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Clinical Journal of Orthopaedic Surgery

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CONTENTS

I Selected papers

1. Enocson. Dislocation of total hip replacement in patients with fractures of the femoral

Acta Orthopaedica. Orthopaedica,80:2,184 — 189

713 consecutive hips [Swedish]

Analyzed factors influencing the stability of the total hip replacement, paying special attention to the surgical approach.

A 6- to 8-week prospective follow-up was performed within the context of a clinical audit. An anterolateral surgical approach was used on 463 hips and a posterolateral approach on 250 hips. A posterior repair with re-attachment of the short external rotators and/or the posterior joint capsule was performed in 110 of the 250 posterolateral approaches

The overall dislocation rate was 6%. The anterolateral surgical approach was associated with a lower risk of dislocation than the posterolateral approach with or without posterior repair (2%, 12%, and 14%, respectively ($p < 0.001$)).

The posterolateral approach was the only factor associated with a significantly increased risk of dislocation, with a hazards ratio (HR) of 6 (2–14) for the posterolateral approach with posterior repair and of 6 (2–16) without posterior repair.

In order to minimize the risk of dislocation, we recommend the use of the anterolateral approach for total hip replacement in patients with femoral neck fractures.

The anterolateral surgical approach was associated with a lower risk of dislocation than the posterolateral approach with or without posterior repair (2%, 12%, and 14%, respectively)

The patient's age, sex, the indication for surgery, the experience of the surgeon, and the femoral head size had no influence on the dislocation rate.

The first dislocation occurred early (within 6 weeks) in 24 of the 41 patients with dislocation. Closed reduction was successful for 39 of these 41 patients.

One of the remaining 2 patients (posterolateral approach) was reoperated with a socket wall augmentation device and had no further dislocations.

The significantly higher dislocation rates after the posterolateral approach with and without posterior repair (12% and 14%, respectively) were of the same magnitude as those reported for THR groups in RCTs using the posterolateral

An interesting additional finding in that study was that the dislocation rate was elevated in patients with mental dysfunction: 32%, as compared to 12% in lucid patients.This supports the notion that patients with severe cognitive dysfunction who—besides their increased risk of dislocation—also have a worse outcome regarding
function and mortality (Söderqvist et al. 2006) should not be considered for the THR procedure.
Morrey (1982) reported that the instability persisted in one third of the hips revised due to recurrent dislocations.

Repair of the posterior structures, i.e. the short external rotators and/or the posterior joint capsule, has been reported to increase stability after a posterolateral approach. In a recent meta-analysis by Kwon et al. (2006) comprising 4,115 patients from 5 studies, the dislocation rate for THR was 0.5%for patients with a posterior repair and 5% for those without. However, the conclusion that a posterior repair greatly reduces the risk of dislocation is probably most valid for patients with degenerative joint disease.
Only 2 of the studies included reported on the preoperative diagnosis and, in those, only a minority of the patients had had fractures of the femoral neck or had sequelae after femoral neck fractures (5% and 15%, respectively).

2.Mann. Hallux Valgus. J Am Acad Orthop Surg 1995;3:34-43

a. Keller's operation: destabilizes the first MTP joint due to loss of the windlass mechanism and results in transfer metatarsalgia and deformity of the great toe due to lack of stability.

a. Bunnionectomy and capsulorrhaphy: resulted in alleviation of the painful bunion, but the correction
of the first MTP joint abnormality was not achieved in most cases, except inthose with a minimal deformity.

b. McBrides; occurred, resulting in hallux varus, probably mainly due to the imbalance

c. Osteotomies: the degree of correction that can be obtained with a distal osteotomy is not as great as with a proximal osteotomy. Problem is shortening of first metatarsal and results in some dorsiflexion

d. Arthrodesis of the MTP joint will produce excellent correction of a severe deformity or can be used to salvage a failed operative procedure.

e. Factors:

Degree of deformity; Arthritis

The patient's occupational and recreational requirements are also important; professional dancers and high-performance athletes need very special consideration before any type of foot surgery.

A critical factor is patient expectations. It is crucial that the patient understand precisely what can be achieved surgically and what cannot.Unfortunately, patients may have been led to believe there is a "quick fix" for many foot problems. In a study of our patients, we found that prior to surgery for hallux valgus only one third of the patients could wear the type of shoe they desired. After surgery, two thirds achieved their goal, which unfortunately left one third unsatisfied.

. f. As a general rule, the more severe the deformity, the greater the degree of pronation

g. The second MTP joint must be evaluated for instability, medial deviation, and the presence of a hammer toe.

Not infrequently, the second toe is more symptomatic, in terms of pain and deformity, than the hallux even though the great toe has initiated the problem..

h. X ray: HVA; IMA; DMA; HVI; Sesmoid displacement; OA; Congruence

i. Currently, the use of a prosthesis in primary bunion surgery is not recommended because of the less than- optimal long-term results and the silicone-related problems that often occur, such as significant synovitis, osteolysis,

j. Juvenile Hallux Valgus

Unfortunately, surgical correction of the juvenile form is associated with a significant rate of recurrence.

Most surgeons advocate delaying surgery until skeletal maturity has been achieved unless an unusual degree of pain and deformity.

There is a high prevalence of pes planus and ligamentous laxity. There also appears to be an increased incidence of lateral deviation of the distal articular surface of the first MTP joint

When considering treatment for the patient with juvenile hallux valgus, one can follow the same decision- making precepts based on the severity of the deformity already outlined in the algorithm .

If there is an open metatarsal epiphysis at the time of surgery, it should be avoided to prevent possible growth disturbance.

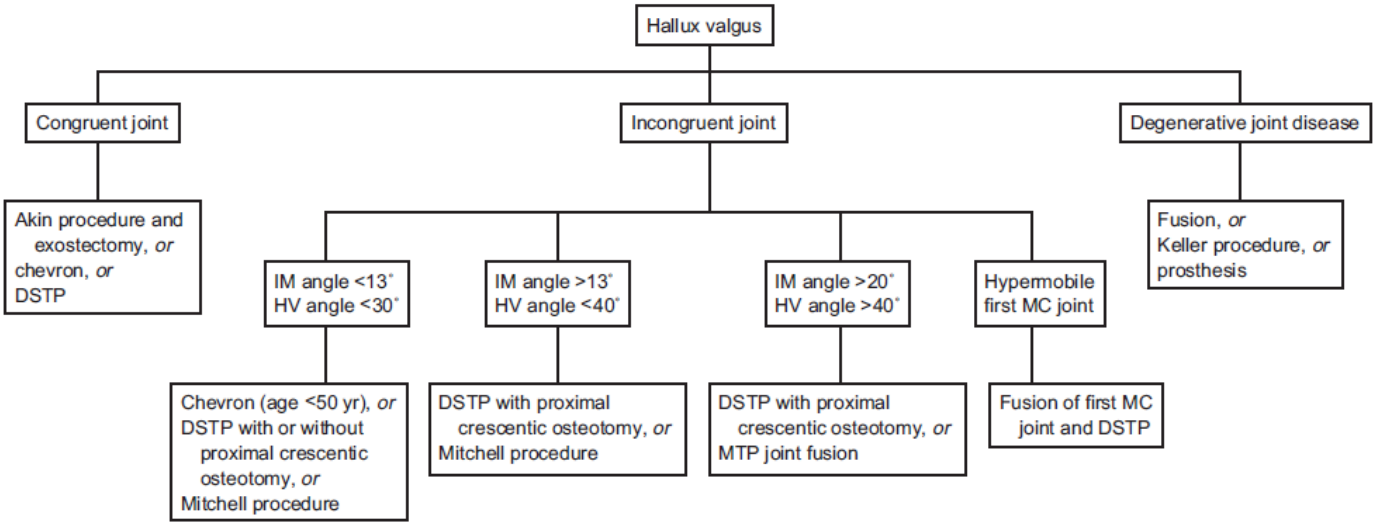


Fig. 6 Algorithm for selecting the operative approach to treatment of hallux valgus (HV). DSTP = distal soft-tissue procedure; MC = metatarsocuneiform. (Adapted with permission from Mann RA: Decision-making in bunion surgery. *Instr Course Lect* 1990;39:3-13.)

3. Rudloff. Intramedullary J Orthop Trauma 2009;23:S12–S17)

a. Cortical perfusion was decreased by 83% and returned to baseline at 11 weeks after fixation.

b. Intra-cortical temperature: direct correlation with temperature and incremental increase in reamer size.

c. Reaming a normal size canal did not seem to produce any adverse clinical events but cautioned that preparation of smaller diameter canals could potentially produce significant heat production.

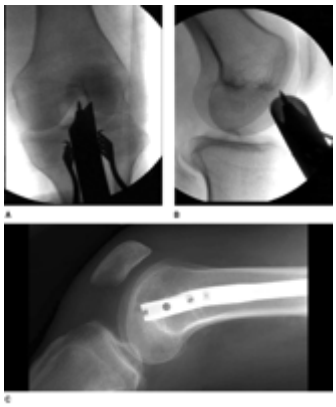
d. Reaming results in elevated temperature and pressure within the intramedullary cavity, which may adversely affect bone healing. The mechanical loading of the femur is optimized by using narrow reamer shafts, long lead head taper, and enlarged cutting flutes.61 The design features reduced intramedullary pressure by 37% and as high as 58% with hollow reamers

e. Data also suggest that reaming at slow driving speeds and high revolutions results in the least intramedullary pressure increase.

Retrograde Nailing

Proper technique includes an insertion site in the intracondylar notch at the apex of the Blumensaat line, which is approximately 1 cm anterior to the posterior cruciate ligament origin.

With this as the starting point, the trajectory for nail insertion should be colinear with the long axis of the femur in both the anteroposterior and lateral planes. The distal end of the nail must be buried beneath the subchondral bone to avoid injury to the patella with the knee in flexion.8 At least two distal interlocks should be used to minimize the risk of secondary telescoping of the nail into the knee joint. This complication can occur after fracture of the distal interlocking screws associated with comminuted, axially unstable fracture patterns.



Retrograde nailing using modern techniques that include reaming, snug-fitting nails, and interlocking screws is associated with union rates similar to those for antegrade nailing.

Reaming

In animal models, reaming has been shown to increase IM pressures, increase pulmonary artery pressures, and be associated with fat embolization. However, several studies have demonstrated only limited and transient effects of emboli.

The degree of fat embolization associated with reamed nailing has been shown to be similar to or only marginally greater than that associated with unreamed nailing.

Reaming has been shown to cause variable grades of endosteal thermal damage and disruption of the endosteal cortical blood flow in animal studies, effects that, in theory, would be detrimental to fracture healing. Thermal necrosis should be avoided.

The proper nail diameter for a snug fit is therefore 1 to 1.5 mm smaller than the largest reamer used, a width that also correlates to the diameter of the isthmus. Such undersizing of the nail is required to avoid iatrogenic bursting of the femoral canal because of mismatch of femoral and nail bows.

Other strategies to avoid thermal necrosis and excessive fat embolization include use of modern fluted reamer designs and use of sharp reamers. Slower reaming, which remains the de facto standard, generates less heat but more emboli than does faster reaming.

Multitrauma Patient

The timing of IM nailing and the safety of reaming in the multitrauma patient have been closely scrutinized in recent years. Several detrimental effects of acute femoral nailing in patients with multiple trauma, especially those with pulmonary compromise, have been

theorized and have led to the current practice of damage control orthopaedics.25 The additional trauma induced by IM nailing can tip a borderline stable patient toward decompensation. Release of inflammatory mediators, surgical blood loss, hypothermia, and the effects of reaming associated with IM nailing procedures are among the factors implicated in systemic decompensation.

Current damage control principles include provisional surgical stabilization methods that minimize surgical time, blood loss, and additional trauma. Most commonly, these are practiced with monolateral external fixation that, in the absence of pin-site infection, can be safely converted to IM nailing once the patient is optimally stabilized.27 Retrograde unreamed nailing with or without proximal locking has recently been advocated as an alternative to external fixation.

Open fractures

Immediate IM nailing of open femoral shaft fractures is indicated in all but the most severe cases, most notably those involving grossly contaminated canals. Provisional external fixation for open fractures is useful when repeat irrigation and débridement of a contaminated IM canal is necessary. IM nailing can be performed once the canal has been sufficiently cleansed.

Malunion

Angular malunion of femoral shaft fractures after IM nailing is most common in proximal (30%) and distal (10%) fractures, in which the surgeon cannot rely on the interference fit of the nail to align the fracture.

Blocking screws can be used to assist in aligning more proximal and distal fractures, but these are unnecessary in the diaphysis.

Rotational malunion remains a concern even with modern nailing techniques. The patient may "sag" on the fracture table, resulting in relative external rotation of the hemipelvis. Additionally, fluoroscopic evaluation of cortical widths,40 any key fragments, or femoral anteversion41 can assist in obtaining proper rotation. Both legs should be examined for rotational symmetry before exit from the operating suite. Rotational malalignment, if noted at this time, can be easily treated by removing interlocking screws, manually correcting the rotation, and reinserting interlocking screws.

Nonunion

The rate of nonunion after nailing of femoral shaft fractures, is usually <10%. In the event of nonunion, deep infection should be considered.

The treatment of nonunion may involve dynamization, exchange nailing, or plate fixation with bone grafting. Dynamization can be useful for distracted fractures;

Fractures with bony defects, atrophic characteristics, or failed dynamization may benefit from reaming and exchange nailing or open grafting and repair. Results for exchange nailing of femoral shaft fractures show good but not outstanding union rates, ranging from 53% to 96% . Recalcitrant nonunions may warrant an evaluation for underlying metabolic disturbances[47] and can be successfully managed with bone grafting and plating.[48]

Leg Length Discrepancy

Obtaining equal leg lengths after nailing of comminuted fractures is a challenge, with discrepancy noted in up to 43% of cases.[49,50] Immediately after nailing, leg lengths should be compared and any discrepancy corrected at the same setting. The treatment protocol for a problematic discrepancy is to return to the operating room and relock the nail at the correct length.

Infection

Infection rates noted in large series of femoral shaft fractures treated with IM nails are low, ranging from 1% to 3.8%.

4..Synn. Distal Radius Fractures in Older Patients.Is Anatomic Reduction Necessary? Clin Orthop Relat Res (2009) 467:1612–1620

1. Surgically treated fractures were less likely to display residual dorsal angulation and radial shortening, but surgical intervention did not independently predict functional outcome in > 55 years.
2. No correlations between length of follow up and functional outcome.
3. Data revealed no correlation between treatment modality and functional outcome

5. Granan Timing of ACLReconstructive Surgery and Risk of Cartilage Lesions and Meniscal Tears. American Journal of Sports Medicine, Vol. 37, No. 5

3475 patients, there were 26% with cartilage lesions, 47% with meniscal tears, and 15% with both cartilage and meniscal lesions.
The odds of a cartilage lesion in the adult knee (>16 years) increased by 1.006 (95% confidence interval, 1.003-1.010) for each month that elapsed from injury to surgery.
The cartilage in young adults (17-40 years) deteriorated further with an increase in odds of 1.03 (95% confidence interval, 1.02-1.05) related to the aging in years of the patient.
The odds for meniscal tears in young adults increased by 1.004 (95% confidence interval, 1.002-1.006) for each month that elapsed since injury.
The presence of 1 degenerative lesion increased the odds of having the other degenerative lesion by between 1.6 and 2.0 in all patient groups.

Conclusion: The odds of a cartilage lesion in the adult knee increased by nearly 1% for each month that elapsed from the injury date until the surgery date and that of cartilage lesions were nearly twice as frequent if there was a meniscal tear, and vice versa.

A recent study2 based on review of 183 cases concluded that primary ACL reconstruction surgery should be carried out within 12 months of injury to minimize the risk of meniscal tears and degenerative changes. In this study, presence and type of meniscal tear and type of degenerative change were recorded. The incidence of meniscal tears and degenerative change was assessed and related to the timing from injury to surgery. The patients were divided into an early group (surgery within 12 months of injury) and a late group (surgery more than 12

months from injury). Incidence of meniscal tears was significantly higher in patients undergoing reconstruction late compared with those in the early group (71% vs 42%).

6. Soo: Complication of Ankle fractures ORIF. J Bone Joint Surg Am. 2009;91:1042-9

Discharge database, we identified 57,183 patients who had undergone open reduction and internal fixation of a lateral malleolar, bimalleolar, or trimalleolar ankle fracture as inpatients in the years 1995 through 2005. 58, 000 patients

.

Results: The overall rate of short-term complications was low

Pulmonary embolism (0.34%),

Wound infection (1.44%),

Amputation (0.16%),

Revision open reduction and internal fixation (0.82%).

The intermediate-term rates of reoperation were also low, with ankle fusion or ankle replacement being performed in 0.96% of the patients who were observed for five years.

Open fractures, age, and medical comorbidities were significant predictors of short-term complications. The presence of complicated diabetes was a particularly strong predictor (odds ratio, 2.30; $p < 0.001$), as was peripheral vascular disease (odds ratio, 1.65; $p < 0.001$).

The intermediate-term rate of reoperation for ankle fusion or replacement was higher in patients with trimalleolar fractures (hazard ratio, 2.07; $p < 0.001$) and open fractures (hazard ratio, 5.29; $p < 0.001$).

Open injury, diabetes, and peripheral vascular disease were strong risk factors predicting a complicated short-term postoperative course. Fracture type was a strong predictor of reoperation for ankle fusion or replacement. Studies also have revealed that bone healing is impaired as well, which places patients with diabetes at additional risk for malunions and the need for subsequent surgery15-17. For these reasons, it has been suggested that patients with diabetes require longer immobilization and should receive longer postoperative bracing compared with patients without diabetes.

Fracture severity	odd ratio	
Bimalleolar fracture	1.3	[compared to uni]

Trimalleolar fracture 2.0 [compared to uni]

Open fracture 5.4. [compared to closed fracture}

7. Tashjian :Genitics in Rotator cuff disease. J Bone Joint Surg Am. 2009;91:1136-1142.

A genetic predisposition has been suggested to contribute to the risk for development of rotator cuff disease on the basis of observed family clusters of close relatives.

The overall study group (3091 patients) and a subgroup of the study group diagnosed before the age of forty years (652 patients).

The Genealogical Index of Familiarity test in patients diagnosed before the age of forty years showed significant excess relatedness for individuals with rotator cuff disease in close and distant relationships (as distant as third cousins) ($p = 0.001$).

The relative risk of rotator cuff disease in the relatives of patients diagnosed before the age of forty years was significantly elevated for second degree (relative risk = 3.66, $p = 0.0076$) and third degree (relative risk = 1.81, $p = 0.0479$) relatives.

The observations of significant excess relatedness of patients and the significantly elevated risks to both close and distant relatives of patients strongly support a heritable predisposition to rotator cuff disease.

Clinical Relevance: A better understanding of the familial risk of rotator cuff disease could lead to the identification of candidate genes predisposing individuals to rotator cuff disease. Gene identification will possibly allow the development of improved treatments, including biologic augmentations of rotator cuff repairs, which may improve tendon healing and repair outcomes.

When only those individuals with a diagnosis before the age of forty years were considered, we observed significantly elevated risks.

The largest body of data evaluating the genetic link between tendinopathies, as far as we know, has been reported for patients with Achilles tendinopathy or tearing.

Two genes have been localized to the same region on chromosome 9 as the ABO gene, tenascin C (TNC) and collagen type-V a 1 (COL5A1), and they have been shown to have polymorphisms associated with the presence of Achilles tendon injuries

Rotator cuff disease likely has a multifactorial etiology, which includes mechanical and environmental influences. We have additionally shown a strong genetic predisposition for the

disease. Future applications of these data include high-risk pedigree studies to identify the predisposition gene(s) responsible for these observations,

8. Green. Forearm instability. J Hand Surg 2009;34A:953–961.

Forearm instability is a complex problem resulting from traumatic disruption of the forearm stabilizers: the radial head, the interosseous membrane, and the triangular fibro cartilage complex. Dissociation of the forearm unit is often under recognized and therefore inadequately treated, leading to poor patient outcomes.

If left untreated, forearm instability leads to considerable pain, limited forearm motion, and deformity at the wrist

In 1951, Essex-Lopresti further described an injury pattern of forearm instability resulting from a traumatic axial load transmitted from the wrist to the elbow. This load resulted in a radial head fracture, a disruption of the distal radioulnar joint (DRUJ), and a rupture of the interosseous membrane.

With disruption of these stabilizers and inadequate treatment, longitudinal radioulnar dissociation typically occurs, resulting in proximal migration of the radius, altered loading patterns through the forearm and wrist, and forearm instability.

Forearm destabilization, if recognized acutely, requires immediate surgical intervention with repair or replacement of the radial head and possibly the TFCC as well.

Stability of the forearm is attributed primarily to the radial head and secondarily to the TFCC and the interosseous membrane.

At DRUJ. the TFCC, is the major stabilizer.

Interosseous membrane: There are 3 fiber groups present on the volar aspect of the forearm. The first group, most proximal in location and traveling in a distal direction, is the proximal descending fibers. The second fiber segment is the central band, supplying most of the r the interosseous membrane. The third fiber group is the distal descending fibers, which exhibits a more oblique trajectory.

On the dorsal aspect of the radius and ulna, there are 2 main fiber groups: the proximal ascending bundle and the distal ascending bundle.

In the setting of ulna neutral variance, the radiocarpal joint absorbs 80% of the axial load transmitted through the wrist, and the remaining 20% is transmitted to the ulna.11 The interosseous membrane functions to redistribute the radial load to the ulna as the force travels through the forearm, so that at the elbow, the radiocapitellar joint sees 60% of the original axial load and the ulnohumeral joint the remaining 40%..

Hotchkiss also noted that once the radial head has been removed, the interosseous membrane takes on 90% of the axial load transmitted through the forearm resisting proximal migration of the radius.7

Galeazzi fractures (radial shaft fracture with associated dislocated DRUJ) and Monteggia fractures (ulna shaft fracture with associated radial head dislocation) can also lead to forearm instability, but these are typically recognized and treated early, preventing the consequences of late forearm instability.

Excision of the radial head without disruption of any other soft tissues can result in up to 7 mm of proximal migration of the radius with axial loading of the forearm.

For every 1 mm of proximal radial migration that occurs, there is a 10% increase in load across the distal ulna.18 This changes the force transmission across the ulnocarpal joint and can lead to symptoms of ulnocarpal impaction, including limited forearm rotation, wrist pain, and DRUJ instability.
Hotchkiss,7 once the radial head is excised, the central band of the interosseous membrane becomes responsible for 71% of the longitudinal stiffness of the forearm.7 This increase in force across the interosseous membrane eventually leads to attenuation of any previously intact fibers of the interosseous membrane,9,19 with resultant forearm instability and pain.

Establishing the diagnosis of longitudinal radioulnar
1.A detailed history
Falling on an outstretched hand with an extended elbow, sustaining an acute axial load injury.
Pain at the elbow is often due to a radial head fracture

2.Palpation at the mid-dorsal forearm, the DRUJ, and the fovea may elicit tenderness that heightens suspicion for longitudinal radioulnar dissociation.
3.The DRUJ should also be evaluated for instability in the positions of full supination, neutral, and full pronation.
4. The x-rays should be scrutinized for positive ulna variance and cystic or sclerotic changes in the triquetrum secondary to impaction. Wrist magnetic resonance imaging (MRI) may be useful for advanced imaging.
5. Longitudinal forearm instability can be assessed intraoperatively using the “radius pull test.” : With excision of the radial head, followed by sequential sectioning of the interosseous membrane and the TFCC. Longitudinal traction on the radius with greater than 3 mm of proximal radial migration indicated disruption of the interosseous membrane and decreased longitudinal stability of the forearm. Proximal radial migration greater than 6 mm was associated with damage to both the TFCC and the interosseous membrane, resulting in gross forearm instability, and a contraindication for a radial head excision without replacement.

If there is any concern for forearm instability, then the radial head should be replaced.

At the wrist, consideration should be given to repair of the TFCC. Replacing the radial head and repairing the injured TFCC may be sufficient to maintain radius and ulnar lengths relative to each other and eliminate the possibility of subsequent forearm instability.32

Chronic injury treatment options

In the past, outcomes for treatment of patients with chronic forearm instability injuries have been poor.
With increased understanding of the mechanics of this vexing problem and more recent research into developing methods of reconstructing the interosseous membrane, outcomes are more optimistic.
Treatment efforts are aimed at re-establishing the integrity of the forearm stabilizers and levelling the DRUJ to eliminate the ulna sided wrist symptoms resulting from positive ulnar variance. Ultimately, the goal is to re-create a more normal association between the radius and ulna and to eliminate the forearm instability.34
Establishing the relative length of the radius and ulna is crucial in attempting to re-create forearm stability in a patient with a chronic injury. An ulnar-shortening osteotomy to

establish neutral or slightly negative variance is often recommended. After the DRUJ is levelled with an ulnar-shortening osteotomy, a TFCC repair may be indicated.

9. Zywiel: Osteonecrosis of the Knee: Orthop Clin N Am 40 (2009) 193–211

Osteonecrosis (ON) of the knee is a debilitating disease that is poorly understood.

3distinct conditions: spontaneous osteonecrosis of the knee (SPONK),

secondary ON of the knee,

post arthroscopic ON of the knee. This

SPONK, which typically affects a single condyle in older patients;

True ON, which is most commonly seen in younger patients after exposure to corticosteroids and presents with several simultaneous foci in the distal femur or proximal tibia;

Post arthroscopic ON, which presents in a condyle after arthroscopic surgery.

In addition, true ON can occur after trauma, radiation, or other rare disorders. Although different gender and

location biases have been reported for these conditions, all three can affect women or men and can

involve the distal femora, proximal tibiae, or both.

SPONTANEOUS OSTEONECROSIS OF THE KNEE

Etiology, Pathology, and Pathogenesis

SPONK is a disorder of unknown etiology

Several reports have demonstrated the presence of subchondral fractures in an affected condyle,with a recent report suggesting that this precedes the development of necrotic tissue.

Yamamoto and Bullough2 reported histopathologic results in a group: They concluded that necrosis was not the primary condition but only secondary to a subchondral insufficiency fracture.

SPONK has been classically described as being localized to the medial femoral condyle. However,

the lateral femoral condyle and tibial condyles, as well as the patella, are also susceptible.10–12

Age: (>55 years of age), with women outnumbering men 3 to 1.

Report the sudden onset of severe unilateral knee pain localized to the affected condyle, with the pain usually reported to be worse at night or with weight bearing.

The x-ray appearance ranges from completely normal in early stages of the disease to collapse of the affected condyle with degenerative changes of the opposite articular surface in the most advanced stages.

Magnetic resonance imaging (MRI) is extremely sensitive and specific in detecting SPONK, with low signal in the affected area on T1-weighted images and a high signal margin of the affected area on T2-weighted images.13 These changes can be evident in the early stages of the disease before any abnormalities are visible on plain radiographs.

Table 1
Comparison of spontaneous osteonecrosis, secondary osteonecrosis, and postarthroscopic osteonecrosis of the knee

Characteristic	Spontaneous Osteonecrosis of the Knee	Secondary Osteonecrosis of the Knee	Postarthroscopic Osteonecrosis	
Age (years)	55 and older	Younger than 45	No bias	
Gender	3:1 ♀:♂	♀ > ♂ with SLE as associated factor ♂ > ♀ with alcohol as associated factor	No bias	
Onset of pain	Sudden	Gradual	Sudden	
Bilaterality	<5%	>80%	Never	
No. lesions	One	Multiple	One	
Location on bone	Epiphysis	Epiphysis, metaphysis, and diaphysis	Epiphysis	
Condylar involvement	One condyle (femur 90%, tibia 10%)	Multiple condyles (femur 90%, tibia 20%)	One condyle (femur 95%)	
Femur and tibia affected	No	~20%	Never	
Other joint involvement	No	>90% (hip, shoulder, ankle)	No	
Associated factors	None	Corticosteroids, alcohol, tobacco, other	Arthroscopic surgery	
Associated diseases	None	SLE, sickle cell, caisson disease, Gaucher's disease, thrombophilia, hypofibrinolysis	None	
Pathologic findings	Fibrotic bone, healing fracture	Necrotic bone	After laser-assisted chondroplasty	Necrotic bone
			After mechanical debridement or meniscectomy	Fibrotic bone and healing fracture

Abbreviations: SLE, systemic lupus erythematosus; ♀, women; ♂, men.

Several reports have suggested that radionucleotide scintimetry is effective in the detection of early-stage SPONK, with increased update visible on scans before the appearance of visible changes on plain radiographs.

The size of the lesion has been described as a prognostic factor in SPONK. Lesions can be sized using one of three methods originally developed for secondary ON. Motohashi measured the greatest width of the
lesion in millimetres on the AP and lateral radiographs

: those measuring more than 10 mm were described as large.

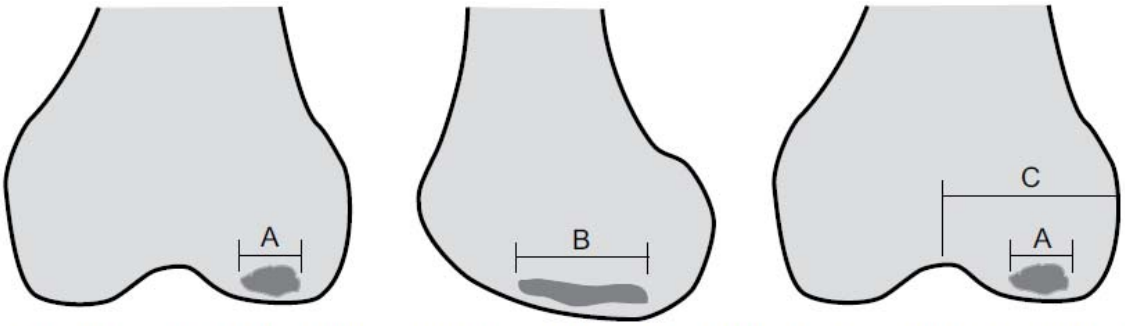


Fig. 5. Lesion size can be estimated by measuring the greatest width of the lucency on an AP radiograph (A) and multiplying it by the greatest length of the lucency on a lateral radiograph (B), in addition to the ratio of lesion width to total width of the affected condyle (A divided by C). (*Data from* Aglietti P, Insall JN, Buzzi R, et al. Idiopathic osteonecrosis of the knee. Aetiology, prognosis and treatment. J Bone Joint Surg Br 1983;65:589.)

Nonoperative treatment

Initial treatment in precollapse disease is nonoperative, consisting of protected weight bearing and nonsteroidal anti-inflammatory drugs for analgesia as required, if tolerated.

The best results were achieved in small stage I and II lesions

Yates and colleagues28 reported

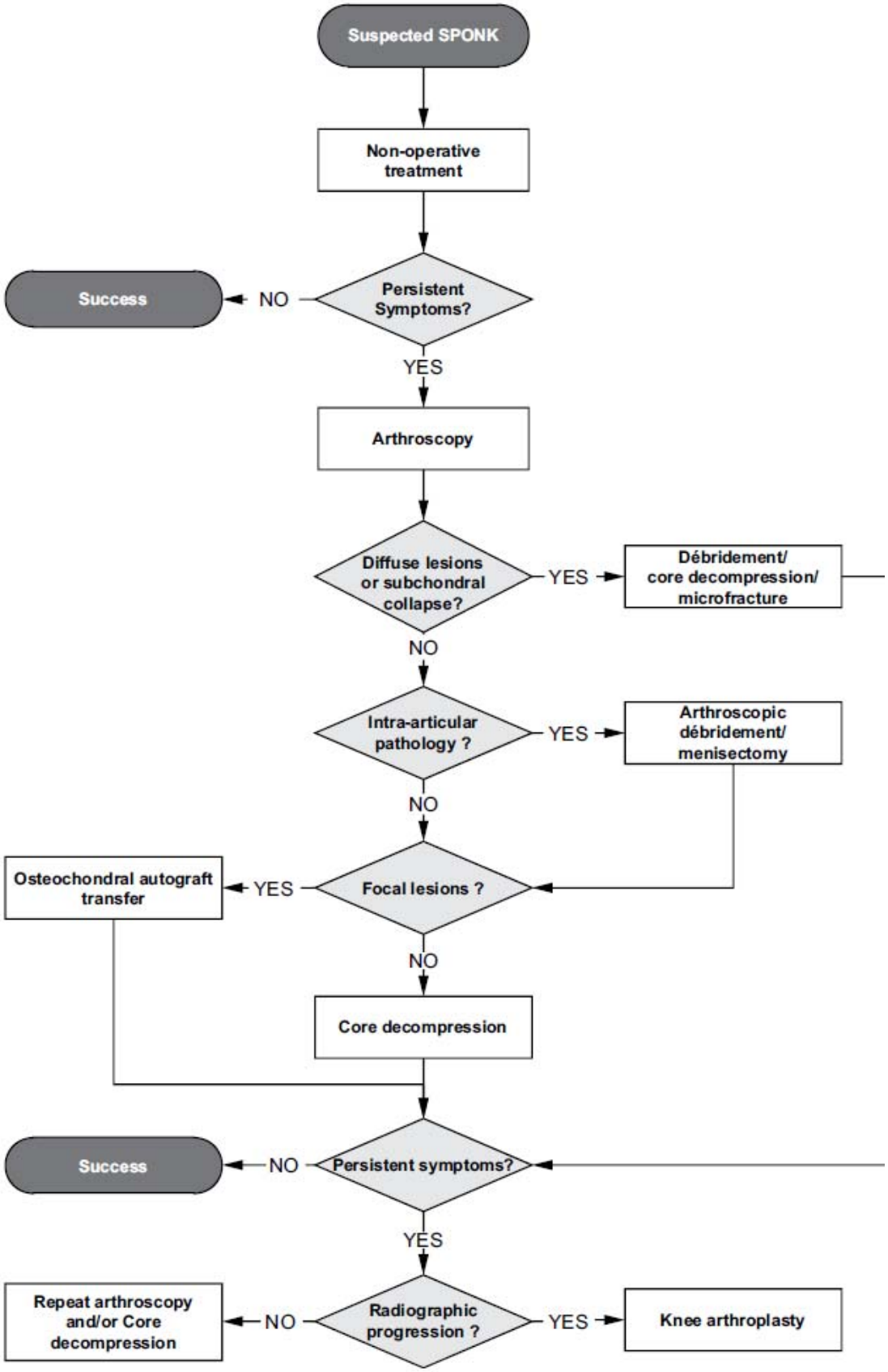
a mean time to recovery from clinical symptoms of knee pain of 4.8 months (range: 3–8 months) in all 20 knees with stage I SPONK treated with protected weight bearing or activity restriction and analgesia.

POSTARTHROSCOPIC OSTEONECROSIS

ON of the knee has been described as an infrequent but often destructive complication of arthroscopic surgery, with approximately 70 cases reported to date.

Developing after arthroscopic meniscectomy, shaver-assisted chondroplasty, anterior cruciate ligament reconstruction,and laser- or radiofrequency-assisted de´ bridement.

It usually affects the epiphyseal region of a single condyle in the operated knee and has been reported to develop at a mean time of approximately 24 weeks after surgery (range: 4–92 weeks). The pathophysiology of osteonecrosis following these procedures is not completely understood. Some lesions in ON after meniscectomy have been noted to bear a strong similarity to SPONK lesions in histologic and radiographic appearance, with dead bone found only distally to a subchondral fracture, and in clinical presentation and course, suggesting that this condition may not be true ON in some cases.



Treatment algorithm for spontaneous ON of the knee.

10. Gerber: Reverse Total Shoulder Arthroplasty.J Am Acad Orthop Surg, Vol 17, No 5, May 2009, 284-295.

Highly successful salvage implant for pseudoparalytic, severely rotator cuff–deficient shoulders.

Moving the center of rotation more medial and distal as well as implanting a large glenoid hemisphere that articulates with a humeral cup in 155° of valgus are the biomechanical keys to sometimes spectacular short- to mid-term results.

However, this technique has a complication rate approximately three times that of conventional arthroplasty. Radiographic and clinical results appear to deteriorate over time.

Proper patient selection and attention to technical details are needed to reduce the currently high complication rate.

The design of conventional TSA prostheses does not account for concomitant musculotendinous pathologies.

RTSA

(1) The prosthesis must be inherently stable.

(2) The weight-bearing part must be convex, and the supported part must be concave

(3) The center of the sphere must be at or within the glenoid neck

(4) The center of rotation must be medialized and distalized.

Inherent Stability

TSR: The radius of curvature of the glenoid is at least 5.5 mm longer than the radius of the humeral component,23 to allow free rotation and adequate translation without deleterious rim loading. To avoid glenohumeral dislocation, the orientation of the joint reaction force vector must be within 30° of the glenoid center line at all times.

With the coordinated action of the rotator cuff and deltoid muscle, this is easily achieved. In the absence of a mechanically effective rotator cuff, however, the unopposed contraction of

the deltoid creates a force vector that is beyond the maximally tolerated 30° of the glenoid center line, so that the head is displaced superiorly rather than abducted.

RTSA components have no mismatch. The radii of curvature of the humerus and the glenoid are identical, imposing concentric motion. In current designs, the convex component is larger than it was in earlier RTSAs, which allows for more mobility.[25] The convex component is smaller than that used in TSA (usually of a diameter of between 36 and 42 mm) and has a substantially shorter radius of curvature. The concave component is larger and deeper than in TSA. The angle that the total joint force vector can subtend without risk of dislocation with the center line is thereby increased to ≥45°. With a head-neck-shaft angle of 155° for the concave component, an isolated contraction of the deltoid does not superiorly dislocate the joint but induces rotation about the medialized, fixed center of rotation, thereby converting superior subluxation of the humerus into glenohumeral elevation or abduction

Medializing the Center of Rotation to the Scapular Neck

Grammont et al[9] reversed the ball-and-socket and eliminated the neck, which thereby automatically medialized the center of rotation to the former glenoid surface. All forces acting on the prosthesis pass through the fixed center of rotation; thus, the neckless design with a hemispheric glenoid component transforms the torque created by former RTSA designs into compressive forces at the prosthesis-bone interface. This solved the formerly inevitable problem of loosening of the convex glenoid component.

However, this design feature invites a mechanical conflict between the humeral component and the inferior scapular neck with the arm in adduction. The almost horizontal humeral cup impinges at the inferior scapular neck, leading to wear of the humeral polyethylene component and erosion of the inferior bony glenoid rim, known as "inferior scapular notching." Current prosthetic designs attempt to alleviate this conflict. Some authors lateralize the center of rotation, which increases the tilting forces at the interface but also increases the impingement-free ROM. Others preserve as much glenoid bone as possible and use a convex glenoid baseplate.

RTSA may be considered when the following conditions are fulfilled:

(1) The patient presents with a clinically symptomatic, irreparable rotator cuff tear
(2) Deltoid function and structure are reasonably preserved.

(3) Glenoid bone stock and glenoid bone quality must allow secure fixation of an inverse glenoid component.

Complete axillary nerve palsy is considered a contraindication.

Infection, neuroarthropathy, and substantial glenoid bone erosion or defects are contraindications to RTSA.

Severe osteopenia, such as in the patient with long-standing, steroid-dependent rheumatoid arthritis, is a relative contraindication.

The patient must be informed that the complication rate of RTSA is approximately three times that of conventional TSA, that radiographic findings deteriorate after approximately 6 years

Our current preference is the deltopectoral approach because we most often use RTSA as a revision procedure.

Results

Massive Rotator Cuff Tear and Cuff Tear Arthropathy

484 patients in the French multicenter study (mean follow-up, 52 months)

The Constant score: 24 ➔ 62 points; elevation increased from 71° ➔ 130°.

At 10 years postoperatively in the study by Molé and Favard,10 89% of the prostheses were still in place, and 72% of the patients had a Constant score >30 points. Radiographic deterioration started to appear after approximately 5 to 6 years, with clinical deterioration appearing after approximately 8 years.

Rheumatoid Arthritis

The most important prerequisite is appropriate glenoid bone stock. When this is compromised by medial and superior erosion of the glenoid cavity, hemiarthroplasty may remain the least unsatisfactory treatment. For the patient with sufficient glenoid bone stock, however, RTSA has shown encouraging short-term results

For this reason the use of a transacromial approach was discouraged.14 Follow-up studies of between 5 and 10 years suggest that the radiographic results deteriorate faster than in rotator cuff disease.33 Longer-term studies are needed to determine whether glenoid component loosening progresses substantially, necessitating further revision surgery. Currently, advanced rheumatoid arthritis should not be considered a well-established indication for RTSA.

Complications

Infection

Deep infection has been shown to occur in 5.1% of the primary cases of RTSA.10 This is approximately four times the infection rate of TSA and is most likomplively related to prosthesis design. The inverse prosthesis creates a large subacromial dead space that is often the site of hematoma formation.

Glenoid Complications

Glenoid loosening has been observed in 4.1% of prostheses followed for longer than 2 years; Risk factors for glenoid loosening are younger patient age (<70 years), female sex, and a superolateral approach.

Inferior Scapular Notching

Notching of the bone of the inferior and posterior scapular neck has an incidence of 50% to 96%.1This complication is generally observed within the first 6 months after surgery and appears to stabilize in most cases. However, some studies demonstrate an apparent increase in incidence and severity of notching with time. Whereas the presence of a notch has been found not to have a significant effect on pain.

Instability

Instability has been observed to occur in 3.4% of primary cases of RTSA. Instability is always anterior and occurs with the arm in extension and internal rotation.

Acromial Fracture

Increasing the passive tension of the deltoid muscle can result in insufficiency fractures of the acromion or displacement of the os acromiale.

II Free Paper: Guyon's canal syndrome A rare case of venous malformation. Vasu Pai MS, D[orth], National board [Orth], FICMR, FRACS, MCh[Orth], Gisborne Hospital,New Zealand, Andrew Harp, Vishal Pai MBChB

ABSTRACT

This paper describes an unusual case of parasthesia in the medial two fingers of the hand in a 56 year old lady. MRI suggested a space occupying lesion and on exploration this proved to be a venous malformation causing a pressure neuropathy of the ulnar nerve.

INTRODUCTION

Ulnar nerve compression at the wrist is a rare diagnosis. A literature review on entrapment at Guyon's canal documents only case reports and short case series. The epidemiology of this neuropathy is not clear.

In contrast to carpal tunnel syndrome, the ulnar nerve entrapment within the Guyon's canal is uncommon. The most common reported cause is a ganglion within the canal; the next most common cause is repeated trauma to the hypothenar eminence[1]. In one retrospective study of 31 cases, idiopathic neuropathy was the most common aetiology[2]. Vascular causes are reported as cases and include aneurysms of the ulnar artery[3], arteriovenous malformations[4], haemangiomas of the ulnar artery[5], ulnar artery thromboses[6] and tortuous ulnar artery[7]. Accessory muscles can cause a compression neuropathy, the two most commonly reported muscles being the accessory palmaris muscle[8] and the accessory abductor digiti minimi[9]. Rarer causes also include amyloidosis[10] (which also caused a carpel tunnel syndrome in the case), Duputren's[11], lipomas[12] and ganglia[13].

We report a case of ulnar nerve entrapment at the Guyon's canal due to an arteriovenous malformation arising from the ulnar vein. Following a literature search we believe that this is the first reported case with a vascular tumour arising from the vein.

CASE REPORT

A 56 year old midwife presented to us with a history of pins and needles in the left ring and middle finger present for four months. She also had some clumsiness in the left hand. This did not prevent her from working. Pain occasionally used to wake her up in the night.

Examination of the left hand revealed localizing tenderness over the hypothenar eminence. There was no evidence of swelling. There was no palpable thrill. Tinel's sign was positive just distal to the pisiform bone. Although touch sensation was present, it was diminished over the little finger and the ulnar aspect of the ring finger. There was no evidence of any wasting of the small muscles of the hand. The intrinsic muscles (namely hypothenar, lumbrical, interossie and adductor pollicis) of the hand were grade IV[MRC grading]. Froment's sign was weakly positive. The range of movement of the hand joints was normal. The elbow and neck examination were also normal.

The total cell count was 8000 cells/mm^3, the ESR was 14mm at one hour and the CRP was 4 mg/l. The radiological examination was unremarkable. The nerve conduction study was inconclusive but reported as normal at the wrist and elbow. However EMG studies could not be performed.

The MRI revealed a soft tissue swelling pressing over the ulnar nerve at Guyon's canal using intermediate signal on T1 and high signal on fat suppressed T2 [Fig1a,b]. A benign lesion was diagnosed.

On exploration of the Guyon's canal, a well encapsulated vascular swelling measuring 3cm x 2cm arising from the ulnar vein [Fig2] was demonstrated. There was pressure on the ulnar nerve distal to the pisiform bone. This was carefully dissected and sent for biopsy [Fig 3]. The biopsy was consistent with a vascular malformation and was characterised by irregular vascular channels, some of which were surrounded by smooth muscle. There was no evidence of malignancy

The postoperative course was uneventful and the symptoms had resolved within 4 weeks.

DISCUSSION

Compressive neuropathies of the ulnar nerve in the canal of Guyon are uncommon compared to ulnar nerve entrapment at the elbow. These entrapments can also result in significant disabilities.

Guyon's canal is bounded medially by the pisiform, laterally by the hook of the hamate, floor by flexor retinaculum and the roof by the volar carpal ligament. The contents medial to lateral are ulnar nerve, ulnar artery and ulnar vein. Compression can occur in one of three zones. Zone 1 is in the most proximal portion of the canal, where the nerve is a single structure consisting of motor and sensory fascicles. Zones 2 and 3 are distal where the ulnar nerve has divided into motor and sensory branches. The clinical picture correlates with the zone in which compression occurs.

Vascular malformations[14] are errors of vascular morphogenesis with normal endothelial turnover and normal numbers of mast cells. Unlike haemangioma, they manifest late and do not resolve spontaneously. Although the exact aetiology is unknown it may arise as a result if miscommunication between cells during the process of vasculogenesis. It may be sub-grouped as: capillary, venous, lymphatic or combined. It has no gender predilection. It may be symptomatic or asymptomatic depending on its site.

The common presentation of an ulnar nerve entrapment at the wrist is pins and needles in the little and ring finger with some weakness of the small muscles of the hand. Because of variable clinical presentation and paucity of radiological finding, the diagnosis is very often delayed. It has been suggested that a high index of suspicion is required for early proper diagnosis. When the diagnosis is suspected an MRI examination is essential. Although positive nerve conduction or EMG is useful it is not always helpful. When a space occupying lesion is demonstrated the majority require surgical excision. The outcome after surgery is usually favourable.

In summary, we emphasize that the diagnosis of entrapment of the ulnar nerve at the wrist is not easy. Early diagnosis may help in early treatment and hence avoid unnecessary suffering and late complications such as permanent nerve damage.

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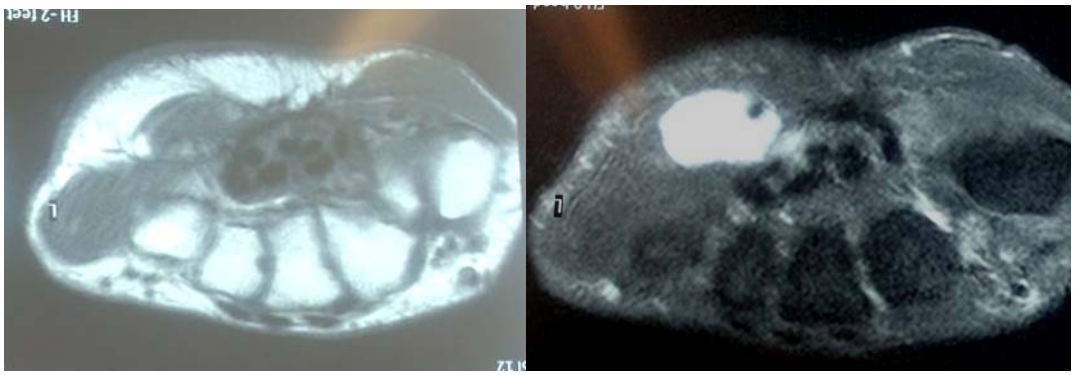
LEGEND

1a and b: T1 and T2 images showing space occupying lesion in the Guyon's canal



2. Intra-operative photograph showing ulnar nerve and the vascular malformation

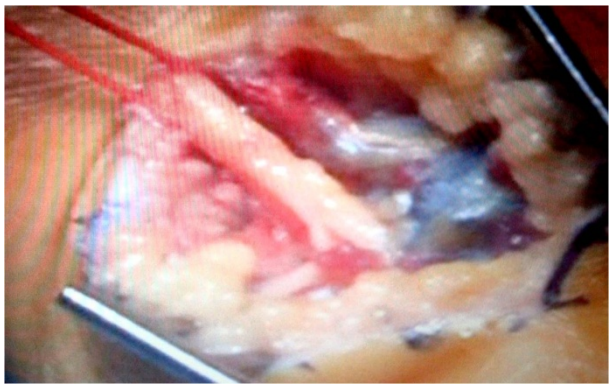
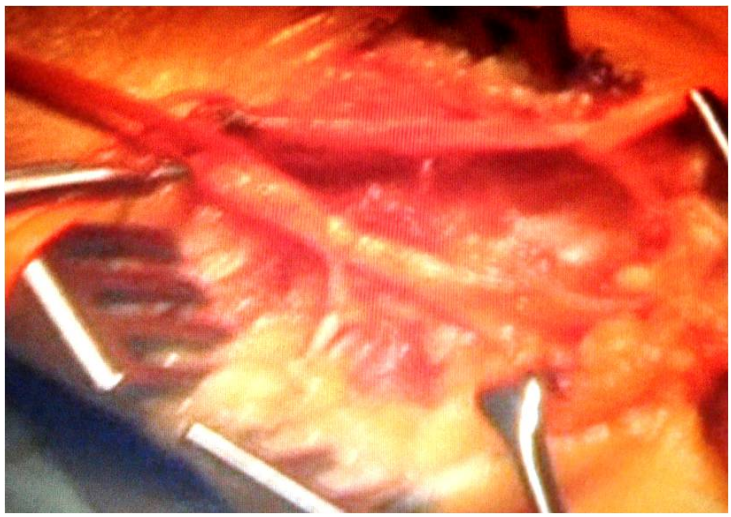


Fig. 3: After dissection: showing ulnar nerve and the artery



III Notes: DDH V.S.Pai **DEVELOPMENTAL DISLOCATION OF THE HIP [DDH]**

Older terminology was Congenital dislocation of the hip.

DDH means 'developmental dysplasia of the hip'.

DDH is better than CDH as dislocation is not always congenital.

DDH includes: Acetabular dysplasia

Dislocatable on Barlow's test

Dislocated: Early: Reducible

Irreducible [Teratologic] : Larsen's syndrome

Arthrogryposis

I**ncidence**: 1: 1000

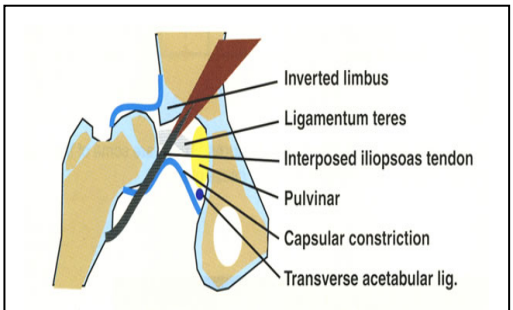
Risk Factors

Family history	20%
First born	common
Female	85% [7:1]
Breech	40%
Premature	More common
L side	65%
Package Disorder	Torticollis, Plagiocephaly, Metatarsus varus

Flat foot.

Pathology

Anteverted neck, Shallow acetabulum



Excessive capsule, Inverted limbus

Narrow medullary cavity of the femur

Structures obstructing reduction of a dislocated hip are

Inverted Labrum [Limbus]

Capsular constriction

Tight iliopsoas tendon

Inferior transverse acetabular ligament

Fibrofatty pulvinar, Hypertrophied ligamentum teres

Natural course of DDH

90% of unstable hips stabilise by 9 weeks of age.

Only reduction is effective when it is performed before 18 months. The maximum remodelling of the acetabulum occurs by this time.

After 18 months: Pelvic osteotomy is required.

Salter's is performed <8 years; Dega's osteotomy >8 years

Secondary osteoarthritis occurs at 20-45 years

Hip check during first 3 weeks

Family history

Pregnancy history: Full term or not

Caesarean or not

Breech or not

Other congenital problem: inspect Feet, knees,

Spine, neck for Torticollis

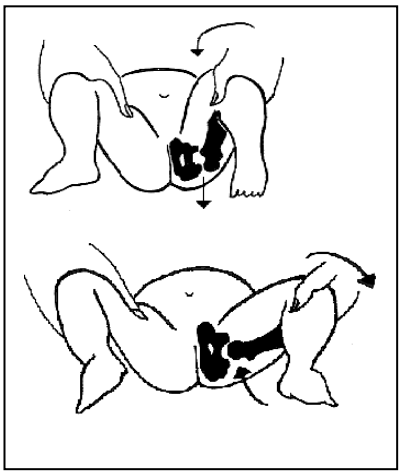
Hip examination

Asymmetric skin folds is not a reliable sign

Galeazzi test for limb length

Abduction of the Hip: usually 90º

Tests: Barlow's, Ortolani's tests



Barlow's test

Positive in Dislocatable hip

Examine one hip at a time

With one hand to stabilise pelvis

With the other hand held over hip under question with thumb over the groin and fingers over the greater trochanter. Now slightly adduct.

Pressure over the lesser trochanter dislocates the head.

Ortolani's test

Positive in early [<3months]

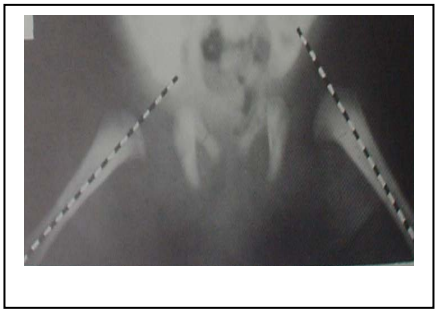
Both hips examined at same time

Hip at 90º; Knee 30 º Flex

Now Abduct with finger pressure over the greater trochanter

X ray

Von Rosen View: <4 months

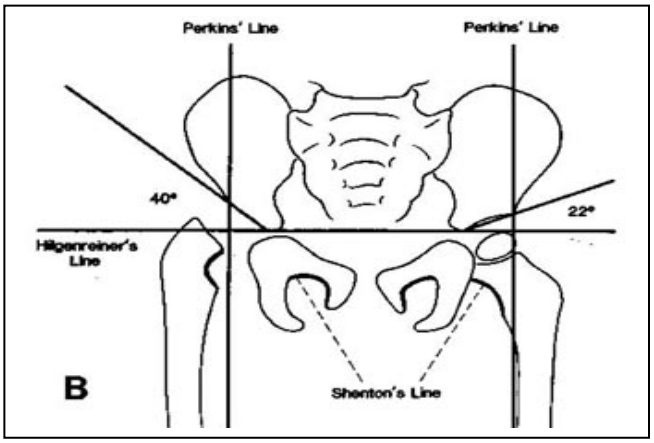


Patient is supine with hips abducted 45º and
in internal rotation

AP projection of the pelvis is then obtained

Shaft points towards the triradiate cartilage

X rays at 4 months

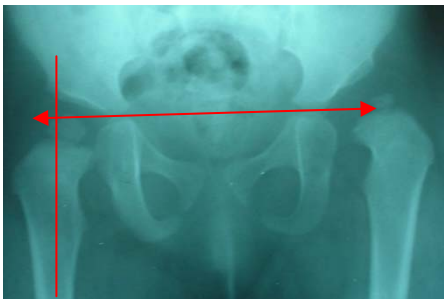


H Hilgenreiner line

P Perkin's line

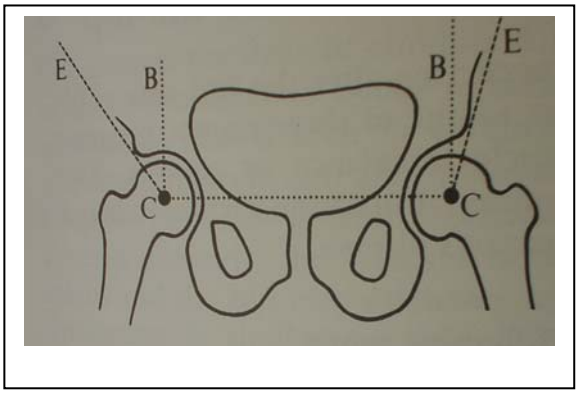
S Shenton's line

AI Acetabular Index:



Normal 27.5 [>30º Pathological]

X ray > 5 years.



CE angle: N > 25º

< 15º abnormal

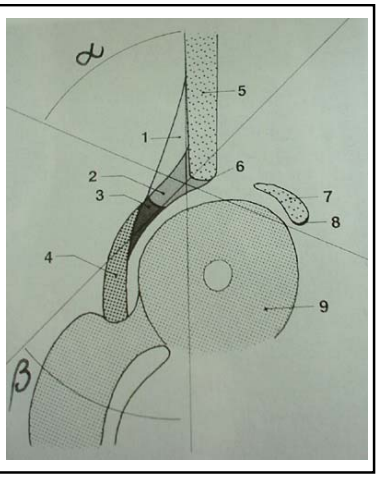
Ultrasound

Gives accurate diagnosis

Useful under the age of six mo

Non-invasive

Can be assessed in the Harnes



1. Periosteum of ilium
2. Cartilage. Acetabular. Roof
3. Acetab labrum
4. Joint capsule
5. Ilium
6. Promontory of acet rim
7. Iliac bone
8. Inf. Margin of ilium

Dynamic ultrasound gives information about stability

Alpha angle >45-60° dysplasia;

<45° dislocation

Disadvantages

Operator dependent

TREATMENT

1. All new born requires screening with Barlow's and Ortolani's test, Abduction, Galeazzi test.
2. Usually first 3 weeks does not require any treatment. If unstable at 3 weeks, needs Pavlick Harness
3. After 4 weeks, repeat the ultra-sound in the harness. If head is unreduced, fixed abduction splint is used.

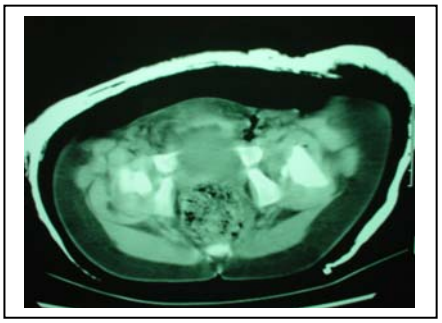
4. At 3 months, when X ray is suspicious, an

Arthrogram is done under anaesthesia to check whether hip is concentrically reduced.

When there is no concentric reduction, adductor tenotomy and then look for concentric reduction under Image intenfier.

5. When reduced hold it in a human position ie.,

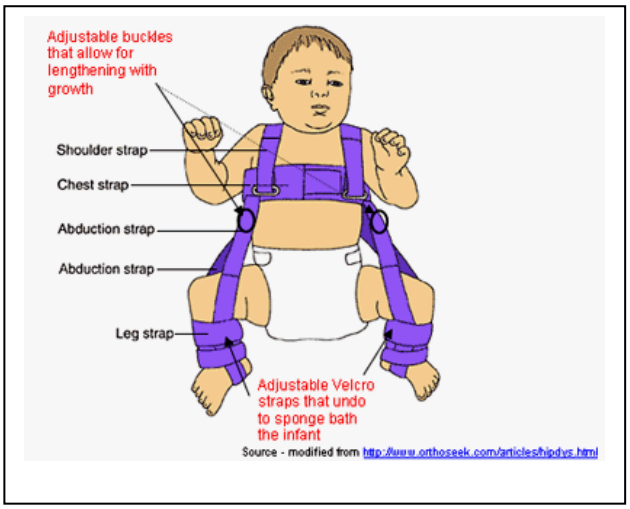
90º of flexion and 45º abduction in a Hip spika.



6. Following spika, aCT scan is done at day one and then at one week and at 6 weeks to confirm concentric reduction

7. Failure to achieve concentric reduction, need open reduction. Sometimes femoral or pelvic osteostomy is required.

Pavlick Harness



- Parts: Shoulder harness; Booties
- Anterior strap controls flexion
- Posterior strap controls the abduction
- Indication: 0-6 months
- Safe zone of Ramsey:

  Flexion 90º and Abduction 45º

Problems	Solution
Posterior wall defect and persistent subluxation	Prolong harness; Consider Arthrogram
Failure of reduction and lax joint	Fixed abduction brace
Inferior dislocation of the hip	Decrease flexion by 20°
Femoral nerve neuropathy	Decrease flexion by 20°
Osteonecrosis [1-4%]	Decrease abduction
Poor harness fit	Change sizes
Poor compliance	Parent education; Think about fixed splint like Von Rosen

OPEN REDUCTION

Open reduction: Medial approach

Anterolateral approach

MEDIAL APPROACH [LUDLOF'S]

Indication 6 months – 1 yr

Technique

Small groin incision [from the femoral art pulses to medial]

Divide Adductor longus

Visualize Adductor brevis with anterior branch of Obturator Nerve

Go between Adductor brevis and Pectineus and identify iliopsoas

Psoas tenotomy distal to the MCFA

Arthrogram

Hip joint capsulotomy and divide the ligamentum teres

Trace to transverse acetabular ligament.

Disadvantages of medial approach

- poor exposure
- unable to reef redundant capsule

Advantage

Less Avascular necrosis

Less invasive and less scar

Contraindication: Teratologic dislocation

ANTEROLATERAL APPROACH

[SMITH PETERSON]

Indication 12 months to 8 years

Technique

Bikini incision - lateral femoral cutaneous nerve of thigh
retracted medially

Interval between Tensor fascia lata and Sartorius

Ligate ascending branches of Lateral circumflex femoral artery lying on rectus femoris

Iliac crest apophysis is split and elevate abductors laterally

Both heads of Rectus Femoris divided [AIIS]

Capsule: T incision of capsule. Transverse along the labrum and vertical along the neck

Iliopsoas divided at the pelvic brim [only tendon the muscle]

Open the joint and trace the ligamentum terus to transverse acetabulum ligament and divide it

Excise bulky ligamentum teres and pulvinar fat

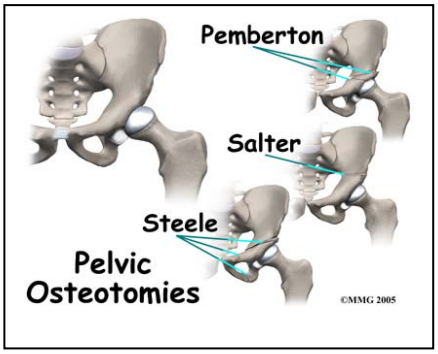
Reduce the head in the joint and double breast capsular flaps

Femoral shortening if reduction is tight.

PELVIC OSTEOTOMY

TYPES

I **Redirectional osteotomy**: Increase anterior-lateral coverage of the femoral head by redirecting roof of the acetabulum.



Eg: Salter's osteotomy in younger kids [<8 years]

Dega's osteotomy in older kids [> 8 years]

Ganz or Bernes [>15 years]

Other less commonly done osteotomy

Dial osteotomy [Wagner]

Double osteotomy [Sutherland]

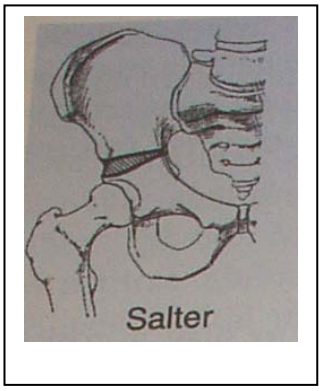
Triple [Steel]

II **Reshaping Osteotomy**: Pemberton osteotomy

III **Augmentation of the roof of the acetabulum:** Chiari's osteotomy

Shelf (Staheli)

SALTER'S OSTEOTOMY



Prerequisite

Head of the spherical should be spherical

Concentric reduction should be possible

Age < 8 years

Approach: Antero-lateral like Smith Peterson through a bikini incision

Osteotomy: From Greater Sciatic notch and Anterior inferior iliac spine

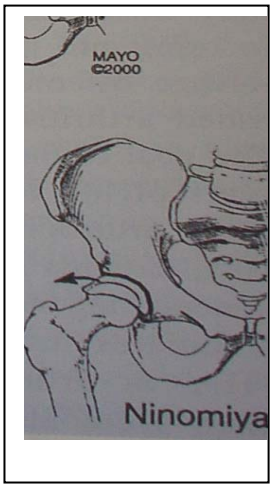
Distal fragment is rotated: Entire acetabulum, pubis and ischium is rotated with a hinge at Symphysis pubis to cover anterior and lateral aspect of the head

Osteotomy site is opened anteriorly: Wedge from the anterior part of the Ilium is placed and fixed with K Wires

Hip spika for 6 weeks.

Salter recommends: 18 Months to 6 years for dislocation and 18 M to 12 years for Subluxation of the hip.

PEMBERTON OSTEOTOMY



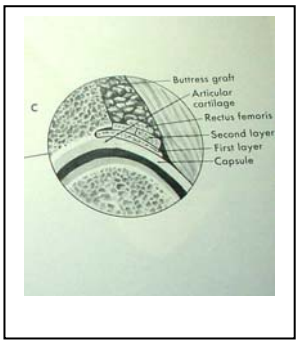
Large acetabulum and spherical head

Hinge: Triradiate cartilage

Pericapsular osteotomy curved and bone graft

Upper limit 12 yrs [when triradiate cartilage closes]

STAHELI'S AUGMENTATION PROCEDURE



Indication: DDH with aspherical head

Normal CE angle is drawn to 35° and measure graft length as shown

Bikini incision 2 cm below and parallel to the Iliac crest
Expose hip through a standard Ilio-femoral approach.
Divide Rectus Femoris reflected head
Placement of acetabular slot is important: at the margin
1 cm deep
Autograft from outer table and second layer right angle to the first one
pack them above with cancellous

CHIARI OSTEOTOMY

Outcomes Related to age of the patient, the degree degenerative change, the degree of the medial

displacement of the acetabulum.

It is a medial displacement of ilium for older children,

With deformed head and a CE angle greater than –9°
Medial displacement 40-60%

When an osteotomy indicated

< 8 years = Salter's osteotomy
> 8 years = Dega's osteotomy
Head spherical but acetabulum is large = Phemberton

>8 years, Head not spherical = Chiari's/Shelf procedure

>15 : " but pain is disabling: Arthrodesis or arthroplasty
>15 year, head is spherical: Dial, Ganz or Sutherland or triple

FEMORAL OSTEOTOMY

Indication

1. Femoral reduction causes excessive pressure. {>3 yrs}. Requires femoral shortening
2. Derotation: Undertake if extreme cast position necessary

Technique

Separate lateral incision

Guide wires as marker

Amount of shortening, overlap of bone when hip reduced
and bone osteotomised or rotation

Femoral head reduced

Blade and plate fixation

Hip spika: 3-4 months

Avascular necrosis in DDH

Incidence: Pavlic Harness 1-4%
Open reduction 5%

Ogden's Classification

I Complete fragmentation; no residual deformity

II Lateral growth arrest from occlusion
Sup. Branch of MCFA (Coxa magna and valga, subluxation)

III Complete involvement of the head and
substantial deformity

Kalamchi and MacEwen classification

I Changes confined to the ossific nucleus

II Type I + Lateral physeal damage (Coxa Valga)

III Type I + Central physeal damage (Coxa brevis)

IV Total damage to the head and physis (Coxa plana and brevia)

V Unclassifiable

IV ICL: Heyworth. Internal impingement of shoulder. Am J Sports Med 2009 37: 1024

Internal impingement of the shoulder is a pathologic condition characterized by excessive or repetitive contact of the greater tuberosity of the humeral head with the posterosuperior aspect of the glenoid when the arm is abducted and externally rotated. This arm positioning leads to rotator cuff and glenoid labrum impingement by the bony structures of the glenohumeral joint.

However, it is believed that varying degrees of glenohumeral instability, posterior capsular contracture,
and scapular dyskinesis may play a role in the development of symptomatic internal impingement

“Internal impingement” is a normal or pathologic condition, it has most often been described as a chronic, pathologic condition that is associated with throwing and other repetitive, overhead athletic activities.

Findings typical of internal impingement include articular-sided partial thickness rotator cuff tears and posterosuperior or posterior labral fraying or tears.

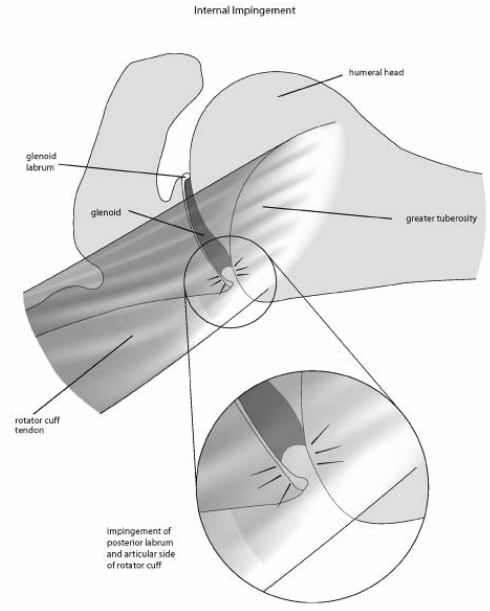
Unlike “external” or “subacromial” impingement, most often simply called “impingement syndrome,”59 there is not a single pathophysiologic process at work in the painful throwing shoulder. Internal impingement syndrome is thought to be fundamentally more complex and multifactorial in nature.

Conway also noted that “anterior glenohumeral instability almost certainly contributes to internal impingement.”

Overhead athletes, by definition, commonly position the arm in the maximally abducted and externally rotated position; this arm position causes anterior translation of the humeral head and rotator-cuff impingement on the posterior glenoid rim. The potential role of anterior

instability in the origin of internal impingement is further substantiated by the common findings of Bankart lesions, anterior labral fraying, and SLAP tears seen in throwing athletes.

The fact that nonpathologic interposition of the rotator cuff and posterosuperior labrum between the glenoid rim
and greater tuberosity, which some authors will refer to as internal impingement, occurs in throwers and nonthrowers alike has become a well-accepted concept.

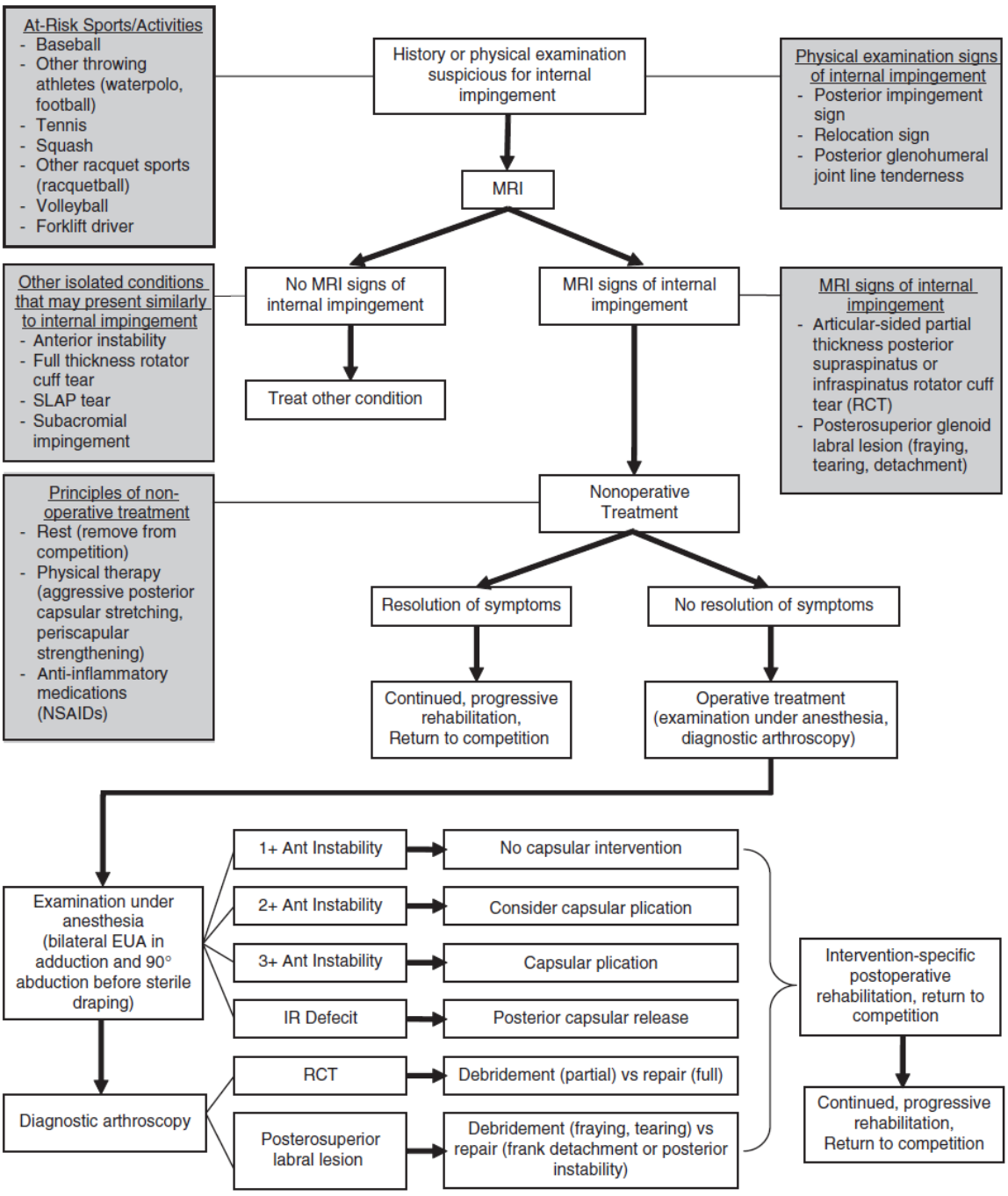


impingement of the greater tuberosity on the posterosuperior glenoid rim, with the interposed articular side of the rotator cuff and the posterosuperior labrum, which are prone to inflammation, fraying, or tears.

In 2003, Burkhart : Tthe biomechanics of how a loss of internal rotation, or development of a glenohumeral internal rotation deficit (GIRD), could initiate the central pathophysiologic cascade in the throwing
shoulder.
The first step in this cascade as the development of a contracture of the posterior band of the inferior glenohumeral ligament (PIGHL) and posteroinferior capsule. As shown by O’Brien et al,61 the PIGHL and
anterior inferior glenohumeral ligament normally act as individual but reciprocating cables balancing the humeral
head in the center of the glenoid, in the glenoid bare spot, when the arm is in abduction.

A contracture of the PIGHL, commonly seen in pitchers, acts as a tether to normal glenohumeral rotation, shifting
the normal, central contact point of glenohumeral articulation in a posterosuperior direction, which can lead to a
greater arc of external rotation occurring before the normal contact of internal impingement. Moreover, they suggested that this shift decreases the beneficial “cam effect” that the humeral head and proximal humeral calcar exert on the anteroinferior capsule, by occupying space and tensioning the capsule when the arm is in abduction.
An increase in the pathologic “peel-back mechanism,” in which the vector of the biceps in the cocking position transmits heightened torsional loads on the posterosuperior labrum, leading to SLAP tears.

Burkhart et al15 also describe a constellation of findings they refer to as scapular malposition, inferior medial border prominence, coracoid pain and malposition, and dyskinesis of scapular movement, which they call “SICK scapula syndrome,” as a critical part of the disabled throwing shoulder. They believe this muscle overuse fatigue syndrome causes protraction of the scapula, which in turn leads to malposition of the glenoid and, ultimately, increased tensile loads on the anterior capsule and posterosuperior labrum. They believe this increase in loads can exacerbate the pathologic cascade responsible, in most cases, for dead-arm syndrome in throwers.


At-Risk Sports/Activities
- Baseball
- Other throwing athletes (waterpolo, football)
- Tennis
- Squash
- Other racquet sports (racquetball)
- Volleyball
- Forklift driver
History or physical examination suspicious for internal impingement
Physical examination signs of internal impingement
- Posterior impingement sign
- Relocation sign
- Posterior glenohumeral joint line tenderness
MRI
Other isolated conditions that may present similarly to internal impingement
- Anterior instability
- Full thickness rotator cuff tear
- SLAP tear
- Subacromial impingement
No MRI signs of internal impingement
MRI signs of internal impingement
MRI signs of internal impingement
- Articular-sided partial thickness posterior supraspinatus or infraspinatus rotator cuff tear (RCT)
- Posterosuperior glenoid labral lesion (fraying, tearing, detachment)
Treat other condition
Principles of non-operative treatment
- Rest (remove from competition)
- Physical therapy (aggressive posterior capsular stretching, periscapular strengthening)
- Anti-inflammatory medications (NSAIDs)
Nonoperative Treatment
Resolution of symptoms
No resolution of symptoms
Continued, progressive rehabilitation, Return to competition
Operative treatment (examination under anesthesia, diagnostic arthroscopy)
Examination under anesthesia (bilateral EUA in adduction and 90° abduction before sterile draping)
1+ Ant Instability
No capsular intervention
2+ Ant Instability
Consider capsular plication
3+ Ant Instability
Capsular plication
IR Defecit
Posterior capsular release
Diagnostic arthroscopy
RCT
Debridement (partial) vs repair (full)
Posterosuperior labral lesion
Debridement (fraying, tearing) vs repair (frank detachment or posterior instability)
Intervention-specific postoperative rehabilitation, return to competition
Continued, progressive rehabilitation, Return to competition

Physical Examination

1.Posterior glenohumeral joint line tenderness, increased external rotation, and decreased internal rotation

2. Testing for SLAP lesions, “classic” impingement signs such as the Neer and Hawkins tests, cross-body adduction tests, and instability testing should be performed.

3. O’Brien et al62 reported 100% sensitivity and 98.5% specificity

4.Meister investigated the ability of a single maneuver, referred to as the “posterior impingement sign,” to detect the presence of articular-sided rotator cuff tears and posterior labrum lesions.

5. Jobe and his associates suggested that the relocation test could be used to identify internal impingement as well.With the arm in an abducted and maximally externally rotated position (in throwers, sometimes up to 140°), the internal impingement patient would experience posterior shoulder pain that was relieved with a posteriorly directed force on the proximal humerus.

This finding is distinct from the uncomfortable feeling of apprehension and anterior shoulder pain noted in

patients with true anterior shoulder instability, who also experience relief with a posteriorly directed force.

6.As previously mentioned, a glenohumeral internal rotation deficit, marked by a loss of greater than 30° to 40° of

internal rotation relative to the expected gain in external rotation, compared with the contralateral side, is an overwhelmingly common physical examination finding in symptomatic throwers.

7.In addition, scapular protraction, caused by SICK scapula syndrome and associated with scapular dyskinesis, is a commonly reported finding by the same investigators.15 Characteristic features include a prominent inferior medial border of the scapula

Radiographic Findings

Four radiographic findings that have been described in association with internal impingement include (1) exostosis of the posteroinferior glenoid rim, also known as a Bennett lesion; (2) sclerotic changes of the
greater tuberosity; (3) posterior humeral head osteochondral lesions or cystic “geodes”; and (4) rounding of the posterior glenoid rim. It should be noted that radiographic findings may often be minimal or normal in patients with internal impingement.
Mithöfer et al57 stressed the importance of assessing the greater tuberosity for sclerotic and cystic changes; these
findings are present in approximately half of patients with internal impingement.
MRI: advocate the use of magnetic resonance arthrography with either gadolinium contrast material or saline to better identify labral tears
Both MRI and radiographs should be used in conjunction with physical examination findings to establish a
diagnosis of internal impingement. However, as a number of studies have shown, most of the described findings may also be seen in the asymptomatic shoulder. Thus all the features of the patient’s clinical picture must be considered as a whole, with consideration of age, profession, patient activity level, symptom severity, degree of disability, and the effects of the condition on athletic performance and activities of daily living.

TREATMENT AND RESULTS
Rest, cryotherapy, oral anti-inflammatory medications, and physical therapy
Exercises should focus on posterior capsular stretching
Strengthening of the periscapular musculature and rotator cuff

Approach to Surgical Management
Primary arthroscopic interventions focused on the lesions of internal impingement in individuals
with persistent signs of subacromial impingement.
Mithöfer et al57 also suggested that internal impingement represents a relative contraindication to acromioplasty.
Findings on Diagnostic Arthroscopy and Treatment of Intra-articular Lesions
throwing athletes showed abnormal contact between the posterosuperior glenoid rim and the rotator cuff when the arm was placed in the position of the “relocation test”;

These patients were noted to have undersurface fraying of the rotator cuff.64 In another series reported by Walch.

Although few authors distinguish between the types of rotator cuff lesions that are associated with internal impingement, we believe the fraying often seen at the musculotendinous junction of the anterior infraspinatus

generally warrants only minimal debridement; these lesions are not typically full thickness

. More distal, articular- sided tears near the supraspinatus footprint may be more severe, particularly in older throwers, and may therefore necessitate repair.

After arthroscopic debridement alone of articular-sided rotator cuff tears and posterosuperior labral lesions,

reporting an 82% satisfaction rate.

Revision following cemented and uncemented primary total hip replacement: G J Hooper JBJS B Vol. 91, Iss. 4; pg. 451

Abstract (Summary)

We have reviewed the rate of revision of fully cemented, hybrid and uncemented primary total hip replacements (THRs) registered in the New Zealand Joint Registry between 1999 and December 2006 to determine whether there was any statistically significant difference in the early survival and reason for revision in these different types of fixation.

Of the 42 665 primary THRs registered, 920 (2.16%) underwent revision requiring change of at least one component. Fully-cemented THRs had a lower rate of revision when considering all causes for failure ($p < 0.001$), but below the age of 65 years uncemented THRs had a lower rate ($p < 0.01$).

The rate of revision of the acetabular component for aseptic loosening was less in the uncemented and hybrid groups compared with that in the fully cemented group ($p < 0.001$), and the rate of revision of cemented and uncemented femoral components was similar, except in patients over 75 years of age in whom revision of cemented femoral components was significantly less frequent ($p < 0.02$).

Revision for infection was more common in patients aged below 65 years and in cemented and hybrid THRs compared with cementless THRs ($p < 0.001$).

Dislocation was the most common cause of revision for all types of fixation and was more frequent in both uncemented acetabular groups ($p < 0.001$).

The experience of the surgeon did not affect the findings. Although cemented THR had the lowest rate of revision for all causes in the short term (90 days), uncemented THR had the lowest rate of aseptic loosening in patients under 65 years of age and had rates comparable with international rates of aseptic loosening in those over 65 years.

Cementless fixation has the potential to attain a permanent bond with bone by bony ingrowth, and once stable fixation has occurred, the outcome does not appear to deteriorate in the decade after implantation.11-15 Cementless fixation has also introduced greater surgical options with respect to the size and type of bearing surface used. The modularity of

cementless acetabula has improved the ability of the surgeon to deal with the problems of dysplasia, acetabular deficiency and recurrent dislocation and has increased the ability of the surgeon to restore the anatomy, particularly in the difficult THR.

Hybrid THR was introduced to make use of the potential benefits of a cemented stem and uncemented acetabular component, particularly in younger patients.17-19 Acetabular wear and loosening were identified as the weak links of cemented THR in younger patients and early results showed that hybrid THR performed well in these patients at medium-term follow-up with low rates of aseptic loosening.17-20 However, polyethylene wear and osteolysis remained a problem.

Recent analyses of joint registries have revealed that the early revision rates (within nine years) for primary THR have been higher for cementless than for cemented fixation.21,22 This has not been the perceived experience in New Zealand where there is widespread use of cementless fixation, and it was decided that analysis of the New Zealand data was timely. We wished to confirm whether there was a significant difference in the rate of revision between fully cemented, hybrid and uncemented THR and to determine whether there were any factors predisposing to early revision in either group.

Annual auditing of the registry consistently confirms a nationwide compliance rate of 95% to 98%.

A criticism of registries has been that the orthopaedic practice within the catchment area may be skewed towards one particular procedure. The Swedish Joint Registry23 has produced valuable data for several years and has had a considerable role in modifying the use of implants throughout the world. However, a valid criticism has been the relatively few uncemented compared with cemented procedures within this registry.

One of the reasons for introducing the uncemented THR was to eliminate the cement layer in order to reduce the number of potential interfaces which could fail and thereby decrease the rate of aseptic loosening. The incidence of femoral aseptic loosening in the uncemented group in our study was low with revision-free survival of about 98% which compares favourably with other studies which have shown femoral survival of almost 100% at ten years.12-15,23 These studies indicate that the stability of the femoral component does not deteriorate with time, suggesting that the biological bond formed between the prosthesis and

bone may indeed be permanent. The rate of revision for femoral loosening in the uncemented group in our study was comparable with that of cemented components, except in the group aged over 74 years in which the numbers were small, resulting in wide confidence intervals. These data are in agreement with the low incidence of aseptic loosening of uncemented femoral components recently reported by the Norwegian arthroplasty register.25

Aseptic loosening of the uncemented acetabulum was low (0.31%) and once ingrown they performed better than the cemented acetabulum in the medium term (nine years, 0.28% compared with 0.58%).

Hybrid THR was introduced to improve the results of cemented THR in younger patients in whom acetabular failure was the main cause of early revision. However, in our study, hybrid THR only performed better in the 55- to 64-year age group when compared with the uncemented THR and did not out-perform cemented THR in any age group.

Younger patients across all three groups had a higher rate of revision compared with those over 65 years of age. Patients under 55 years of age at the time of THR had a lower rate of revision if an uncemented prosthesis was used, confirming other studies showing a higher incidence of early failure in this more active age group if they had a cemented replacement.28-31

Our study again confirmed the higher rate of revision surgery for dislocation with a posterior approach. However, the rate did not change with time suggesting that a stable THR, performed through the posterior approach, did not become unstable later.

There was a significant number of patients in the cemented group who underwent revision for infection. A large proportion of these (70%) did not receive antibioticimpregnated cement for fixation of the components. There is evidence that the infection rate is markedly reduced by the use of antibiotic-impregnated cement and matches that of uncemented components.32 This finding suggests that all primary cemented THRs should be performed with antibiotic cement although it could be argued that an uncemented THR which was well fixed may have been more likely to survive in the presence of infection and therefore not require revision. Our study only looked at revision as defined by component exchange and there were no data collected on those THRs which might have had a deep infection, but did not require revision.

Polyethylene wear and osteolysis accounted for a large number of revisions within the 'other' category and there was a greater number of uncemented acetabula within this group. Again, it is possible that revision of a liner, which radiologically shows signs of wear, is more likely to occur than that of a cemented acetabular component showing the same signs because of the relative ease of the procedure with lower complications. However, these results raise questions about the uncemented acetabular component and the rate of articular and back-side wear occurring in these components.

We believe that our study has confirmed that the uncemented THR, at least in the younger age group (< 65 years), has a lower early rate of revision than that of cemented THR, and as such should be considered in these patients. Cemented THR continues to provide the best results in older patients with lower rates of revision. However, the changing nature of THR with the use of heads of larger diameter, increased modularity and different articulating surfaces may result in a wider indication for the use of uncemented THR in this age group, particularly with respect to the acetabular component.

10. Shoulder Resurfacing, Burgess, J Bone Joint Surg Am. 2009;91:1228-38

_ Resurfacing is a type of shoulder arthroplasty that involves replacing the humeral joint surface with a metal covering, or cap, thus preserving the bone of the proximal part of the humerus. If the glenoid is also replaced, a current conventional polyethylene glenoid replacement prosthesis or an interposed soft-tissue graft is used.

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The potential advantages of humeral resurfacing, as compared with conventional shoulder arthroplasty, are:

(1) no osteotomy is performed (and thus the head-shaft angle does not have to be addressed);

(2) minimal bone resection;

(3) a short operative time;

(4) a low prevalence of humeral periprosthetic fractures; and

(5) ease of revision to a conventional total shoulder replacement, if needed.

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Outcomes of surface replacement arthroplasty have been comparable with those of arthroplasties with a stemmed prosthesis in numerous short and mid-term follow-up studies.

Future studies are required to assess the long-term outcomes of humeral resurfacing and to evaluate alternative surface bearing materials, especially on the glenoid side.

Resurfacing appears to be a viable option for shoulder replacement, especially in young patients.

V MCQ

a.Stability of the THR in fracture neck of femur and the surgical approach.

1. 1. he posterolateral approach was the only factor associated with a significantly increased risk of dislocation than the posterolateral approach with posterior repair and without posterior repair.

2. Dislocation of the THR occurred overall in dislocation rate of 6%.
3. The anterolateral surgical approach was associated with a lower risk of dislocation than the posterolateral approach with or without posterior repair (2%, 12%, and 14%, respectively)
4. The patient's age, sex, the indication for surgery, the experience of the surgeon, and the femoral head size had no influence on the dislocation rate.
5. The first dislocation occurred early (within 6 weeks) over 50%
6. An interesting additional finding in that study was that the dislocation rate was elevated in patients with mental dysfunction: 32%, as compared to 12% in lucid patients.
7. In OA hip: the dislocation rate for THR was 0.5%for patients with a posterior repair and 5% for those without

2.Mann. Hallux Valgus. J Am Acad Orthop Surg 1995;3:34-43

- Osteotomies: the degree of correction that can be obtained with a distal osteotomy is not as great as with a proximal osteotomy. Problem is shortening of first metatarsal and results in some dorsiflexion
- Arthrodesis of the MTP joint will produce excellent correction of a severe deformity or can be used to salvage a failed operative procedure.
- As a general rule, the more severe the deformity, the greater the degree of pronation
- Not infrequently, the second toe is more symptomatic, in terms of pain and deformity, than the hallux

  even though the great toe has initiated the problem..

- Currently, the use of a prosthesis in primary bunion surgery is not recommended because of the lessthan-
- optimal long-term results and the silicone-related problems that often occur, such as significant synovitis, osteolysis,
- Juvenile Hallux Valgus: Unfortunately, surgical correction of the juvenile form is associated with a significant rate of recurrence. Most surgeons advocate delaying surgery until skeletal maturity has been achieved unless an unusual degree of ain and deformity. There is a high prevalence of pes planus and ligamentous laxity. There also appears to be an increased incidence of lateral deviation of the distal articular surface of the first MTP joint. When considering treatment for the patient with juvenile hallux valgus, one can follow the same decision- making precepts based on the severity of the deformity in the adult

3. Timing of ACLReconstructive Surgery A J Sports Med Vol. 37, No. 5

- 1. 47% with meniscal tears, and 15% with both cartilage and meniscal lesionsL tear.
- 2. The odds of a cartilage lesion in the adult knee increased by 1.006 (95% confidence interval, for each month that elapsed from injury to surgery.
- 3. The odds of a cartilage lesion in the adult knee increased by nearly 1% for each month that elapsed from the injury date until the surgery date and that of cartilage lesions were nearly twice as frequent if there was a meniscal tear, and vice versa.
- 4.A recent study2 based on review of 183 cases concluded that primary ACL reconstruction surgery should be carried out within 12 months of injury to minimize the risk of meniscal tears and degenerative changes. In this study, presence and type of meniscal tear and type of degenerative change were recorded.

4. Complication of Ankle fractures ORIF. J Bone Joint Surg Am. 2009;91:1042-9

1.Pulmonary embolism (0.34%),
2.Wound infection (1.44%),

3.Amputation (0.16%),

4.Revision open reduction and internal fixation (0.82%).

5.The intermediate-term rates of reoperation were also low, with ankle fusion or ankle replacement being performed in 0.96%.

6. Open fractures, age, and medical comorbidities were significant predictors of short-term complications.

7.The intermediate-term rate of reoperation for ankle fusion or replacement was higher in patients with trimalleolar fractures (hazard ratio, 2.07; $p < 0.001$) and open fractures (hazard ratio, 5.29; $p < 0.001$).

8. Open injury, diabetes, and peripheral vascular disease were strong risk factors predicting a complicated short-term postoperative course.

5. **Forearm instability. J Hand Surg 2009;34A:953–961.**

1.Forearm instability is a complex problem resulting from traumatic disruption of the forearm stabilizers: the radial head, the interosseous membrane, and the triangular fibro cartilage complex.

2.In 1951, Essex-Lopresti further described an injury pattern of forearm instability resulting from a traumatic axial load transmitted from the wrist to the elbow. This load resulted in a radial head fracture, a disruption of the distal radioulnar joint (DRUJ), and a rupture of the interosseous membrane.

3. Stability of the forearm is attributed primarily to the radial head and secondarily to the TFCC and the interosseous membrane.

4.In the setting of ulna neutral variance, the radiocarpal joint absorbs 80% of the axial load transmitted through the wrist, and the remaining 20% is transmitted to the ulna.

5. The interosseous membrane functions to redistribute the radial load to the ulna as the force travels through the forearm, so that at the elbow, the radiocapitellar joint sees 60% of the original axial load and the ulnohumeral joint the remaining 40%..

6.Hotchkiss also noted that once the radial head has been removed, the interosseous membrane takes on 90% of the axial load transmitted through the forearm resisting proximal migration of the radius.

7.Excision of the radial head without disruption of any other soft tissues can result in up to 7 mm of proximal migration of the radius with axial loading of the forearm.

8.For every 1 mm of proximal radial migration that occurs, there is a 10% increase in load across the distal ulna.

9.Proximal radial migration greater than 6 mm was associated with damage to both the TFCC and the interosseous membrane, resulting in gross forearm instability, and a contraindication for a radial head excision without replacement.

6. Osteonecrosis of the Knee: Orthop Clin N Am 40 (2009) 193–211

1. 3distinct conditions: spontaneous osteonecrosis of the knee (SPONK),
secondary ON of the knee,
post arthroscopic ON of the knee. This

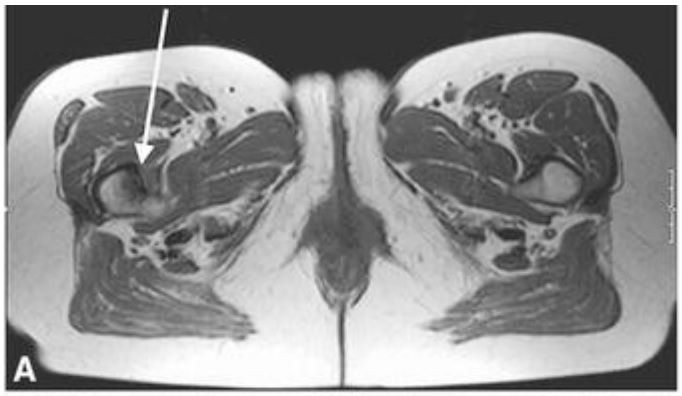
2. SPONK, which typically affects a single condyle in older patients;
True ON, which is most commonly seen in younger patients after exposure to corticosteroids and presents with several simultaneous foci in the distal femur or proximal tibia;
3.Post arthroscopic ON, which presents in a condyle after arthroscopic surgery.

VI Case Report

A 53-year-old woman presented with 3 months of progressively worsening right medial thigh pain. Her pain was worse at night, often awakening her from sleep. She denied any back pain, fever, chills, night sweats, or weight loss.

Physical examination: Right antalgic gait was noted. There was no edema, erythema, skin warmth, or palpable mass on examination of the right thigh. There was full and painless active and passive range of motion of the right hip and knee. Neurovascular examination, strength, and tone were normal.

Magnetic resonance images of the right hip and thigh, CT scans of the right proximal femur , and a total body bone scan were available from the referring physician. Plain radiographs had not been performed at the time of the initial evaluation.


A


B


C

Based on the history, physical examination, and the imaging studies, what is the differential diagnosis?

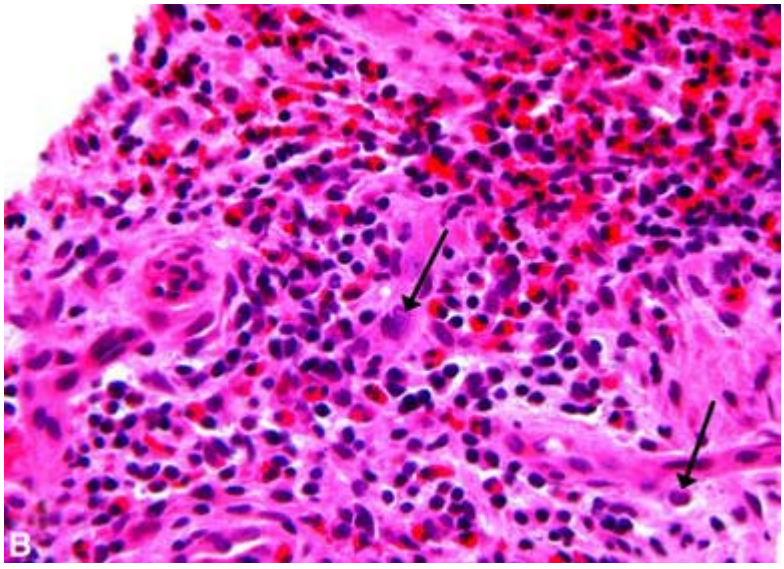
Imaging Interpretation

Magnetic resonance images of the right thigh showed a femoral lesion involving the cortex and the medullary canal with a small zone of surrounding medullary and soft tissue edema. This lesion had low signal intensity on T1-weighted images, high signal intensity on T2-weighted fat-saturated images, and were peripherally enhanced with contrast administration. Computed tomography scans showed involvement of the medial femoral cortex that resembles tunneling without apparent cortical breakthrough

Differential Diagnosis

- Osteoid osteoma
- Metastatic disease
- Infection
- Eosinophilic granuloma
- Lymphoma

A needle biopsy and radiofrequency ablation were performed and the specimen was sent for pathologic examination. Immunohistochemical staining with CD1a and S-100 also was performed .



Histology Interpretation

On gross examination, the specimens consist of multiple fragments of red core tissue. Scanning magnification showed sheets of cells with eosinophilic cytoplasm, a preponderance of eosinophils, and bone fragments. Higher-power magnification showed the cells had eosinophilic cytoplasm with reniform (bean-shaped) nuclei with inconspicuous to small pinpoint nucleoli surrounded by many eosinophils

Immunohistochemical stains for CD1a and S-100 highlighted the Langerhans cells.

Diagnosis

Intracortical eosinophilic granuloma

Discussion and Treatment

Eosinophilic granuloma is one manifestation of a spectrum of diseases known as Langerhans cell histiocytosis (LCH). It formerly was known as histiocytosis X and is a rare disorder characterized by clonal proliferation of antigen-presenting mononuclear cells of dendritic origin known as Langerhans cells. This disease was thought to be an immune-mediated reactive disorder until more recently; however, no infectious agent has been isolated. In addition, the clonal proliferation of the Langerhans cells appears to indicate a neoplastic origin.

The differential diagnosis for the typical presentation of LCH is broad and includes infection, malignancies such as Ewing sarcoma, lymphoma, or metastasis, and benign lesions such as osteoid osteoma or osteoblastoma. The intracortical long bone lesion presented in this case is atypical for an eosinophilic granuloma, so osteoid osteoma, infection, and metastasis were high on our differential before this lesion was definitively diagnosed with biopsy. Like eosinophilic granuloma, osteoid osteoma most frequently occurs in young patients, but it remained high on the differential owing to the size of the lesion and the patient's history of obtaining some relief with NSAIDS. Metastatic disease and lymphoma also can cause substantial pain and are present in this patient's age group. As infection can mimic many diseases of bone, this was on the differential list; however, the surrounding edema present in

eosinophilic granuloma is less extensive than the edema seen with infectious processes, which is apparent in this case. Although stress fracture should be considered with this patient's history and the benign-appearing surrounding edema, the presence of peripheral enhancement which resembles a lesion made this diagnosis doubtful.

The unifying feature of LCH is the clonal proliferation of Langerhans cells. When this occurs as solitary or multiple bone lesions without systemic involvement, it is known as eosinophilic granuloma. Langerhans cell histiocytosis also may present as extraosseous lesions or with multisystem involvement, which are more commonly found in the pediatric population. The triad of skull lesions, exophthalmos, and diabetes insipidus is referred to as Hand-Schuller-Christian disease. Letterer-Siwe disease is an aggressive, multifocal, systemic, and often fatal form of LCH that usually presents in infancy. These three clinical entities are thought to be different manifestations of the same underlying proliferative process.

The typical presentation of LCH is recent onset of pain with or without swelling in the area of a solitary bone lesio. Subcutaneous edema also may be visible if the lesion is in a bone with little soft tissue coverage, such as the clavicle. Pathologic fracture complicates approximately 16% of cases. Langerhans cell histiocytosis most commonly presents in the pediatric population, with the majority of cases occurring during the first 5 years of life. However, it can manifest at any age, and some reports suggest 30% to 40% of cases occur in adults. In adults, extraosseous involvement occurs in approximately 10% of cases, with eosinophilic granuloma of the lung being the most common extraosseous manifestation.

Langerhans cell histiocytosis can affect any bone in the body; however, bone lesions are most common in the axial skeleton, such as the skull, ribs, vertebrae, and mandible. The appendicular skeleton is involved 1/3 of the time, with the femur, humerus, and clavicle being the most frequent sites. Lesions are diaphyseal in the majority of appendicular cases, with most of the remaining lesions being metaphyseal. Epiphyseal lesions are reported to be rare in children.

Imaging typically begins with plain radiographs, although our patient did not get preprocedure radiographs. The radiographic appearance of a lesion is variable and will depend on location and the stage of the lesion. Acute or active lesions typically have an osteolytic appearance with poorly defined margins without surrounding sclerosi]. An active lesion in a long bone often will cause medullary destruction, which may progress to endosteal

scalloping, cortical erosion, or periosteal reaction. The periosteal reaction can be multilayered (laminated), which may resemble the onion skin periosteal reaction of Ewing's sarcoma. These nonspecific radiographic characteristics often make active lesions difficult to differentiate from tumor or infection. In the spine, vertebral body lesions are the most common location often characterized by anterior wedging or near-total collapse (known as vertebra plana) with disc-space preservation. Chronic lesions can have well-defined borders and reactive sclerosis.

As LCH can involve multiple sites, it is important to screen for other lesions. There is some debate regarding whether radionuclide skeletal scintigraphy or radiographic skeletal survey is more sensitive. Lesions that have been treated with chemotherapy or are not active may not be detected with a bone scan, whereas very small actively growing lesions likely will be visible on a bone scan before being visible on radiographs. Additionally, sensitivity may be affected by the anatomic site, as lesions of the ribs, spine, and pelvis are more likely missed with radiography than with a bone scan.Therefore, some authors suggest both modalities be used, as they may provide complimentary information.

Histologically, the bone lesions have sheets of cells with eosinophilic cytoplasm, a preponderance of eosinophils, and bone fragments. Higher magnification reveals large, elongated Langerhans cells with abundant eosinophilic cytoplasm and a bean-shaped nucleus. The nuclei have vesicular chromatin with inconspicuous to small pinpoint nucleoli. Formerly, electron microscopy showing Birbeck granules was used to confirm the diagnosis, but today immunohistochemical staining for CD-1a and S-100 can highlight the Langerhans cells

Treatment often is individualized based on symptoms, morbidity, extent of disease, and location of the lesion(s). Mild isolated bone lesions can be observed and may spontaneously heal. Lesions that are symptomatic, few, and accessible may be treated with intralesional injection of corticosteroid or surgical curettage with grafting

Radiation therapy is also an option, especially for lesions for which surgical morbidity would be high, as local control rates greater than 90% have been reported for low-dose radiation therapy in isolated bone lesions [