المجلس الصحي العام

General Health Council

الموافق: ..../..../.....14م

التاريخ: ..../..../.....20م

الأدلة الإرشادية السريرية في مجال طب وجراحة العظام تم إعدادها بالتنسيق بين

المجلس الصحي العام ومجلس التخصصات الصحية ومجموعة من الخبراء في جمعية

العظام الليبية

TKA GUIDELINES

Relative contraindications

a. Obesity
b. Range of motion (ROM) <80deg
c. Previous high tibial osteotomy

d. Cemented fixation is the gold standard for TKA across all indications
e. Optimization of cementing techniques has allowed for reliable and durable fixation for all three components (patella, femur, tibia)
f. The cement used is prepared with vacuum suction and centrifugation
g. Cancellous bone is cleaned with pulsatile lavage and drying at the time of implantation. Drying can be augmented with intraosseous suction or negative pressure intrusion into the proximal tibia
h. Critical attention to details allows for adequate cement penetration and minimizes interruption of the bone-implant-cement interface
i. The most common late complication is osteolysis
j. The most commonly used technique uses a 5° to 7° (depending on body habitus) valgus femoral cut and a neutral tibial cut
k. Most of the ligament balancing required for a varus deformity occurs at the time of exposure controlled posteromedial release
l. The medial side is tight, and therefore subperiosteal medial release or stripping of the medial side will help with balancing
m. The surgeon must be careful not to perform an overly aggressive medial release during the exposure
n. The medial structures may be attenuated and lax in valgus deformity
o. Significant valgus deformities will require: -
p. Osteophyte resection
q. Lateral capsule release off the tibia
r. Iliotibial band release if tight in extension (either Z-type release or release off the Gerdy tubercle)
s. Popliteus release if tight in flexion
t. Lateral collateral ligament release (Use of constrained device should be considered when severe valgus deformity with incompetent MCL is present
u. In valgus deformities >15°, the iliotibial band and popliteus may have to be released. This is often done through a selective internal

release of tight lateral structures and with a tensioning device in place

v. When correcting combined valgus deformity with flexion contracture, the risk of peroneal nerve palsy is a concern
w. Normal posterior capsular recess is recreated by stripping the adherent capsule proximally off of the femur after posterior condylar resection
x. Posterior osteophytes are removed
y. The tendinous origins of the gastrocnemius are released
z. If extension is tight and flexion is acceptable, an asymmetric gap is present and either not enough of the posterior capsule was released or not enough of the distal femur was cut. Therefore, the posterior capsule should be released and more bone should be removed from the distal femur in 1- to 2-mm increments

1- If extension is acceptable and flexion is tight, an asymmetric gap is present, the tibial bone cut has no posterior slope, and either not enough posterior bone was cut or—if a PCLretaining implant is used—the PCL is scarred and too tight

2-If extension is loose and flexion is acceptable, an asymmetric gap is present and either too much of the distal femur was cut or the anteroposterior size of the implant is too big. Therefore, distal femoral augmentation should be performed, a smaller size (anteroposterior) femoral component should be used, and a thicker tibial polyethylene inset should be used to address the tight flexion gap

3- Unconstrained

4-Posterior cruciate-retaining TKA

5- Advantages

6- Minimizes flexion instability (taut PCL in flexion prevents anterior translation)

7- Preserves femoral roll-back (posterior shift of the femoral tibial contact point as the knee flexes)

8- Preservation of roll-back may improve flexion

Disadvantages

1- Roll-back is actually a combination of roll and slide (no anterior cruciate ligament)

2- Polyethylene must be flat to allow rollback—leads to increased contact stresses and sliding wear

3- Posterior cruciate-substituting TKA

4- Should be used in patients with previous patellectomy, inflammatory arthritis, previous PCL injury, or excessive release of PCL that occurs during surgery

5- Polyethylene post and cam between femoral condyles produces mechanical roll-back in flexion

6- Can also use a highly congruent liner with build-up of the anterior lip (allows for use of a femoral component without a box or cam)

The guidelines for septic arthritis in native joints (SANJO)

History:

Patients presenting with acute joint swelling, pain, erythema, warmth, and joint immobility should be screened for risk factors associated with septic arthritis Particular vigilance is needed during a monoarticular flare-up of rheumatoid arthritis, because patients on immunosuppressive medications, but not biologic therapy, have a fourfold increased risk of septic arthritis. Many patients with rheumatoid arthritis are treated with anti–tumor-necrosis-factor-α, which further increases the risk of infection twofold.

Constitutional symptoms such as fever, chills, or rigors may be present in patients with septic arthritis, although their sensitivities are 57, 27, and 19 percent, respectively

PHYSICAL EXAMINATION

The physical examination should determine if the site of inflammation is intraarticular or periarticular, such as a bursa or skin. Generally, intraarticular pathology results in severe limitation of active and passive range of motion, and the joint is often held in the position of maximal intraarticular space. For example, a septic knee will be extended fully. Conversely, pain from periarticular pathology occurs only during active range of motion, and swelling will be more localized.

Although septic arthritis is usually monoarticular, up to 20 percent of cases are oligoarticular. In native joints, the knee is the most commonly affected, followed by the hip, shoulder, ankle, elbow, and wrist. Infections of axial joints, such as the sternoclavicular or sacroiliac joint, may occur; however, they are more common in patients with a history of intravenous drug abuse

LABORATORY EVALUATION

Serum markers, such as white blood cell (WBC) count, erythrocyte sedimentation rate,[10,17] and C-reactive protein levels,[9] are often used to determine the presence of infection or inflammatory response. Patients with confirmed septic arthritis have been found to have normal

erythrocyte sedimentation rates and C-reactive protein levels.[9] When elevated, these markers may be used to monitor therapeutic response. Because pathogenesis may be hematogenous, blood cultures are positive in 25 to 50 percent of patients with septic arthritis.

SYNOVIAL FLUID ANALYSIS

Because the clinical presentation of septic arthritis may overlap with other causes of acute arthritis arthrocentesis is needed to identify the causative infectious agent. Synovial fluid should be evaluated at the bedside and then sent for WBC count with differential, crystal analysis, Gram stain, and cultureIn synovial fluid, a WBC count of more than 50,000 per mm^3 (50×10^9 per L) and a polymorphonuclear cell count greater than 90 percent have been directly correlated with infectious arthritis, although this overlaps with crystalline disease. Lower synovial fluid WBC counts may occur in persons with disseminated gonococcal disease, peripheral leukopenia, or joint replacement. Septic arthritis can coexist with crystal arthropathy; therefore, the presence of crystals does not preclude a diagnosis of septic arthritis.

Clinical recommendation

Suspicion of septic arthritis should be pursued with arthrocentesis, and synovial fluid should be sent for white blood cell count, crystal analysis, Gram stain, and culture.

In addition to antibiotic therapy, evacuation of purulent material is necessary in patients with septic arthritis; arthrocentesis and surgical methods are appropriate.

Intraarticular white blood cell cutoff values for infection as low as 1,100 per mm^3 (1.10×10^9 per L) with a neutrophil differential of greater than 64 percent can help diagnose prosthetic joint infection.

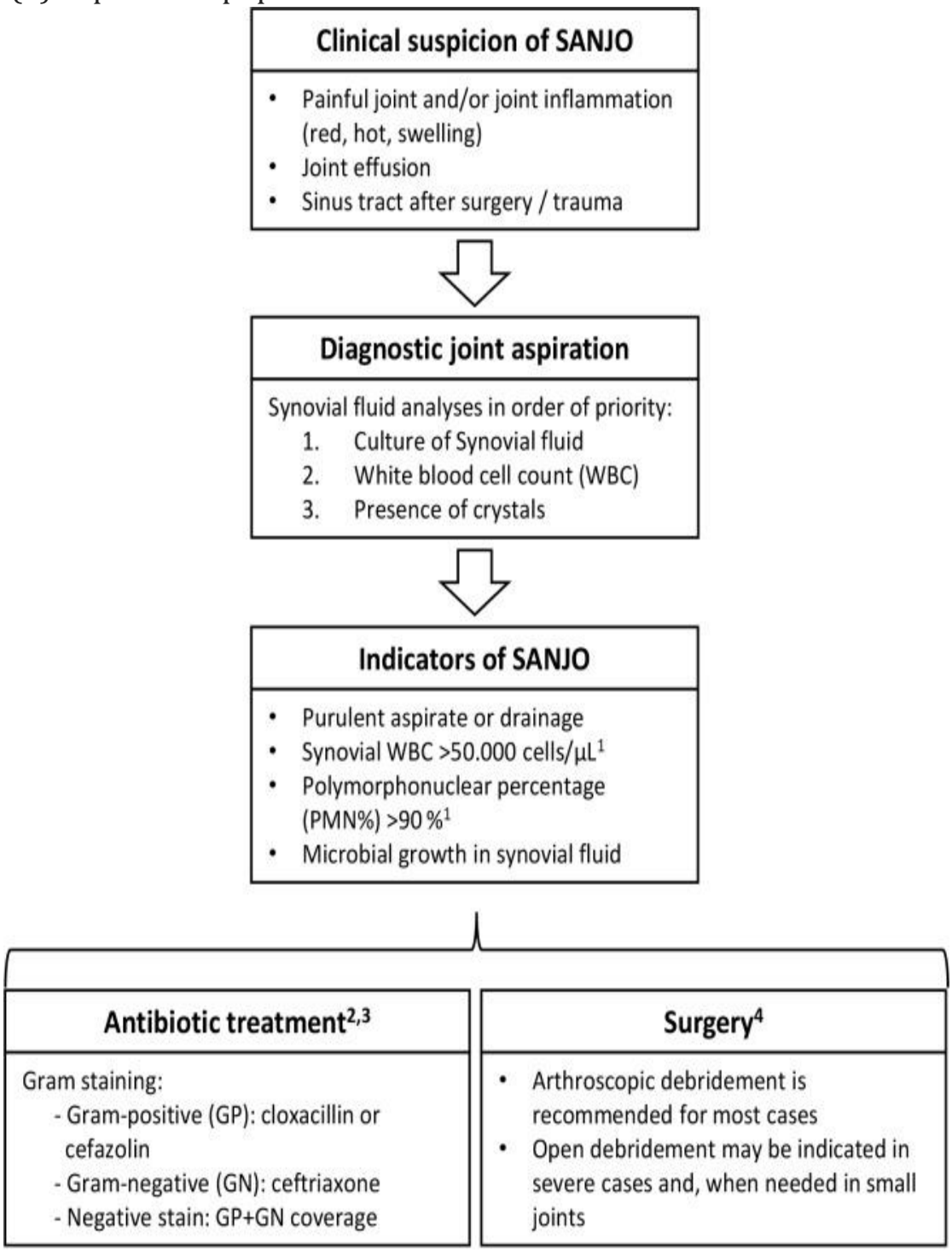
The diagnosis of septic arthritis in native joints (SANJO) is mainly based on aspiration of joint fluid, which initially is analysed for synovial leucocyte count, but most important, for bacterial identification. Except for patients with signs of sepsis, empirical

antibiotic treatment should await diagnostic sampling of joint fluid to avoid false negative culture results. Arthroscopic lavage (with synovectomy, depending on the clinical stage) is recommended for SANJO particularly in larger joints, although open revision could be considered in cases with synovial membrane adhesions or in the presence of cartilage or bone damage. Empirical antibiotic treatment should be selected considering the most likely pathogens and targeted according to the results from microbiology laboratory. Joint mobilization to avoid contracture should be started as soon as possible when infection is under control and after drains have been removed. Careful postoperative evaluation should reveal early signs of treatment failure, which indicates repeated surgical revision. This guideline also includes specific considerations for SANJO:

(1) after reconstruction of the anterior cruciate ligament,

(2) in tuberculous arthritis, and

(3) in pediatric population.



[1] SANJO can be present without an elevated white blood cell count (WBC) or percentage of neutrophils (PMN%). Gout, pseudogout and rheumatic diseases can also cause elevated WBC and PMN%.
[2] Empirical antimicrobial therapy should be adapted to local epidemiology and individual risk factors for methicillin-resistant *S. aureus, P. aeruginosa* or other resistant pathogens. Target therapy is imperative once the cultures are available.
[3] In case of sepsis or septic shock, antibiotic should be administered even before joint aspiration.
[4] Surgical treatment may be postponed ≤24h, if: 1) the patient has no sepsis/septic shock, 2) the joint is drained and irrigated by re-aspiration of saline injection until clear fluid is obtained, 3) empirical antibiotic treatment has been started, and 4) an experienced surgeon can perform the procedure.

Guidelines for Pilon Fracture

Tibial pilon fractures are rare, but present an immense challenge for orthopedic surgeons. Preoperative planning includes CT scans and thorough investigation of the patient's history to identify possible risk factors, which is key to successful treatment. Special consideration and care should be taken in managing the fragile soft tissue envelope surrounding tibial pilon fractures. Choosing the right approach for each fracture pattern is important to get the best possible visualization and therefore be able to anatomically reduce the articular surface of the tibial pilon. With modern surgical techniques and hardware outcomes have improved, but are still only moderate with a high overall complication rate.

Nonsurgical Treatment

Nonsurgical treatment may be recommended for stable fractures in which the pieces of bone are not displaced or are minimally displaced.

It may also be recommended for patients who are unable to walk or patients with very serious medical problems who may not be able to tolerate surgery.

Nonsurgical treatment may include:

Splints and casts. In most cases, a splint to hold ankle in place. Once the swelling goes down, they will replace the splint with a short leg cast. To provide effective support, cast must correctly fit your ankle. For this reason, as the swelling of ankle decreases. Monitoring. Your doctor will closely monitor the healing of your fracture. Regularly follow-up X-rays.

Recovery. For up to 12 weeks after the injury. For recommend the use of crutches or a walker. After 6 weeks, replace by brace.

Surgical Treatment

We suggest a combined anterior and posterior approach in the second stage in order for the posterior column to be reduced and adjusted simultaneously, whenever needed. Following with these

procedures, a satisfactory reduction and good recovery of ankle function should be expected.

Surgery is commonly recommended for unstable fractures in which the bones are out of place.

Open Reduction and Internal Fixation

During this operation, the displaced bone fragments are first repositioned (reduced) into their normal alignment, and then held together with screws and plates

Timing of Surgery

When significant swelling or blisters, delay surgery until the swelling goes down. Performing surgery too soon increases the risk for infection or problems with incision. may be delayed for up to 2 weeks or more, depending on how long it takes for the swelling to go down.

Keep ankle in a splint until surgery, or recommend k-wire fixation surgery to protect while waiting for the second surgery.

External Fixation

The application of an external fixator to hold pilon fracture in place and stabilize the ankle until second surgery can take place.

Fractures NOF guidelines

This guideline covers managing hip fracture in adults. It aims to improve care from the time people aged 18 and over are admitted to hospital through to when they return to the community. Recommendations emphasise the importance of early surgery and coordinating care through a multidisciplinary Hip Fracture Programme to help people recover faster and regain their mobility.

Imaging

In patients with a continuing suspicion of a hip fracture but whose radiographs are normal, what is the clinical and cost effectiveness of computed tomography (CT) compared to magnetic resonance imaging (MRI), in confirming or excluding the fracture?

Recommendation Perform surgery on the day of, or the day after, admission. Postponement of surgery carries increased risk of complications, as well as prolongation of pain, and the need for repeated preoperative fasting.

Recommendation

Identify and treat correctable comorbidities immediately so that surgery is not delayed by:

- anaemia
- anticoagulation
- volume depletion
- electrolyte imbalance
- uncontrolled diabetes
- uncontrolled heart failure
- correctable cardiac arrhythmia or ischaemia
- acute chest infection

exacerbation of chronic chest conditions.

Analgesia

Assess the person's pain:

immediately upon presentation at hospital and within 30 minutes of administering initial analgesia and hourly until settled on the ward and regularly as part of routine nursing observations throughout admission.

Offer immediate analgesia to people presenting at hospital with suspected hip fracture, including people with cognitive impairment.

Ensure analgesia is sufficient to allow movements necessary for investigations (as indicated by the ability to tolerate passive external rotation of the leg), and for nursing care and rehabilitation.

Offer paracetamol every 6 hours preoperatively unless contraindicated.

Consider adding nerve blocks if paracetamol and opioids do not provide sufficient preoperative pain relief, or to limit opioid dosage.

Offer paracetamol every 6 hours postoperatively unless contraindicated.

Non-steroidal anti-inflammatory drugs (NSAIDs) are not recommended.

Anaesthesia

Offer people a choice of spinal or general anaesthesia after discussing the risks and benefits. Consider intraoperative nerve blocks for all people undergoing surgery.

Surgical procedures

Operate on people with the aim to allow them to fully weight bear (without restriction) in the immediate postoperative period.

Offer replacement arthroplasty (total hip replacement or hemiarthroplasty) to people with a displaced intracapsular hip fracture.

Consider total hip replacement rather than hemiarthroplasty for people with a displaced intracapsular hip fracture who:

were able to walk independently out of doors with no more than the use of a stick and do not have a condition or comorbidity that makes the procedure unsuitable for them and are expected to be able to carry out activities of daily living independently beyond 2 years.

Use cemented implants in people undergoing surgery with arthroplasty

Consider an anterolateral approach in favour of a posterior approach when inserting a hemiarthroplasty.

Use extramedullary implants such as DHS in preference to an intramedullary nail in people with trochanteric fractures above and including the lesser trochanter (except reverse oblique).

Use an intramedullary nail to treat people with a subtrochanteric fracture.

Offer people a physiotherapy assessment and, unless medically or surgically contraindicated, mobilisation on the day after surgery.

Offer people mobilisation at least once a day and ensure regular physiotherapy review.

If a hip fracture complicates or precipitates a terminal illness, the multidisciplinary team should still consider the role of surgery as part of a palliative care approach .

Guidelines for acetabular fractures;

Recommendation: Hip dislocations are orthopedic emergencies and require prompt reduction

Acetabular fractures associated with central (medial) dislocation of the femoral head do not benefit from reduction

Recommendation: reduce anterior or posterior hip dislocations as soon as possible

Unsuccessful reduction

If hip reduction is not successful in the emergency department,

1. *Surgeon may repeat attempts at closed reductions optimizing the technique (under general anesthesia, under image intensifier, using Schanz screw)*
2. *Open reduction without definitive fixation should be avoided*
3. *In case of unsuccessful reduction in the hip reduction skeletal traction is not useful*
4. *Surgeon can consider early definitive management with fixation and restoration of acetabular stability*

Footnote: the authors agreed that repeating reduction attempts present a low rate of complications and are necessary in complex cases.

Instability after reduction

Recommendation: the authors were not able to find a consensus about treatment in case if severe instability after reduction. Otherwise the authors suggested treating these types of injuries as early as possible.

Timing of CT scan

A CT pre and post reduction to better study the presence of intrarticular fragments but those protocols presents also the advantages of either a major radiologic exposure either they require more time.preoperative CT scan is not mandatory before reduction

Skeletal traction; Recommendation:

1. *Skeletal traction is not necessary in all acetabular fracture*
2. *Traction is not necessary after reduction of a fracture dislocation*
3. *Traction may be helpful in case of poor pain control*

Recommendation: Pain management protocols for long bone fractures may be used also for acetabular fracture

Ultrasound exam for Thromboembolism prophylaxis

Prophylaxis for DVT is effective but there is no evidence-based proof that it is also effective in reducing the risk of fatal pulmonary embolism.

It is appropriate to consider screening the pelvic veins with duplex ultrasound, magnetic resonance venography or contrast enhanced CT scans on high-risk patients, and to delay surgery when findings are positive

preoperative ultrasound exam is not recommended in all acetabular fracture to prevent DVT and PE. A standard DVT prophylaxis should be given to patient with acetabular fractures.

Tranexamic acid in acetabular fracture

Recommendation: tranexamic acid is useful for reduction of blood loss in acetabular fracture

Antibiotic prophylactic protocols; Recommendation: antibiotic prophylactic protocols for long bone fracture may be used for acetabular fracture

Heterotopic ossification prophylaxis;

preoperative heterotopic ossification prophylaxis is not effective in acetabular fracture, heterotopic ossification prophylaxis is recommended after fixation.

Conclusion;

Anterior and posterior hip dislocation even in presence of acetabular fracture should be reduced as soon as possible. If unsuccessful, surgeon may repeat the attempts optimizing the technique (deeper anesthesia, Schanz screw, image intensifier). Preoperative CT scan is not mandatory before reduction and skeletal traction is not indicated in most of the acetabular fracture; standard pain and antibiotic prophylactic protocols for long bone fractures should be used; preoperative ultrasound exam is not recommended in all acetabular fracture; tranexamic acid should be preoperatively used while there is no indication for preoperative ossification prophylaxis.

Guidelines for THR

Total hip arthroplasty (THA), also known as a total hip replacement is an elective surgical procedure to treat patients who experience pain and dysfunction from an arthritic hip joint.

THA is an effective option if the patient's pain does not respond to conservative treatment and has caused a decline in their health, quality of life, or ability to perform activities of daily living.

With advancements in modern medicine, there have been several effective surgical approaches developed for THA, including anterior, posterior, anterolateral, posterolateral, and lateral approaches.

The surgeon will determine the best surgical approach to use for each individual.

For each approach, there are different precautions that must be followed to decrease risk of dislocation based on the tissues that were affected during surgery.

Patients are encouraged to participate in early mobilization while adhering to precautions in order to improve function and limit post-operative complications.

Total hip arthroplasty (THA) is one of the most successful procedures performed in modern orthopedics. The long-term survivorship of contemporary implants is estimated to approach 96% to 99%.

Amidst such growing enthusiasm, it is incumbent upon the orthopedic surgeon to maintain a realistic understanding of the indications and contraindications to this potentially life-changing procedure.

GENERAL CONSIDERATIONS

The decision to undergo any invasive procedure is frequently met with hesitation and anxiety by most patients. A frank, open discussion between patient and surgeon regarding the risks and benefits of THA will provide the foundation for a strong relationship and may alleviate many of the fears harbored by patients with end-stage arthropathy.

Ultimately, the selection of THA as the best course of treatment should be made with a clear understanding of the patient's particular goals and the likelihood of complications.

In general, any patient considered a candidate for THA should have already undergone an earnest attempt at nonoperative management.

This typically includes the use of assistive devices, oral nonsteroidal medications, acetaminophen, and activity modifications.

It is important to advise patients, however, that nonoperative treatment is not without risk. The chronic use of nonsteroidal anti- inflammatory medications has been shown in numerous studies to cause gastrointestinal, cardiac, renal, and hepatic complications.

Patients using oral pain medications for longer than 3 months should undergo routine hepatic and renal screening tests under the supervision of a primary care physician.

The primary indication for THA in a patient with endstage arthropathy is pain resulting in significant limitation of physical activity. With survivorship of contemporary THA components estimated to approach 20 years, those patients with greater than 20 years life expectancy should be counseled regarding the likelihood of the need for future surgery.

In addition, it is important for the surgeon to remember that the definition of both pain and limitation of physical activity may differ from patient to patient, depending on baseline condition. Important factors to be considered in the decision to recommend or undergo **THA are patient age, diagnosis, and medical comorbidities.**

Age The patient and surgeon must recognize that current data describing the longevity of THA are largely drawn from retrospective, non-blinded cohort reviews. It may be gleaned from this limited evidence, however, that excellent long term pain relief can be obtained in low-demand patients up to 20 years or more.

On the contrary, patients with greater than 20 years' life expectancy can anticipate the high likelihood of a need for future revision surgery. For patients over the age of 65, the need for revision surgery due to wear and aseptic loosening is less likely, and the indication for surgery is typically more straightforward.

The more complex clinical scenario for the surgeon is presented by the patient between 30 to 60 years of age, with a painful hip that limits daily activities. In this group, and in even younger patients, the need for a concerted attempt at nonoperative treatment is essential. It is likely that patients in this age category will require at least one revision procedure in future years, and this should be discussed preoperatively. Additionally, it should be explained that activity modifications, including the avoidance of repetitive high impact exercises, will protect both the

implant fixation and bearing surface after THA. Patients unwilling to modify their activities accordingly are less than ideal candidates.

In the short-term following THA, the main reasons for revision continue to be **infection, instability, and aseptic loosening**. In the long-term, however, the most common mode of failure is **wear of the bearing surface resulting in osteolytic lesions and catastrophic loosening of the implant**. As a result, attempts have been made over recent years to improve the wear characteristics of bearing surfaces, particularly for younger, high-demand patients. Growing data exist to support the contention that newer bearing designs will outlast their older counterparts.

Again, it must be recognized that these retrospective reviews provide little evidence of implant survivorship beyond 15 years. Additionally, while laboratory data would suggest the absence of clinically significant wear in metal-on-metal, ceramic-on-ceramic, and metal- on highly-crossed-linked polyethylene bearing surfaces, surgeons have previously witnessed the disastrous results when in vitro data fail to translate in vivo.

For these reasons, it is crucial that the surgeon remains realistic with younger, higher-demand patients, and explains the limitations in accurately predicting implant survivorship

Aside from the above limitations, many authors have demonstrated excellent long-term results from THA even in extremely young patients. In a retrospective review of THAs in patients with early-onset juvenile rheumatoid arthritis (mean age 17.8 years),

The results of THA in patients with radiographic signs of severe degenerative joint disease coupled with anterior thigh or groin pain are quite reliable. Less commonly, the surgeon will encounter patients with radiographic findings of severe hip degeneration and the absence of characteristic hip pain, or patients with pain out of proportion to the radiographic findings. In either scenario, it is important to search for other sources of pain, and if the pain has been present for more than 3 to 6 weeks, it would be prudent to obtain further imaging, typically with magnetic resonance imaging.

It must be remembered that in patients with osteoarthritis of the hip other joints are typically affected as well, in addition to long-standing gait and posture disorders. Specifically, concomitant lumbosacral spine arthropathy is quite common among these patients, and pain radiating

below the knee to the foot is more likely to be attributable to disease within the spine than the hip. Such patients should be advised that THA will not likely relieve pain radiating from the spine, and while the patient's gait may improve postoperatively, there is a possibility of worsening pain from other joints due to increased mobility.

Patients with end-stage arthrosis secondary to inflammatory arthropathy are also excellent candidates for THA. Preoperative evaluation of patients with rheumatoid arthritis should include radiographs of the cervical spine to rule out pre-existing C1-C2 subluxation.

In addition, large erosions and severe bone deficiencies are typical of this patient population, and preoperative templating should alert the surgeon to the need for special implants. Results in this group are encouraging, even in those with early-onset or juvenile rheumatoid arthritis

This increased longevity is likely due to the lower level of activity typical of patients with severe rheumatoid arthritis.

Osteonecrosis of the hip is a common cause of end- stage arthropathy. The etiology of osteonecrosis is simplified to include direct and indirect causes.

The most common direct cause is trauma resulting in decreased blood supply to the femoral head, while atraumatic osteonecrosis is most likely due to corticosteroid use or alcoholism. Treatment of the early stages of osteonecrosis may include core decompression, vascularized or nonvascularized bone grafting, or osteotomy. **Once the femoral head has collapsed, however, most authors would support the use of THA as the preferred method of treatment**.

The debate regarding **the role of THA in patients with an acute femoral neck fracture continues to evolve. The 2 most important predictors of outcome in this group of patients seem to be physiologic age and fracture displacement**. For younger patients with nondisplaced fractures, internal fixation and joint salvage remains the gold standard treatment.

For elderly patients with a displaced femoral neck fracture, prosthetic replacement seems to be both cost-effective and associated with improved pain and function scores in multiple long-term studies. The literature would support the use of THA in this patient population as the most durable, cost-effective treatment alternative.

Hemiarthroplasty is useful in patients without evidence of acetabular wear, but concerns exist regarding the early development of groin pain. There does not appear to be any difference between the use of bipolar and unipolar hemiarthroplasty in this group. THA in patients with a previous history of trauma or surgery can be technically challenging

As discussed previously, **the patient's anatomy is typically abnormal Preoperative templating and** planning is particularly useful in this scenario to alert the surgeon to potential intraoperative problems, and the need for special instruments to remove previously placed hardware.

For patients with a history of multiple previous surgeries, or even multiple previous attempts at total joint arthroplasty, **the Charnley "pseudarthrosis test is helpful to decide whether to proceed with a repeated attempt at salvage**. The essence of the pseudarthrosis test is to proceed with an attempt at THA if the patient would be no worse off with a resection arthroplasty than the present condition.

Previous hip fracture and prior hip surgery certainly confers a higher risk of perioperative complications including dislocation and fracture. Because it can be difficult in such cases to obtain a good repair of the deficient posterior soft tissues, some authors have advocated the use of an anterior approach in these patients to reduce dislocation rates. Despite these limitations, the longevity of implants after failed internal fixation is excellent, with one study demonstrating 100% survivorship at 7-year follow-up, and 87.5% survivorship at 10-year follow-up.

The results of **THA for severe developmental dysplasia are mixed,** with some series showing excellent long- term survivorship and others reporting a greater than 25% revision rate.

Many patients with long-standing congenital hip dislocation are surprisingly functional and have very little pain. It is not uncommon for patients to accommodate to this hip deformity into their fifth and sixth decades. The major indication for joint replacement in this population is significant pain leading to a progressive deterioration of function. The surgeon should have an open discussion with the patient prior to surgery regarding the particular risks involved with THA for severe dysplasia.

Specifically, it should be explained that restoring the hip center of rotation may involve significant lengthening of the limb, placing the neurovascular structures at risk of injury.

For patients with Crowe IV deformity, when the expected limb-lengthening will exceed 3 cm, a subtrochanteric shortening osteotomy is indicated

MEDICAL COMORBIDITIES

THA is designed to improve patient quality of life, and as such, it should be presented to the patient as an elective procedure. In rare instances, the need for THA becomes more urgent, such as in cases of rapidly progressing acetabular bone loss, which could compromise the outcome of surgery

More typically, however, the decision to undergo THA should be made in a controlled manner as described above, allowing for a discussion of the particular risks and benefits to each particular patient. The existence of significant pre-existing medical comorbidities certainly places the patient at greater risk for perioperative and postoperative complications after any elective procedure, and THA is no exception

The authors attributed half of this mortality rate to pre-existing severe cardiovascular or hepatorenal disease. **Preoperative evaluation should include a thorough history and physical examination by a medical physician to determine the existence of significant medical comorbidities.**

A team approach to patient care will provide a more clear understanding of the patient's particular risks and aid in the immediate perioperative management.

CONTRAINDICATIONS TO TOTAL HIP ARTHROPLASTY

The main **contraindication to THA is active local or systemic infection**. Patients with a history of previous hip infection should undergo thorough preoperative evaluation, including erythrocyte sedimentation rate, C-reactive protein, complete blood count, and joint aspiration. If all these tests are negative, the likelihood of infection is low; however, the patient should be counseled that intra- operative findings may dictate the need for resection arthroplasty and antibiotic spacer placement. Intra-operative biopsy in such patients may help to confirm the absence of a subacute infection. Active acquired **immunodeficiency syndrome (AIDS) may also be considered a contraindication** as the risks of infection and other medical complications may outweigh the risks of surgery.

While not considered a firm contraindication to THA, morbid obesity has been shown in numerous studies to result in higher perioperative complication rates.

Obese patients had a higher dislocation rate and higher risk of revision. Other studies repudiate these claims, citing technical error as the reason for higher complication rates among morbidly obese patients, but the issue remains controversial.

Summary of Recommendations

Precautions (strictly adhered to for first 6 weeks, guarded progression thereafter)

Anterior approach:

• No hip extension past 20 degrees

• No hip external rotation past 50 degrees

Posterior approach

• No hip flexion past 90 degrees

• No hip internal rotation or adduction past neutral

General precautions

• WBAT, with use of assistive device (AD) as needed (crutches, walker)

• No crossing legs (crossing ankles OK)

• Use good bending/lifting mechanics (keep back straight and bend at knees)

• Keep hips above knees when sitting, avoid sitting in deep chairs

ROM/Manual Therapy

• Early range of motion (ROM) as tolerated within the restricted range

• Soft tissue mobilization as needed, scar mobilization once incision heals (>2-3 wks)

Corrective Interventions

• Proper activation and recruitment of all hip and core musculature without compensation required prior to initiating strengthening

• Neuromuscular re-education for balance and correction of faulty mechanics

• Therapeutic exercise for lower extremity strength (double and single limb)

Outcome Testing

• Select based on the needs of the patient and practice setting recommendations

• Patient reported outcomes: VAS/NRPS, Lower Extremity Functional Scale, Hip

Osteoarthritis Outcome Score, Hip Outcome Score: ADL (17 items) | Sports (9 items)

• Performance tests: 30-Second Chair Stand Test, Gait Speed, TUG, Functional Reach Test, 6-min Walk Test

Criteria to Initiate Plyometric Program

High impact activities such as plyometrics and running are generally not advised following total joint replacements. First priority following these surgeries is to prevent damage to the new artificial joint. Due to lack of evidence on how high impact activities affect the integrity of artificial joint replacement, patients are advised to participate in low impact exercise/activities. Patients considering plyometrics with the intent to resume running should consult with their physician.

• Full, functional, pain-free ROM

• > 80% quadriceps, hamstring, and hip (using hand-held dynamometer) strength compared to uninvolved leg

• Squat > 150% BW leg press

• 10 forward and lateral step downs from 8” step with proper mechanics

Criteria to Initiate Running Program

• Full, functional, pain-free ROM

• > 80% of uninvolved quadriceps, hamstring, hip strength (hand-held dynamometer)

• Squat > 150% BW (barbell squat or leg press)

• 10 forward and lateral step downs from 8” step with proper mechanics

• Hop and hold with proper mechanics (uninvolvedàinvolved)

• Ability to tolerate 200-250 plyometric foot contacts without reactive pain/effusion

• No gross visual asymmetry and rhythmic strike pattern with running

Criteria for Return to Recreational Activities/ Discharge

• Physician clearance at last check-up

• Strength: > 90% compared to uninvolved hip (using hand-held dynamometer)

• > 90% BW with SL leg press

• Demonstrate ability to simulate functional sport specific movement

• Patient reported outcome measures: Score ≥ 90%

*****Criteria for discharge from PT is less rigorous for those not returning to sport.**

Ensure the patient is able to perform all ADLs and recreational activities without pain, reactive

effusion, and with appropriate functional mechanics.

Guidelines for DDH management

The optimal method to screen for DDH is controversial. The goal of screening in DDH is to both prevent undiagnosed cases and allow for earlier, less-aggressive interventions to achieve hip reduction.

One difficulty with screening DDH is that there is no uniform pathology that characterizes DDH because the definition encompasses mild acetabular dysplasia to frank dislocation.

Although the early natural history is more clearly understood in cases of untreated hip dislocation, the long-term history of mild acetabular dysplasia identified with ultrasound in infancy is unclear.

The normal immature hip can demonstrate instability, such as a Barlow-positive examination result or dynamic ultrasonography evidence instability, due to ligamentous laxity during the early neonatal period. With normal maturation, these early pathologic findings often resolve spontaneously with time.

For infants up to 6 months of age, the Pavlik harness has classically been used for the stabilization of the dysplastic hip.

The Pavlik harness is used to hold the hips in a position of flexion and abduction that allows for the centering of the femoral head in the acetabulum.

Recent studies on the use of the Pavlik harness help us understand which patients have successful outcomes and those who are at risk for failure of harness treatment.

The Barlow-positive hip has been demonstrated to have >90% successful stabilization with a Pavlik harness.

Hip Reduction

In older infants with untreated hip dislocations (generally 6–18 months) or those who failed early brace treatment of hip stabilization, closed reduction and hip spica casting is next in the treatment algorithm.
The technique or indication for closed reduction has not significantly changed over time, yet our understanding of the outcomes of the procedure continues to expand.
Closed reduction is performed under general anesthesia, the hip is placed in 90° to 100° of flexion, and the minimal amount of abduction necessary to maintain a
stable hip reduction is sustained.
Failure of reduction or redislocation can occur in up to 13.6% of cases.

AVN of the femoral head and the associated proximal femoral growth disturbance is the most feared and frequent complication of this procedure.
Several etiologies and risk factors for this complication have been recently studied, including age, radiographic presence of the ossific nucleus, and abduction angle in the cast

In patients >12 to 18 months of age or younger patients who failed closed reduction, an open surgical approach is recommended to remove anatomic blocks to achieving a concentric hip reduction. Open reduction can be performed via an anterior- or medial-based surgical approach to the hip. The medial approach is less invasive and does not require splitting the iliac apophysis. The anterior approach is more classic and allows for more comprehensive access to the acetabulum and the barriers to reduction. The capsulorrhaphy is only possible with anterior approach.

Pelvic Osteotomies

In patients who have failed initial treatment and have persistent acetabular dysplasia, pelvic osteotomies may be indicated to resume a more normal development of the acetabulum.
These surgeries are usually reserved for older children because the acetabulum has been shown to remodel throughout childhood up to age 5 years, allowing for continued development in the presence of a well-located hip.
Hence, the timing of performing the osteotomy is controversial although typically performed at ~3 to 5 years of age for residual acetabular dysplasia. The most commonly used pelvic osteotomies are termed the Salter, Pemberton, and Dega.

TABLE 1
General Treatment Algorithm for Hip Dislocation

Age	Treatment	Comments
<6 mo	Abduction orthosis (ie, Pavlik harness)	—
6–18 mo	Closed reduction under general anesthesia with hip spica cast	Closed reduction at <6 mo of age if abduction orthosis attempt fails
>12–18 mo	Open hip reduction	Open reduction <1 y of age if previous closed-reduction attempt fails
>2 y	Open hip reduction with or without femoral shortening osteotomy	Femoral shortening osteotomy may, but not always, be needed on the basis of the amount of tension that needs to be relieved to achieve a hip reduction.
3–8 y	Open hip reduction with or without femoral shortening osteotomy and with or without pelvic osteotomy	Pelvic osteotomy may, but not always, be needed to address residual acetabular dysplasia.
>8 y	Open hip reduction versus observation for eventual arthroplasty	Controversial; poorer outcomes noted in attempting hip open reductions in those >8 y old

Conclusions

The treatment of DDH remains challenging, yet recent advances have refined our understanding of how best to survey for the condition during infancy, minimize complications during early treatment, and refine the selection of patients who can best benefit from hip preservation surgery. The ideal continued target would be to prevent missed hip dislocations or dysplasia during the infant period, prevent AVN during early treatment, and decrease the incidence of total hip arthroplasty in adulthood related to undertreated DDH.

Guidelines & for Acute osteomyelitis

Osteomyelitis can be defined as an inflammation of the bone tissue caused by an infectious agent. This infection may be hematogenic, contiguous to an adjacent infectious focus, or even the result of direct bacterial inoculation from a traumatic mechanism. In general, hematogenous osteomyelitis is caused by a single agent, while other types can show polymicrobial infection. Hematogenous osteomyelitis has more consolidated data in the medical literature, and is considered a predominantly pediatric disease, with 85% of patients aged below 17 years. In adult patients, it is estimated that 47–50% of all osteomyelitis are post-traumatic. Vertebral osteomyelitis occurs in 2–7% of patients.

Waldvogel classification of osteomyelitis.

	Characteristics
Mechanism of bone infection	
Hematogenous	Secondary to bacterial transport through the blood. Majority of infections in children
Contiguous	Bacterial inoculation from an adjacent focus. E.g.: Post-traumatic Osteomyelitis, infections related to prosthetic devices
Associated with vascular insufficiency	Infections affecting the feet in patients with diabetes, hanseniasis or peripheral vascular insufficiency
Duration of infection	
Acute	Initial episodes of osteomyelitis. Edema, formation of pus, vascular congestion, thrombosis of the small vessels
Chronic	Recurrence of acute cases. Large areas of ischemia, necrosis and bone sequestra

Clinical suspicion is critical to start medical investigation, and its manifestations depend on several factors, such as the length of infection (acute or chronic), infection site and type of bone involved.

Which subsidiary tests are important for the diagnosis of osteomyelitis?

The diagnosis of osteomyelitis considers a range of clinical signs and symptoms, laboratory tests, imaging studies and histological analyses, as well as the identification of pathogens by means of bone tissue or blood cultures.

In terms of laboratory tests, serum leukocyte count and inflammatory markers, such as erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP), can assist in the initial diagnosis of osteomyelitis. However, these are non-specific tests and are more useful in the control of treatment.

Laboratory tests

Acute infections are often associated with leukocytosis and neutrophilia – a change that is rarely found in chronic osteomyelitis. Inflammatory markers, such as ESR and CRP, are often elevated in acute hematogenous osteomyelitis in children. However, these are nonspecific tests and are more important in the control of treatment. The serum procalcitonin levels for the diagnosis or follow-up of hematogenous osteomyelitis in children or in diabetic patients did not prove effective in several studies. Serum level of interleukin-6 is most commonly studied as a diagnostic tool of bone infections associated with joint prosthesis

The histology of biological samples should be carried out in all suspect cases, and bone biopsy, soft tissue, and bone sequestra can confirm the diagnosis of osteomyelitis.

Histological tests

Samples of bone, soft tissue and bone sequestra should be sent for histological analysis after biopsy or surgical debridement, as these can confirm the diagnosis of osteomyelitis. In acute osteomyelitis, polymorphonuclear leukocytes are predominant, while in chronic forms, lymphocytes, osteoblasts and osteoclasts are predominant. In suspicious cases of osteomyelitis, histological examination may lead to diagnostic confirmation in up to 50% of patients. Frozen samples of bone tissues obtained during surgery with more than five neutrophils per field

present sensitivity ranging from 43% to 84% and specificity of 93–97% in bone infections associated with orthopedic implants

A definitive diagnosis of osteomyelitis is obtained with microbiological identification of the pathogen in bone, through a bone biopsy. Samples obtained through swabs of the fistula or secretions for use in cultures will result in false positive results, as they identify microorganisms that colonize the skin. At least three different samples of bone tissue should

be obtained, in order to increase the positivity of the test. Antimicrobial therapy should be started after collecting culture samples or at the same time as anesthetic induction. Patients should stop any antibiotics two weeks before collecting culture samples, if possible. In cases of osteomyelitis with osteosynthesis or in infected arthroplasties, sonication of the implants significantly increases the identification of pathogens.

Microbiological tests

At least three bone samples should be obtained, in order to increase the positivity rate of the test. Antimicrobial therapy should be started after collecting culture samples or at the same time as anesthetic induction. Patients should stop any antibiotics two weeks before collecting culture samples, if possible. Slow-growing bacteria, such as *Propionibacterium acnes*, may be associated with osteomyelitis with osteosynthesis, and in these cases it is important to prolong the incubation time of the culture plates for up to 14 days. In fact, bone cultures can produce false-negative results in up to 40% of cases, especially in patients using antibiotics.

Imaging diagnosis and nuclear medicine

In acute osteomyelitis, initial plain radiography does not show any changes. After around three to four days there may be an increase in soft tissues. Bone

changes appear after two weeks, and poorly delineated lytic lesions can also be observed, simulating an aggressive lesion. A lamellar periosteal reaction is also evident. Plain radiographies have a positivity rate of only 20% after two weeks, but are necessary to rule out other orthopedic illnesses (tumors, fractures).

MRI is considered the main type of imaging in the evaluation of bone infections, revealing changes as early as the first few days of the disease. Bone marrow edema is also evident in MRI (as poorly defined areas of hyposignal in T1-weighted sequences and hypersignal in T2, with post-contrast enhancement). As the disease progresses, abscesses appear, with typical peripheral enhancement in the contrast phase. In children, the infection characteristically crosses the growth cartilage, unlike neoplastic changes. The specificity of MRI is higher than that of bone scintigraphy in the diagnosis of infection.

CT is of little utility in the diagnosis of acute infection. Its role is restricted to the study of bone sequestra in case of subacute and chronic infections, indicating potential infection activity.

Ultrasound examination may be of use, especially in younger patients, as it reveals edema of the soft tissues around the bone, periosteal thickening, and subperiosteal collections.

Imaging methods are of little utility in the therapeutic management of bone infections. Radiographic changes may still be present, despite adequate treatment. In these cases, functional methods, especially PET-CT, play a more important role.

Nuclear medicine uses radiotracers with known biological properties in order to outline an image of a physiological process of the organism. Some of the most common indications of nuclear medicine methods are in cases of suspected

osteomyelitis with doubtful clinical or radiographic signs, when there are image artifacts in the radiological methods and in the developmental follow-up or response to treatment.

PET-CT is a technique that uses positron-emitting isotopes to form images, the main one being fluorine-18-labeled fluorodeoxyglucose. It provides improved spatial resolution, better sensitivity, and better specificity when compared to conventional scintigraphy (96% and 91%, respectively).

Bone scintigraphy is an examination that has historically been used to differentiate osteomyelitis from soft tissue infections.

Antimicrobial treatment

The rate and extent of antibiotic penetration in bone tissues are seen as determining factors for therapeutic success in osteomyelitis. On the other hand, penetration of an antibiotic into infected bone tissue depends on its pharmacological characteristics, the degree of vascularization, good conditions of soft tissues, and the presence of foreign bodies.[41] Integrating information related to tissue concentration in clinical practice is a stumbling block in the process of antimicrobial selection for the treatment of bone infection

Therapeutic regimens in acute and chronic infections

The success of osteomyelitis treatment, particularly in cases related to implants, depends on extensive surgical debridement and adequate and effective antibiotic therapy. Starting empirical antibiotics in anesthetic induction prevents the risks of bacteremia arising from surgical manipulation of infection without adequate antibiotic coverage. Yet, it does not interfere with the positivity of cultures taken during the procedure. Empirical antibiotic can also be started after collecting culture samples in non-septic patients.

The duration of antibiotic therapy varies from four weeks to six months, and the treatment should be adjusted based on the results of the cultures collected,

where necessary. Acute infections can be treated initially with extensive surgical cleaning associated with antibiotic therapy lasting four to six weeks.

Chronic infections should be treated with extensive surgical debridement and removal of any synthesis materials, which can be replaced during the same surgical procedure if there is orthopedic indication. Due to biofilm formation, the total administration time of antibiotics in these infections is three to six months

Suggested empirical initial antimicrobial regimens for osteomyelitis.

Clinical situation		Initial antimicrobial	Possible oral regimens
Community associated	Acute (child<4 months or NB)	Oxacillin, cefazolin or clindamycin[a]+ceftazidime or cefepime	Starting oral treatment in this situation is not recommended. After obtaining the culture results, the regimen is adjusted
	Acute (child>4 months or NB)	Oxacillin or cefazolin[a]	Starting oral treatment in this situation is not recommended. After obtaining the culture results, the regimen is adjusted
	Acute adults	Oxacillin or cefazolin	Starting oral treatment in this situation is not recommended. After obtaining the culture results, the regimen is adjusted
Healthcare associated	Child and adults (for example, infection after fracture fixation)	Glycopeptide+ceftazidime, cefepime, iperacillin/tazobactan or carbapenem agents[b]	Starting oral treatment in this situation is not recommended. After obtaining the culture results, the regimen is adjusted
Hemoglobinopathy	*Salmonella* spp. and other GNBs should be considered	Ceftriaxone or fluoroquinolone	Fluoroquinolone

Special antimicrobial – rifampin

There is no antimicrobial regimen that is perfect for every situation. The ability of rifampin in erradicating slow-growing bacteria in biofilms is well known. Thus, the suggestion to add rifampin to another drug with activity against *S. aureus* is recurrent in the literature, but this drug should never be used as monotherapy

Surgical treatment

Hematogenous osteomyelitis

it is essential to stage the disease correctly. This includes investigating inflammatory activity and culture tests, and conducting imaging examinations. Sometimes infection in the pediatric age group can be confused with other oncological diseases that occur in this age group.

Surgical treatment is mandatory when abscess is present. Surgical drainage associated with debridement is performed after confirmation of the diagnosis by bone biopsy in the operating room, with all the resources of asepsis and antisepsis.

The surgical approach may be open surgery, arthroscopy or puncture/aspiration and flushing. The use of flushing under excessive pressure should be avoided, because in addition to causing injury to the soft parts and bone, the pressure can inoculate microorganisms deeply into the tissues.

Adequate debridement is the best predictor of success in the treatment of osteomyelitis. The surgical approach should be with broad resection. Nowadays, a wide variety of surgical techniques are available for the reconstruction of both bone and soft tissues.

Acute post-traumatic osteomyelitis

The treatment of acute osteomyelitis is surgical, particularly in the presence of an implant, because early bacterial identification and effective debridement are the only ways to save this implant. The surgeon should heed the clinical signs of a possible infection. During the postoperative period, when there are pain, local hyperemia, inflammation, serous exsudate and suspicion of a hematoma at the surgical site, the surgeon must act quickly, taking the patient back to the operating room for debridement and cultures.

The most important factor for a successful treatment of patients with bone infection is the quality of debridement. The debridement must achieve a clean and viable wound through a

non-traumatic exposure. In acute infection, surgical drainage and copious flushing of the cavity significantly reduce bacterial load at the site. Flushing should be performed with saline solution, with a total volume of 3–9L, and there is a direct relationship between the amount of saline solution used and the reduction of bacterial load.

In situations in which there is a dead space after the removal of devitalized tissues, the use of polymethylmethacrylate cement impregnated with an antibiotic for local release is a good option. The high local concentration of antibiotics obtained using this technique is far above the MIC for the majority of microorganisms, and it would be impossible to achieve this concentration with the use of systemic antibiotics, due to associated toxicity. The antibiotics used in bone cement must not be thermolabile, due to the exothermic reaction of polymerization of polymethylmethacrylate, which inactivates these agents.

Chronic osteomyelitis

In the approach to a patient with chronic osteomyelitis, the choice between palliative treatment and a curative approach should be considered. Surgery is currently the only form of cure in almost all cases; however, it is not always the best option. Therefore, a multidisciplinary approach is important in the assessment of each case, in order to decide on the best treatment.

The steps in the treatment of chronic osteomyelitis consist of correct microbiological diagnosis; improvement of the host's defenses; stabilization of underlying diseases; correct anatomical localization of bone involvement; adequate antimicrobial therapy; surgical debridement of all devitalized tissue; repair of soft tissues; and bone reconstruction and rehabilitation.

All devitalized tissues need to be removed, and the surgical technique used will depend on the extent of the bone lesion. Wound closure by any means is imperative when vital structures (e.g., vessels, nerves, tendons, bone) are exposed, which may often require local flaps, or more complex

flaps located further away (microsurgical). Only complete resection of all the devitalized tissues, with the establishment of adequate blood flow, will lead to effective systemic antimicrobial therapy and resolution of the infection. A resection margin of 5mm should be respected.

The use of antibiotic-coated cement may be an option in cases where there is dead space to be filled after the debridement and before the site is definitively closed. The most commonly used antibiotic is vancomycin at a dosage of 2–4 grams per 40g of cement. Other antibiotics may also be used, provided they are not thermolabile, due to the exothermic reaction of the polymethylmethacrylate

Another measure is the use of vacuum-assisted closure, which has shown excellent results. Its correct use can significantly improve the condition of the soft tissue wound in terms of its granulation, characteristics of vascularization, and reducing its size.

Adjuvant treatment – HBO

Hyperbaric oxygen therapy (HBO) is a form of adjuvant therapy that has been used worldwide for more than sixty years. It is used in patients with infectious, inflammatory, immunological, and ischemic tissue changes. The treatment involves respiration of 100% oxygen under hyperbaric conditions, i.e. under pressures artificially elevated above the atmospheric pressure at sea level, with the patient being placed inside a pressure-resistant hyperbaric chamber. In this setting, large quantities of oxygen under pressure penetrate the blood, are dissolved in the plasma, and reach the tissues. The use of hyperbaric oxygen (O2HB) is associated with all the other therapeutic measures, making them more effective. Wound healing time is accelerated, the esthetic results are better, and the final cost of treatment is also reduced.

Erb Palsy guidlines

Erb palsy, or Erb-Duchenne paralysis, is a paralysis of the arm caused by the injury to the upper group of the main nerves supplying it, specifically the upper trunk C5-C6 of the brachial plexus. It is one of the most common neurological birth injuries, and these injuries most commonly, though not exclusively, arise from the traction on the neck during a difficult childbirth. According to the severity of the injury, it can either resolve on its own over some time or may require rehabilitative therapy and surgery

The degree of severity can be defined as neuropraxic, axonometric, or neurometric. A neuropraxic injury is the least severe. It is reversible and heals without any complication. Axonometric lesions involve disruption of axon and myelin sheath. Recovery of axonometric lesions depends on the level of lesion, and it may take months to heal with proper treatment, including physiotherapy.

Erb palsy is a disorder of clinical diagnosis, MRI of the brachial plexus and cervical cord is likely the best imaging technique if required. Electromyography (EMG) results can estimate and record the electrical activity of the muscle with absent fibrillations likely indicate neuropraxia. Nerve conduction studies (NCS) can measure the time required for the electrical stimulus to move through a particular nerve

The management of Erb's palsy depends upon its severity, with some cases requiring surgical intervention while others can be managed by physiotherapy alone. Recommended treatment includes early immobilization followed by passive and active range of motion exercises. Different treatment modalities suggested for Erb Palsy are:

1-Hydrotherapy: It is a form of physical therapy used because of the anti-gravity environment. It minimizes the stress on the musculoskeletal frame, allowing the neonate to move with less pain and at the same time strengthening muscles and reducing spasms. Paralyzed muscles relax in the opposite position of the waiter's tip posture by abduction at the shoulder, external rotation of the arm, and supination of the forearm. In addition, hydrotherapy helps encourage normal movements in the affected arm.

2-Physiotherapy: Physiotherapy is either done alone or in combination with hydrotherapy. Response to the therapy varies from patient to patient, with some healing earlier than others. Physical therapy can be required for severe cases to accompany surgery or in case of mild condition to work them through strengthening the area and healing on their own. Various forms of physical therapy exercises may include gentle stretching

exercises, sensory stimulation, range of motion exercises, and strength exercises.

3-Occupational therapy: Occupational therapy is usually required after the surgery or for those who sustained long-term damage to help them deal with everyday activities such as eating, tying shoes, playing, drawing, and more.

4-Surgery: Surgical intervention is the last resort and is usually put on hold unless there is no functional recovery by physical therapy. Surgical intervention includes nerve graft and nerve decompression. Nere graft has the best chances of success.

5. Botulinum toxin injections are sometimes used to relieve contractures.

Early recognition and interference are necessary, beginning with proper diagnosis and including rehabilitation and, in certain cases, surgical intervention

Distal Radius Guidelines :

Introduction

The GDG consists of consultant and trainee orthopaedic and trauma surgeons, a physician/orthogeriatrician, a general practitioner, extended scope practitioners, a nurse with plaster room experience and a patient representative.

The production of Guidelines promoting optimum standards of care is key to the achievement of both the BOA's and the BSSH's charitable objectives. No external funding has been sought for the production of these guidelines.

Fractures of the distal radius are amongst the commonest fractures with which adult patients present to ED. Many DRFs will be seen and treated in the ED and then discharged to specialist follow up. Patients may attend with displaced fractures or neurovascular problems which require urgent treatment and so appropriate initial assessment and management is essential.The mechanism of injury and clinical findings, including skin integrity, assessment of circulation and sensation, should be documented at presentation. Radiographic assessment should be postero—anterior and lateral views centred at the wrist.

Open fractures should undergo surgical debridement and stabilisation in accordance with the Open Fracture

Emergency Department

Displaced DRFs have traditionally been treated with initial manipulation on presentation to the ED. Manipulation is not only a first aid measure to minimise the risk of developing neurological symptoms, but for many patients can be the definitive treatment. The following aspects of management in ED were studied:

- Anaesthetic techniques for manipulation
- Methods of fracture reduction
- Types of cast immobilisation outcome following reduction
- Whether manipulation affects functional outcome
- Full cast versus back slab immobilisation
- The effect of Vitamin C preventing complex regional pain syndrome
- The effect of radiological parameters on functional outcome

Fracture Clinic

The Fracture Clinic Services guidelines outline general standards of care in fracture clinic. It is assumed that those guidelines are being followed. The review questions in this section further assumed the following factors:

- The fracture configuration on that particular day in clinic was deemed likely to provide that patient with an acceptable functional outcome, if the fracture healed as it was.
- Associated injuries that would further impair the functional outcome in that patient had also been evaluated.
- Any further imaging required to assist in the decision-making process had been acquired.
- The patient's opinion regarding the various treatment options available and their desired functional outcome had been sought.
- The GDG considered several further factors that were deemed to have possible relevance to ongoing management of such patients.
- Re-displacement and initial displacement
- Re-displacement and age of patient
- Re-displacement and comminution
- Does this fracture need a plaster cast?
- What position should a fractured distal radius be immobilised in?
- Should further radiographs be taken at 2-3 weeks following injury?
- When should immobilisation be discontinued?
- Will the anxious patient recover less well?
- Radiographs at the time of removing immobilisation

Surgery

The baseline functional demands of the patient, the consequences of mal-union and the potential risks of surgery need to be considered and discussed with the patient when assessing the role of surgical intervention. The following factors should be considered:

- Timing of surgery
- **When surgery is indicated the patient is best served by prompt intervention by the appropriate surgeon, as delay confers no benefit to the patient's recovery. The patient is to be fully involved and informed of all options, recommended guidelines and potential risks.**

- Non-operative versus operative management
- **In patients 65 years of age or older, non-operative treatment can be considered as a primary treatment for displaced DRFs. However, other factors such as pre-injury function, medical comorbidities and fracture characteristics should be considered and options discussed with the patient**

- Manipulation under anaesthesia with K-wires versus open reduction and internal fixation
- **In dorsally displaced DRFS that can be reduced closed and where surgery might be considered, there is evidence that open reduction internal fixation does not provide a superior outcome to K-wire fixation when measured by PROMs at one year. There is insufficient evidence to draw conclusions about the best management of unstable DRFs which cannot be satisfactorily reduced closed.**
- **When surgery is needed for dorsally displaced DRFs that can be reduced closed, offer K-wire fixation and cast.**
- *Best Practice Point*: **For DRFs that require open reduction, or for those with an intra-articular step or gap which is unable to be satisfactorily reduced closed, open reduction and fixation can be considered**

- External fixation versus open reduction and internal fixation
- **Open reduction and internal fixation is associated with better early functional outcomes and a lower risk of complications when compared with external fixation**

- **External fixation should not be used as the definitive treatment of closed DRFs where open reduction and internal fixation of the fracture fragments is possible.**

- Concomitant distal ulnar styloid fracture management
- **In the presence of a DRF with a stable DRUJ it is not necessary to fix an ulnar styloid fracture.** *Best Practice Point*: **Stability of the DRUJ should be assessed and recorded after surgical treatment of DRFs**

- In patients 65 years of age or older, non-operative treatment can be considered as a primary treatment for displaced DRFs. However, other factors such as pre-injury function, medical comorbidities and fracture characteristics should be considered and options discussed with the patient

Rehabilitation

Many patients are referred to a rehabilitation provider following a DRF to optimise return to function. The questions consider how functional outcome after DRF is affected by:

- The impact of providing rehabilitation during the immobilisation period
- The impact of providing rehabilitation after definitive treatment implementation (surgically and non-surgically managed patients)
- The type of rehabilitation intervention
- The mode of rehabilitation delivery
- The discipline of the rehabilitation provider

Outcome Measures

The aim was to appraise critically the evidence concerning the measurement properties of questionnaires used to capture self-reported outcome in the setting of adult patients with DRFs.