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Knee and hip arthroplasty: Indication, surgical fitness and perioperative care

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Learning objectives

- Understand the indications for knee and hip arthroplasty in patients with severe joint dysfunction.
- Recognise the importance of evaluating surgical fitness and assessing risk factors before recommending joint arthroplasty.
- Describe the perioperative care and management of patients undergoing knee and hip arthroplasty procedures.

Introduction

Knee and hip arthroplasty are commonly performed orthopaedic procedures to address severe joint dysfunction, alleviate pain, and improve patients' quality of life. This chapter aims to provide guidelines on indications for arthroplasty, evaluation of surgical fitness, and perioperative care associated with knee and hip arthroplasty.

Indications

Patients with severe pain and bone-on-bone arthritis that greatly affects their daily lives will benefit from arthroplasty surgery with reliably predictable outcomes. Prior to the specialist referral, surgical fitness should be evaluated and optimised, including the evaluation and management of psychological disorders.

Severe arthropathy causing bone-on-bone arthritis are most commonly due to osteoarthritis, inflammatory conditions (such as rheumatoid arthritis) or sequalae of previous trauma or infection. Regarding knee arthroplasty, if only one compartment is involved (such as the medial side) partial knee replacement should be considered in a patient without inflammatory arthritis and a stable knee.

Figure 1: *Bilateral knee anterior-posterior (AP) x-rays showing endstage bone-on-bone arthritis. This is a prerequisite for predictable outcomes after total knee arthroplasty. Eccentric joint space narrowing, subchondral sclerosis, osteophytes and small cysts can also be seen and are indicative of osteoarthritis.*

Figure 2: *Mechanical alignment x-ray image of the left leg showing severe varus malalignment due to the progressive knee arthropathy*

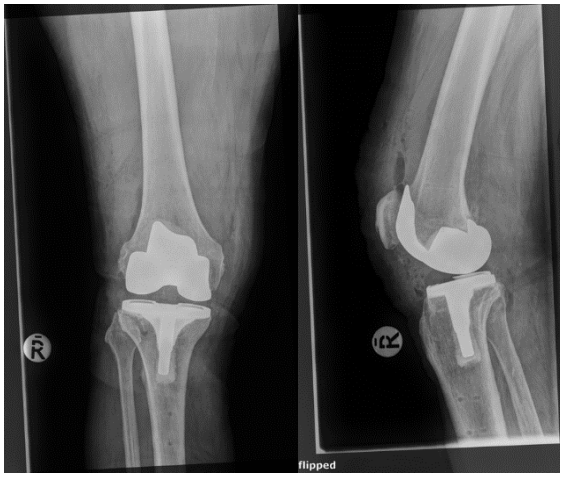

Figure 3: *AP (left) and lateral (right) x-rays after cemented total knee replacement of the right knee. There is mild varus of the tibial component which recreates the original varus orientation of the knee. This could be measured precisely with robotic assisted surgery. The 2 small drill holes in the tibia are evidence of tracing pins which were placed for this robotic surgery.*

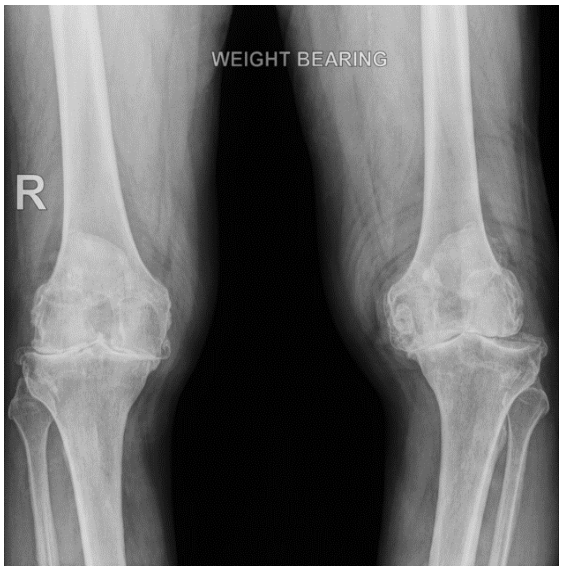

Figure 4: *Bilateral weight-bearing AP x-ray showing medial compartment bone-on-bone arthritis*

Figure 5: *Valgus AP-stress x-ray demonstrating a well maintained lateral joint space, supporting the decision for a partial medial compartment knee replacement*

Figure 6: *AP x-ray of a medial compartment partial knee replacement*

Surgical fitness and perioperative optimisation

Before recommending knee or hip arthroplasty, it is crucial to assess the patient's overall health and surgical fitness. Groote Schuur Hospital standard operating procedure guidelines are as follows:

Red flags (do not operate)

1. American Society of Anesthesiologists (ASA) = 3 (Physical status classification system)

2. Body Mass Index (BMI) >50/albumin <30 g/L

3. Anaemia (Haemoglobin [Hb] <10 g/dl)

4. Cardiac dysfunction/uncontrolled hypertension

5. Alcohol abuse, drug abuse, smoking (cotinine test)

6. Infection/open wounds

7. Haemoglobin A1C (HBA1C) >7.5%

8. Vitamin D insufficiency

9. Urinary tract infection (leukocytes and symptoms)

Yellow flags (think twice)

1. Psychiatric disorders, cognitive impairment, depression

2. Abnormal vitamin D levels

3. BMI >40

4. Age >80

Standard operating procedure

Perioperative care for knee and hip arthroplasty can be divided into non-surgical and surgical aspects to ensure comprehensive management of patients before, during and after the procedure.

Preoperative assessment	Weight, height, chest x-ray, electrocardiograph, albumin, haemoglobin, vitamin D, urea and electrolytes, HBA1C, check for alcohol/drugs/nicotine
In ward	Stop biologic agents, warfarin, aspirin, chlorhexidine full body wash, urine-dipstick, methicillin-resistant Staphylococcus aureus (MRSA) screen and treat with mupirocin
During operation	Shave with clippers in theatre, prophylactic antibiotics 2-4g Cefzol within 30min to incision**,** skin prep: clean with chlorhexidine in alcohol, impervious drapes, close doors, masks, eliminate theatre traffic, no drains
Postoperative	Compression dressing 24h, thrombo-embolic deterrent (TED) stockings, calf pumps in high care unit, no Clexane for 6 hours, Aspirin 75mg on day 1, wound ooze: stop thrombolytics deep vein thrombosis (DVT) prophylaxis
Persistent oozing from wound	Stop thrombolytics, decrease physio, compression. After 7 days: revision surgery and washout

Non-surgical perioperative care

Preoperative education: To decrease anxiety and improve the recovery process, patients should receive information about postoperative pain management, wound care and mobility aids.

Medical optimisation: Prior to surgery, patients' overall health should be assessed and optimised. This includes managing any chronic medical conditions (such as diabetes or hypertension) to reduce the risk of perioperative complications.

Cardiovascular and respiratory evaluation: Preoperative assessment of cardiovascular and respiratory health is essential to determine the patient's fitness for surgery. Identifying any cardiovascular or pulmonary concerns will help the surgical team prepare for potential anaesthesia-related challenges.

Infection prevention measures: Patients should undergo appropriate screening for infections (such as urinary tract infections or skin infections) to reduce the risk of perioperative complications. These are contra-indications for any arthroplasty surgery.

Nutrition and medication management: Ensuring adequate nutrition and proper medication management before surgery is crucial for promoting healing and reducing postoperative complications. Albumin is a good marker for nutrition.

Physiotherapy and exercise programmes: Preoperative physiotherapy and exercise programmes can help strengthen muscles around the affected joint, improve joint range of motion, and optimise functional outcomes after surgery.

Surgical perioperative care

Anaesthesia selection: The choice of anaesthesia (general, regional or spinal) is determined based on the patient's health status, surgeon preference and the complexity of the surgery. Most commonly spinal anaesthesia is chosen for hip and knee arthroplasty.

Implant: The surgeon will select the appropriate surgical implants and approach based on the patient's joint condition and the type of arthroplasty (total, partial or revision). Most commonly, both sides of the joint are replaced by a metal component made from cobalt-chrome and a polyethylene liner acts as a bearing surface.

Intraoperative monitoring: Continuous monitoring of vital signs and blood loss helps ensure patient safety during the surgery. Administration of prophylactic antibiotics before surgery is used to prevent surgical site infections.

Pain management: Effective pain management strategies include local anaesthesia and postoperative pain medications. These are utilised to ensure patient comfort and promote early mobilisation.

Postoperative care: Close monitoring in an appropriate high care unit and subsequent ward care, including wound care, early ambulation (mobility) and physiotherapy to recover joint function and prevent complications.

Figure 7: *AP x-ray of hip osteoarthritis*

Figure 8: *AP x-ray of a total hip replacement*

Key takeaways

- Arthroplasty is considered for severe knee and hip joint pain in bone-on-bone arthritis with severe dysfunction and pain.
- Careful evaluation of the patient's overall health is crucial to determine surgical fitness and candidacy for arthroplasty.
- Conservative treatments are initially attempted and surgery is considered only if conservative options are ineffective.
- Imaging plays an important role in assessing joint condition and guiding surgical planning.
- Perioperative care involves preoperative optimisation, infection prevention and pain management.
- The choice of surgical approach and implants are personalised based on joint condition and patient factors.
- Pre- and postoperative physiotherapy is essential for successful recovery and joint function improvement.
- Knee and hip arthroplasty can provide long-term pain relief and improved joint function.
- Multidisciplinary collaboration ensures comprehensive patient care throughout the surgical journey.

Assessment

1. A 57-year-old patient with advanced avascular necrosis of the femoral head and persistent groin pain, resistant to conservative interventions, would most likely be recommended for?

A. Total hip arthroplasty

B. Core decompression

C. Hip resurfacing

D. Hip hemiarthroplasty

The answer is (A). Core decompression (B) is a contra-indication in advanced arthropathy, and total hip arthroplasty (A) is indicated.

2. Which of the following patient profiles poses the highest surgical fitness risk for knee arthroplasty?

A. A 65-year-old with controlled hypertension and moderate osteoarthritis

B. A 75-year-old with well-controlled diabetes and severe avascular necrosis

C. A 50-year-old smoker with mild rheumatoid arthritis and stable joint function

D. A 60-year-old with obesity and a history of stable knee pain without joint dysfunction

The answer is (D). Obesity increases surgical risk due to potential complications such as wound healing problems and increased stress on the cardiovascular system. The patient's history of stable knee pain without joint

dysfunction suggests that knee arthroplasty may not be immediately necessary, making the risks of surgery less favourable.

3. In perioperative optimisation, the yellow flag indicating potential complications is most relevant for patients with?

A. High BMI and severe joint instability
B. Osteoarthritis and documented vitamin D deficiency
C. Rheumatoid arthritis and cognitive impairment
D. Controlled hypertension and mild osteoporosis

The answer is (A). High BMI and severe joint instability pose a significant surgical risk. A high BMI is associated with increased anaesthetic and surgical complications. Severe joint instability may lead to suboptimal outcomes and postoperative complications.

4. Which intraoperative measure is NOT a standard part of the surgical approach for knee and hip arthroplasty?

A. Administration of prophylactic antibiotics
B. Minimally invasive techniques to minimise tissue trauma
C. Spinal anaesthesia for joint replacement surgery
D. Implantation of modular components to reduce wear and tear

The answer is (D). Implantation of modular components is not an intraoperative measure; It is a design feature of some implants to allow for interchangeability and future revisions. Prophylactic antibiotics (A), minimally invasive techniques (B) and spinal anaesthesia (C) are common intraoperative measures in arthroplasty procedures.

5. A patient with bilateral knee osteoarthritis presents with significant muscle weakness around the knees. What non-surgical perioperative measure should be emphasised to optimise surgical outcomes?

A. Intensive pain management plan
B. Cardiovascular fitness assessment
C. Early mobility post-surgery
D. Preoperative nutritional supplementation

The answer is (C). Early mobility post-surgery is essential for preventing complications such as deep vein thrombosis and improving joint function. While all options contribute to optimal outcomes, addressing muscle weakness through early ambulation is particularly important in enhancing joint recovery and reducing postoperative complications.

References and further reading

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ABOUT THE BOOK

This is the second volume of the *Orthopaedics for Primary Health Care* textbook edited by Michael Held, first published in 2021.

Most patients with orthopaedic pathology in low- and middle-income countries are tested by non-specialists. This book was based on a Delphi consensus study* with experts from Africa, Europe and North America to identify topics, skills and cases concerning orthopaedic trauma and infection that need to be prioritised in order to provide guidance to these health care workers.

The aim of this book is to be student-centred.

*Held et al. Topics, Skills, and Cases for an Undergraduate Musculoskeletal Curriculum in Southern Africa: A Consensus from Local and International Experts. JBJS. 2020 Feb 5;102(3):elO.

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The information in this book is meant to supplement, not replace, orthopaedic primary care training.

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