin. In the study by Lotke and Lonner[23], thirteen (0.38%) of 3473 patients who had been managed with total knee replacement required a reoperation because of deep wound hematoma; nine were receiving aspirin, two were receiving enoxaparin, and two were receiving warfarin. The prevalence of bleeding and hematomas in our study was thirty-five times higher in patients managed with chemoprophylaxis either for prophylaxis (high-risk group) or for treatment. A recently published report on chemoprophylaxis in which warfarin was compared with ximelagatran (Exanta; AstraZeneca,M¨olndal, Sweden) in patients managed with total knee replacement[17] showed no improvement with ximelagatran as compared with our multimodal results. In that study of 2303 patients[17], there were seventeen major bleeding events (twelve in patients being managed with ximelagatran and five in patients being managed with warfarin), with one death from gastrointestinal bleeding and three knee hematomas (outcomes not reported).On the basis of the findings of our study and the results of studies in the literature[8,22,24,33], we conclude that safe and effective prophylaxis can be achieved with use of multimodal therapy. We continue to use this method of venous embolic prophylaxis, and we believe it is time to perform a prospective, randomized, multicenter trial to assess its efficacy in a larger cohort of patients.

V. MCQ

1.Triplane fracture in Children. J Am Acad Orthop Surg 2007;15:738-747

1. It is the result of the characteristic asymmetric closure of the distal tibial physis
2. 10% of pediatric intra-articular ankle injuries
3. The fracture typically presents in children aged 12 to 15 years
4. This closure proceeds from central to anteromedial to Posteromedial and, finally, to the lateral portion of the epiphysis
5. Radiographic views of the ankle demonstrate a Salter Harris type III fracture on anteroposterior X rays and a Salter Harris type II fracture on lateral radiographs
6.Fibula is fractured in 50% of triplane fractures
7. Residual fracture displacement after reduction was the most important determinant of premature physeal closure. This occurs in 45% of cases

2. . Fracture head of Femur. J Am Acad Orthop Surg 2007;15:716-727

1. 10% of posterior hip dislocations have been reported to be associated with femoral head fracture.
2. The primary blood supply for the femoral head is the deep branch of the MCFA
3. The preferred approach to fixation of most femoral head fractures is the anterior approach to the hip.
4 The Pipkin II, III, IV always need surgery
5. The anterior approach is reported to be a risk factor for the development of heterotopic ossification.
6. A study of 32 femoral head fractures recently reported indicated that, overall, 56% of patients had an excellent/good result, 16% a fair result, and 28% a poor outcome

3. UKA. JAAOS. Volume 16, Number 1, January 2008

1. In a a randomized, prospective study of survival analysis at 10 years: showed a survivorship of 77% for UKA and of 60% for HTO.
2.In a comparative study in patients who underwent TKA on one side and UKA on the contralateral side, Laurencin et al3 demonstrated that more patients preferred the UKA side
3.**Traditional Indications**

>60 years with a low demand for activity; weight <82 kg (181 lb); minimal pain at rest; range of motion (ROM) arc >90° with <5° flexion contracture; and an angular deformity <15° that is passively correctable to neutral.

Ritter et al12 noted that only 6.1% of knees met these anatomic qualifications for UKA

4.**Expanding Indications**

Comparable survival and clinical outcomes of UKA in obese patients (body mass index [BMI] >30) at up to 20 years compared with nonobese patients.

Patellofemoral arthritis or an ACL knee considered a contraindication for UKA. [ACL-deficient knees because of instability and a propensity for Meniscal bearing dislocation]

4. Fixed-bearing Versus Mobile-bearing Design

1.Mobile-bearing UKA components such as the Oxford are fully congruent.whereas fixed bearing is flat poly for roll back.

2.. Intraoperatively, one can mark the sulcus terminalis, or the leading edge of the weight-bearing portion

of the femoral condyle, as a reference point for sizing the femoral component.

3. Alignment

a.The tibial component should be implanted perpendicular to the long axis of the tibia in the coronal plane.

b. Increased cancellous bone stresses when the tibial component was placed in varus.

c.The tibial component, a tibial slope of <7º to protect the ACL from degeneration and rupture

d.The femoral component should be placed perpendicular to the tibial component in the coronal plane..

5.**Metal against Ceramic.**

1. Laboratory studies compared ceramic-on-metal with metal-on-metal and ceramic-on-ceramic bearings : friction, wear, and ion levels were lower in ceramic-on-metal bearings compared with metal-on-metal, with results similar to ceramic-on-ceramic couples.

2. Wear particles generated by MOM THAs are in the nanometer size range; therefore, the number of wear particles they produce exceeds the number produced in UHMWPE THAs despite the low wear rates of MOM bearings.

3. The use of COC bearings is currently limited as a result of concerns regarding possible fracture and rim chipping of the liner.

4. The overall mean wear rate of MOM was more than six times that of COM (1.57 mm^3/Mc compared with 0.23 mm^3/Mc).

5.No obvious period of bedding-in wear was observed in hip simulator tests with COC or COM couples; hence, the authors postulate these bearings are less dependent on the lubrication regime in comparison to MOM.

6.Osteolysis

1. The traditional polyethylene cup is wearing at a rate of less than about 0.1 mm/yr
2. The mean particle size is smaller with highly cross-linked polyethylene and that, in equivalent volumes, smaller particles tend to be more likely to cause osteolysis
3. Estimates of the forces through the patella range from 1.5 times body weight at 30° of flexion to six times body weight at 90° of flexion
4. PF joint contact pressure: There is a increase in contact surface area from initial contact in early flexion to about 60°
5. Isolated patellofemoral arthritis occurs in up to 10% of patients who have osteoarthritis of the knee.

7. OA knee

1.Degenerative arthritis of knee a 30% prevalence of knee osteoarthritis of knee in individuals aged 65 to 74 years.

2.Knees also were assessed for articular surface can be assessed by using Outerbridge's classification

3.Mean patient satisfaction score was 73 (range: 50-100) in the 39 knees with grade III or IV chondromalacia after arthroscopic debridement was performed.

4.Outerbridge classification

Grade 0: normal articular cartilage

Grade I: softening and blistering of the articular cartilage,

Grade II: fragmentation and fissuring in an area 1cm

Grade III: fragmentation and fissuring in an area 1 cm

Grade IV: cartilage erosion down to the bone

5.Simple needle or arthroscopic lavage has demonstrated effi cacy in obtaining pain relief in the osteoarthritic knee for at least 1 year postoperatively.

6.In 25%, with grade III and IV chondromalacia required further surgery after an average follow-up of 36 months of arthroscopic debridement.

7.Hemochromatosis in Orthopaedics

1.Is common 1:250

2. Genetic C6; Iron metabolism, Triad: Pigmentation, Cirrhosis, Diabetes

3.Orthopaedic: II & III MPJ, Naviculocunieform joint, Shoulder joint

4.Venesection

8.Tennis elbow

1.The literature suggests that the best predictor of outcome is the amount of daily physical strain encountered

as opposed to the specific treatment rendered.

2. Current data suggest that open and arthroscopic procedures are similarly effective. However, arthroscopic

release tends to allow for a more rapid recovery.

3.In a long-term prospective study, following open release 40% had persistent pain at 6 weeks postoperatively. This number decreased to 24% at 1 year and to 9% at 5 years.

4.Recent study showed that there was minimal benefit of ECSW over placebo in managing lateral epicondylitis, regardless of whether the treatment was given early or late

5.Eccentric therapy has demonstrated a positive treatment effect without causing more disability,but significant gains over stretching alone

6.Approximately 80% of patients with newly diagnosed lateral epicondylitis report symptomatic improvement

at 1 year

7. The ECRB origin is the most commonly cited anatomic location.[tendinoses]
8. Maximal tenderness in radial tunnel syndrome is typically noted 3to 4 cmdistal and anterior to

the epicondyle

over the mobile wad

9. Lateral epicondylitis and radial tunnel syndrome may coexist in up to 5% of patients

9.Mobile Vs Fixed bearing TKA

1. No clinical, radiological, survival, poly wear or osteolysis between 2 groups of knee

1. Men were 3.6 times more likely to have osteolysis than women.
2. Knees in which the base plate had a grit blasted proximal surface were 2.6 times more likely to be affected by osteolysis than those treated by a polished surface

3. Knees with an insert which had been gamma-irradiated in air were 4.0 times more likely to have osteolysis than those with an insert which had been gamma-irradiated in nitrogen.
4. The risk of osteolysis increased by a factor of 1.5 with an increase of one year in the shelf age of the insert.

10.Patellofemoral arthritis

1. As the knee is flexed past 30°, the patella engages the middle of the femoral sulcus. Lateral subluxation of the patella in terminal extension is known as the ‘‘J sign.’’
2. The patellar McConnell tape technique can be useful when excessive lateral patellar translation and tilt
3. Arthroscopic lateral release: This procedure is frequently utilized and is most effective for treatment of isolated lateral patellar tilt.
4. Isolated patellofemoral arthritis occurs in up to 10% of patients who have osteoarthritis of the knee.
5. The use of TKR to treat severe isolated patellofemoral arthrosis that is recalcitrant to therapeutic measures has been well established for older patients
6. The correct placement of the tibial component is rotational alignment of the middle of the component’s anterior border with the tibial crest or the medial one-third of the tibial tubercle.

7.. The combined amount of internal rotation of the femoral and tibial components is directly proportional to the severity of patellofemoral instability: 1° to 4° should be used when there is lateral tracking and patellar tilting; 3° to 8°, when there is patellar subluxation; and 7° to , when there is early patellar dislocation

8.At 90° of flexion, only the superior region of the patella is in contact with the distal aspect of the rochlear groove. After 120° of flexion, only the most medial and lateral aspects of the patella come into contact with the femoral condyles.

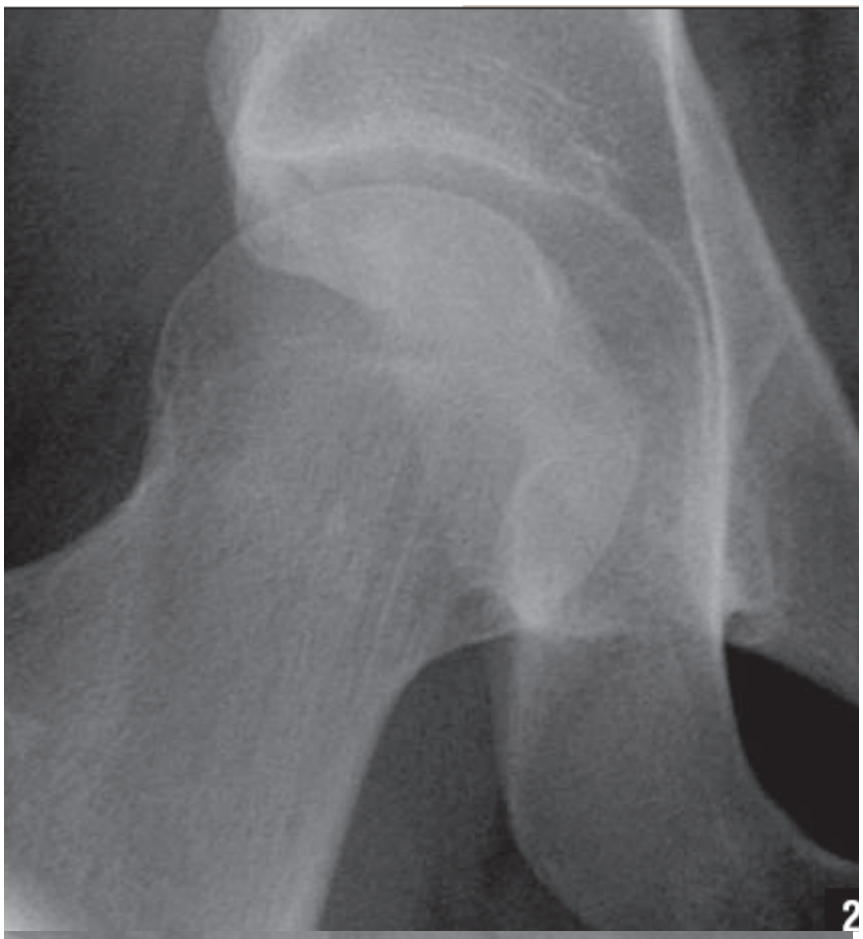
9. The articular cartilage of the patella is the thickest of any in the body

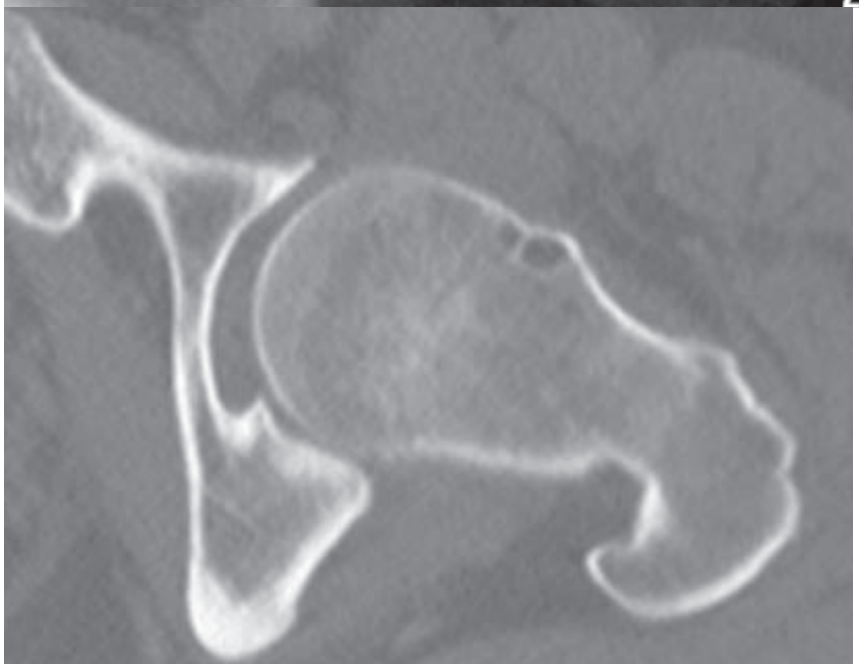
. 10. The forces through the patella range from 1.5 times body weight at 30° of flexion to six times body weight at 90° of flexion.

.. 11. Aglietti et al.11 described a normal Q angle of 17° in females and 14° in males.

VI Case Report

A 35 year old patient presented with hip and groin pain.





What's your Diagnosis

Answer: Femoroacetabular impingement

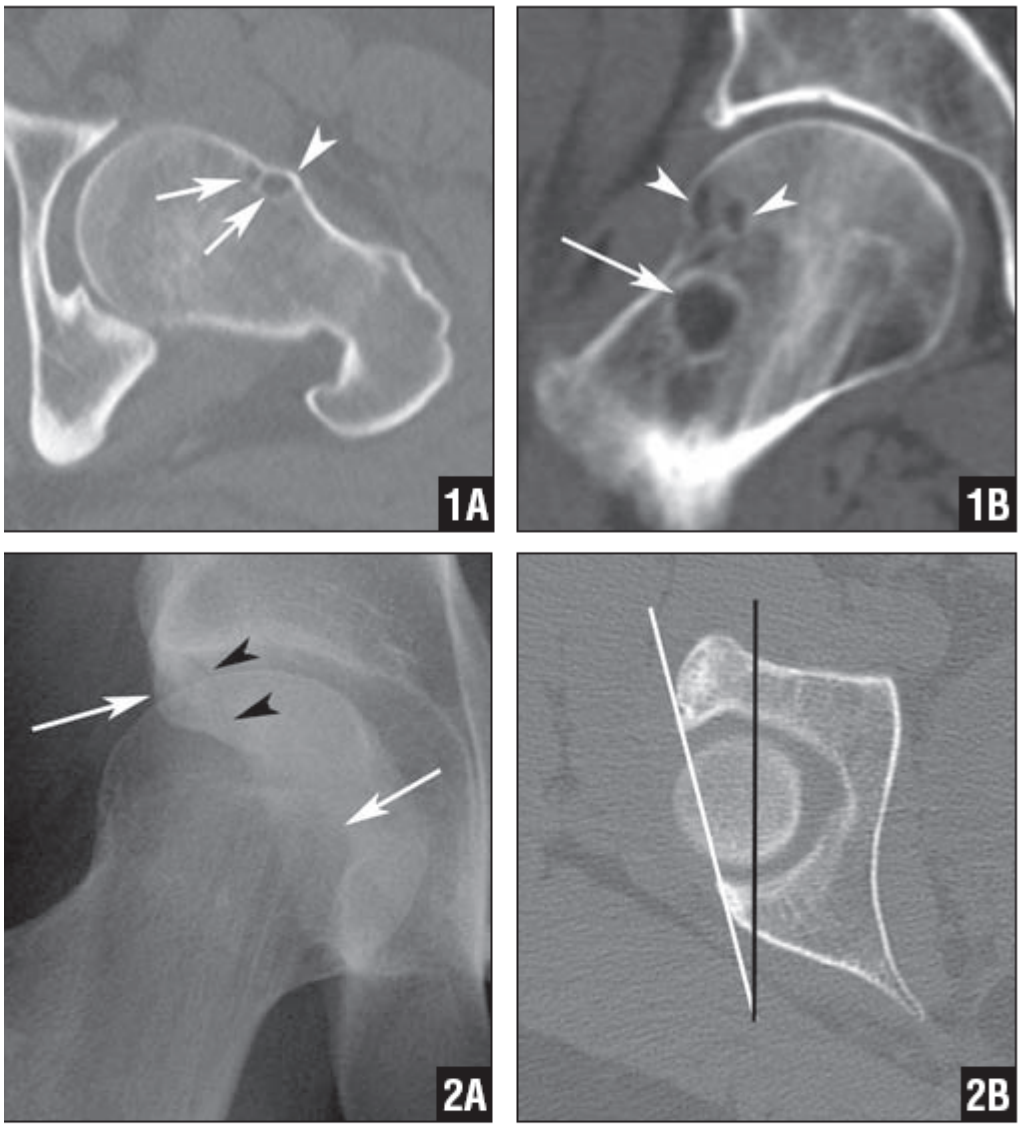


Figure 1: Femoral neck herniation pits (A). CT through the left hip demonstrates two small anterior femoral neck herniation pits (arrows) and a small protuberance at the femoral head/neck junction (arrowhead). Findings are compatible with cam impingement (B). Coronal CT reformatted image in a different patient demonstrates a dominant femoral neck herniation pit (arrow) and two smaller anterior femoral head cysts (arrowheads). **Figure 2:** Crossover sign (A). Frontal radiograph of the right hip demonstrates the "crossover" or "figure-of-eight" sign, where there is focal retroversion of the superior aspect of the hip joint. The superior aspect of the anterior rim (arrows) of the acetabulum extends lateral to the posterior rim (arrowheads) (B). CT of the same patient demonstrates the retroversion of the superior acetabulum (white line) relative to the sagittal plane (black arrow). Patient had symptoms of pincer impingement.

Femoroacetabular impingement, previously termed acetabular rim syndrome, is a major factor in early development of osteoarthritis of the hip.1-7 This syndrome is caused by abnormal contact between the osseous protrusions of the acetabulum and the femur during hip joint movement.1 In patients with femoroacetabular impingement, repetitive microtrauma from the osseous impingement leads to recurring irritation, degenerative changes of the labrum, and ultimately irreversible cartilaginous damage.

Femoroacetabular impingement tends to involve young, active patients and can be debilitating. Femoroacetabular impingement is often bilateral, but may be symptomatic on only one side. Femoroacetabular impingement is diagnosed and classifi ed into two types, pincer and cam, by the clinical and radiologic presentation. 8 However, most cases of femoroacetabular impingement are a combination of the two subtypes. Pincer impingement is caused by acetabular overcoverage with normal femoral head sphericity. The pincer effect is the linear contact between a normal neck and an overcovering acetabular rim, which can lead to labral damage. Pincer impingement is more common in middle-aged women with abnormalities of acetabular morphology.

Cam impingement arises from a prominence of the femur that leads to an abnormal, aspherical shape of the femoral head-neck junction.This terminology arises from the cam, which is the projecting part of a rotating wheel or shaft that strikes a lever at one or more points on its circular path. The asphericity or abnormal head-neck offset in cam impingement is thought to result from subclinical slipped capital femoral epiphysis or a growth disturbance of the proximal femur. Cam impingement is more common in young males with underlying abnormalities of the femoral head morphology.

ETIOLOGY

The etiology of femoroacetabular impingement is not entirely clear and is felt to be either developmental or related to subclinical slipped capital femoral epiphysis. A number of conditions can predispose a patient to femoroacetabular impingement including Legg-Calve-Perthes disease, congenital hip dysplasia, slipped capital femoral epiphysis, avascular necrosis of the femoral head, ununited femoral neck fractures, coxa profunda, coxa vara, protrusion acetabuli, and acetabular retroversion. Slipped capital femoral epiphysis and femoroacetabular impingement have been proposed to be associated due to reduced clearance of the joint and detectable abutment of the metaphysic against the acetabular rim.4 Acetabular anatomic abnormalities (ie, retroverted acetabulum) or proximal femoral anatomic abnormalities (ie, coxa profunda) lead to the pincer-type femoroacetabular impingement. Those anatomic abnormalities that lead to abnormal sphericity of the femoral head (osseous prominence at the anterolateral femoral head and neck junction, slipped capital femoral epiphysis, and developmental dysplasia of the hip) can lead to cam impingement.

DIAGNOSIS

Clinical

The gold standard is clinical diagnosis with radiographic corroboration; however, patients can have radiographic findings and be asymptomatic due to early disease or overall decreased activity. Patients often report intermittent pain early in the course of the disease, followed by more consistent pain after demanding activities or prolonged sitting.

Other exacerbating activities can include stair climbing, prolonged sitting, and athletic events.10,11

Patients with femoroacetabular impingement typically experience groin pain.

Impingement mainly involves the anterolateral portion of the hip joint. Therefore,flexion and internal rotation lead to symptomatic impingement due to shear forces or compression of the acetabular labrum.

The impingement test involves rotating a supine patient's hip internally as it is flexed passively to approximately 90° and adducted. A positive "impingement sign"is pain in flexion-internal rotation.

On examination, limited range of motion (ROM) frequently is encountered and is described as a loss of internal rotation out of proportion with other ROM deficits. Additionally,a grinding or popping sensation can be felt when the femur is externally rotated and the hip is maximally abducted.

Radiographs

Standard standing anteroposterior and lateral radiographs of the pelvis are necessary for radiographic evaluation. Instead of the typical joint space narrowing, osteophyte formation, subchondral sclerosis, or cysts, radiographs of femoroacetabular impingement may demonstrate reactive ossifi cation of the labrum or possibly acetabular rim fractures from repetitive stress.

Herniation pits also may be found in the anterolateral portion of the femoral head/neck or morphologic changes affecting the acetabulum. Radiographic signs of pincer impingement include acetabular retroversion and evidence of impaction between the anterosuperior acetabulum and anterior femoral neck.

Retroversion can be diagnosed by the presence of the "crossover or "figure-of-eight" sign, in which focal retroversion of the superior hip joint exists.

Acetabular retroversion is associated with the development of hip osteoarthritis. The prevalence of radiographic acetabular retroversion is 20% among patients with idiopathic hip osteoarthritis and 5% among the general population.

Lateral radiographs in cam impingement can demonstrate an osseous prominence at the anterolateral head-neck junction that extends beyond the spherical portion of the femoral head. I

A pistol grip deformity of the proximal femur and changes of the acetabular rim may also be detected with radiographs.

Magnetic Resonance Imaging

MRI arthrography can provide detailed views of the labrum and acetabular cartilage. Labral tears, paralabral cysts, and cartilaginous abnormalities are well evaluated with magnetic resonance arthrography. The degeneration of the labrum is characteristically anterosuperior. Acetabular cartilage lesions in cam impingement are characteristically anterosuperior,whereas lesions in pincer impingement are typically posteroinferior.

The alpha angle is determined by first assessing the center of the femoral head. Two vectors are extended from the center of the femoral head along the femoral neck axis and the point at which the femoral neck intersects the spherical portion of the femoral head. The aspherical femoral head-neck junction due to a focal protuberance increases the alpha angle beyond 55°

TREATMENT

The first therapeutic step in treatment is nonsteroidal antiinflammatory drugs and activity modifi cation. Additionally, physical therapy is aimed at strengthening abdominal and gluteal musculature and stretching the paravertebral muscles to change posture or pelvic inclination.

Surgical reconstruction is recommended as early as possible after first symptoms appear to prevent future damage.

Surgical treatment is suitable only if there are no advanced degenerative changes or extensive articular cartilage damage. Once irreversible cartilage damage has occurred, pain will frequently persist after surgical intervention.

Joint preserving surgery involves resection osteoplasty and less frequently osteotomy
for reorientation.

Surgical osteotomy involves removing the osseous protrusion by either surgical hip dislocation or arthroscopy

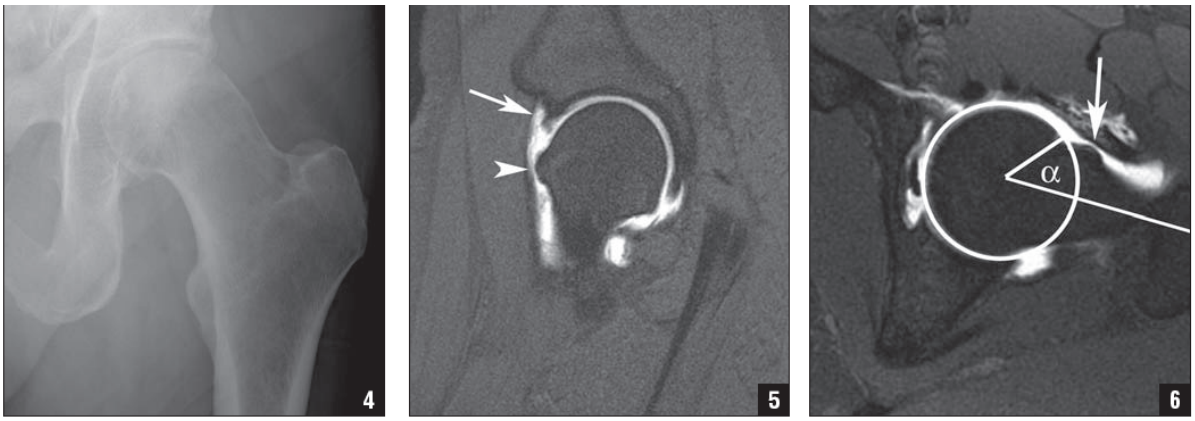


Figure 4: Pistol grip deformity of the proximal femur. Frontal radiograph demonstrates the abnormally sloped configuration of the lateral femoral neck, termed the "pistol grip" deformity. This finding may be the result of subclinical slipped capital femoral epiphysis or a growth disturbance of the proximal femur, and can be associated with femoroacetabular impingement. **Figure 5:** Anterosuperior labral tear associated with cam impingement. Sagittal magnetic resonance arthrogram demonstrates an anterior femoral head-neck junction protuberance (arrowhead) and associated anterior superior labral tear (arrow). **Figure 6:** Cam impingement. Oblique magnetic resonance arthrogram demonstrates an abnormally increased alpha angle (>55°) in this patient with cam impingement. The alpha angle is determined by first assessing the center of the femoral head (white circle). Two vectors are extended from the center of the femoral head along the femoral neck axis (line) and the point at which the femoral neck (arrow) intersects the spherical portion of the femoral head (line). The aspherical femoral head-neck junction due to a focal protuberance in this case increases the alpha angle.