Complications in hip surgery

Anna Helene Katrin Riemen
Christopher Munro

Abstract

Specific complications of hip surgery depend on the surgical procedure. Many that are common to hip arthroplasty also occur in other procedures about the hip and indeed other areas of orthopaedic surgery. Not all can be discussed in their full detail and we highlight further reading materials. Finally, we look at some areas that can be addressed to reduce risk of complications.

Keywords acute kidney injury; arthroplasty; complications; hip; multidisciplinary; obesity; opioid dependence

Introduction

Consent is a continuous process of discussion with the patient. The 'Montgomery ruling' from 2015 (UKSC11) has highlighted again that it is the surgeon's duty to 'ensure that the patient is aware of any material risks involved in any recommended treatment and of any reasonable or variant treatments'. Unlike the Bolam principle, in the Montgomery ruling, 'the test of materiality is whether, in the circumstances of the particular case, a reasonable person in the patient's position would be likely to attach significance to the risk, or the doctor is or should reasonably be aware that the particular patient would be likely to attach significance to it'.

To give patients a choice of treatments and information on risks in relation to hip surgery the surgeon and his team need a good understanding of the complications and ways of addressing them. Furthermore, knowledge of one's own complication rate and targeting information specific to the patient will help in facilitating the patient's decision on a treatment.

Prior to elective orthopaedic surgery, careful preoperative assessment to identify risk factors associated with peri- and postoperative complications is essential to identify factors that can be modified. Where modification is not possible a multidisciplinary approach can be used to quantifying and where possible at least mitigate or prepare the team and patient for complications. This patient-centred approach, with individualized information for each patient, allows the patient to decide on a treatment and to make an informed choice.

Anna Helene Katrin Riemen *BSc Hon Biochemistry MBChB MRCS Ed PhD SCREDS Clinical Lecturer in Musculoskeletal Sciences and Speciality Registrar in Trauma and Orthopaedic Surgery, Aberdeen Centre for Musculoskeletal Health, University of Aberdeen, UK. Conflicts of interest: none declared.*

Christopher Munro *MBChB FRCS Ed(Tr & Orth) Consultant Trauma and Orthopaedic Surgeon, Woodend General Hospital, Aberdeen, UK. Conflicts of interest: none declared.*

Complications

The reporting of complications after hip surgery is not standardized across procedures or within selected procedures such as total hip arthroplasty (THA).[1] The Hip Society has created a list of complications with definitions after hip arthroplasty.[1] This list excludes a significant proportion of adverse events and complications that patients may want to be informed about during the consent process. These include poor functional outcomes and general adverse events such as cardiac, pulmonary, renal and cognitive problems.[1] The list of 19 complications includes many that are common to most hip procedures. Most useful is the grading from 1 to 5 of each complication to allow the stratification of complication severity and impact for the patient:

- Grade 1 complications require no treatment and have no clinical relevance
- Grade 2 complications require a small change in care without any operative treatment
- Grade 3 complications require unplanned surgical treatment prolonged or re-admission
- Grade 4 complications are limb or limb- or life-threatening events
- Grade 5 is defined as death.

Analysing revision rates of primary THA and the reported reason for revision is an easily defined measure of complication. This only captures a subset of complications and does not account for less severe complications that can still influence patient satisfaction. In a retrospective case series of 4555 uncemented THA, an overall 4.4% failure rate requiring reoperation at 10 years was reported. Of these, the leading causes for reoperation were wound problems, peri-prosthetic fracture and hip instability.[2] In national joint registries, these are also common reasons for revision.[3–5] The Scottish Arthroplasty Project also captures complications such as acute kidney injury, myocardial infarction and cerebrovascular events within 90 days.[3] Though not implant related, this type of complication can have a significant impact on the patient.

A less practical, but from a patient perspective probably more adequate, definition of complications is anything that results in a less than perfect outcome.[6] Patient satisfaction is associated with pain relief, absence of a limp and functional improvement.[7] Several factors have been suggested to be associated with lower patient satisfaction. These include higher age, female gender, co-morbidities, associated conditions affecting walking capacity, mental distress, higher pain and lower socioeconomic status.[7] However, patient expectations and preoperative psychological wellbeing are also associated with patient satisfaction.[8]

Complications associated with hip surgery can be classified by timeframe into immediate, early, medium and long-term complications. In this article we will discuss some of the less frequently covered complications in that order. We focus primarily in detail on some, and highlight further reading for others (Table 1). Finally, we will discuss some of the factors that can be addressed using a multidisciplinary approach to minimize risk.

Immediate complications

These are problems arising in the immediate perioperative period. Such complications include: bleeding, neurovascular

injury, intraoperative fracture and medical or anaesthetic complications. The latter are beyond the scope of this article.

Bleeding

The hip is a well-vascularized region and hence blood loss from surgery can be significant. Therefore, intraoperative blood loss is monitored and commonly estimated at the end of surgery. Total blood loss is higher than that measured in theatre. Quoted ranges of total blood loss are as high as 400–1500 ml[9,10]

Risk factors for excessive blood loss and postoperative transfusion requirement are low preoperative haemoglobin, operating time and low body mass index (BMI).[11] Meticulous technique to achieve haemostasis is aided by other blood conserving strategies including use of tranexamic acid at the time of surgery. This anti-fibrinolytic agent reduces blood clot breakdown, blood loss and hence the need for blood transfusion without increasing the risk of venous thromboembolism or pulmonary embolism.[12] Maintaining the patient's body temperature also optimizes clotting. Cell salvage can minimize the need for blood transfusion. The latter can be particularly useful in revision arthroplasty or major procedures around the hip.[13,14]

Neurological injury

Nerve injury can occur in up to 2% of patients undergoing THA[15] and 13% in hip arthroscopy patients.[16] Nerve injuries can be neuropraxia, axonotmesis or neurotmesis.

Nerve injury from positioning can affect nerves at a distance from the operative site, for example the ulnar nerve. Iatrogenic nerve injury due to surgery around the hip is a devastating complication. Nerve injuries about the hip can be due to patient positioning, position of retractors causing pressure or tension on the relevant nerve or direct injury. Prevention of nerve injury requires careful understanding of anatomy, the procedure and attention to detail in all aspects of perioperative care and hence cannot be achieved without a well functioning multidisciplinary perioperative care team. In hip arthroscopy the pudendal nerve is commonly injured but injuries to the lateral femoral cutaneous nerve of the thigh, the sciatic and the superficial peroneal nerve have also been described.[16] In THA multiple nerves are at risk at various stages and hence continuous vigilance throughout the procedure is necessary in addition to a thorough understanding of the relevant anatomy specific to the approach used as outline elsewhere.[15]

Complications after hip surgery in relation to the post-operative timeframe

Immediate	Early	Late
Haematoma/wound problems[56]		
Neurologic injury[15,57]		
Intraoperative fracture		Peri-prosthetic fracture[58]
Broken kit		
Chest infection		
Urinary retention/infection		
	Pain[25]	
	Opioid dependence	
	Instability/dislocation[59]	
Limb length inequality[17]		
		Prosthetic joint infection[18]
Constipation[31]		
Acute kidney injury[20,60]		
Cerebrovascular event/stroke[40]		
Myocardial Infarction[40]		
Thromboembolic disease[32,61]		
Chronic opioid dependency[29]		
Anaesthetic complication		
Death		
		Aseptic loosening[62]
		Bearing surface wear

Note: superscript numbers denote key references for further reading.

Table 1

Limb length and instability

Surgery around the hip can affect limb length and in THA also hip stability. In THA equal leg length and stability are assessed and adjusted intraoperatively. However, despite this some patients have a symptomatic leg length difference. The prevention, assessment and management of patients with symptomatic leg length inequality and instability after primary hip arthroplasty has been discussed elsewhere.[17]

Early

Wound problems

Wound problems, are not captured by large joint registries but are often a cause of concern to patients as the most visible mark of surgery in the immediate postoperative period. These include delayed wound healing, dehiscence, persistent acute wound drainage and suture abscess and are reported to occur in 0.6% of cases.[2] Wound problems such as dehiscence, haematomas or superficial wound infection increase the risk of deep joint infections.[18]

Postoperative pyrexia and infection

Pyrexia within the first 24–48 hours postoperatively is usually an inflammatory response to surgery or an infection elsewhere rather than the surgical site. Such infections include chest and urinary tract infections. Assessment of the patient with pyrexia following hip surgery should include these as potential differential diagnosis.

The overall rate of infections in THA remains around 1%.[3,5] Infection of the operative site, in the early postoperative period and acute haematogenous spread, if detected early, can be treated with debridement, antibiotics and implant retention (DAIR). Modular components such as liners and femoral heads are exchanged in THA.[12] DAIR is a specialist procedure that should only be attempted by an experienced arthroplasty surgeon.

Dealing with infective complications after hip surgery requires a multidisciplinary approach that includes a close working relationship with microbiologists and infectious disease specialists. A combined approach is essential due to different pharmacokinetic properties and synergistic and antagonistic effects of different combinations of locally administered antibiotics and systemic antibiotic treatment.[19] An excellent summary of the management of prosthetic hip joint infection was published this year.[18]

Acute kidney injury

The incidence of acute kidney injury (AKI) following hip arthroplasty has steadily increased and is at least 2%[3] to 8%.[20] A diagnosis of acute kidney injury (AKI) is made when a rise in creatinine of 26 mmol/litre or greater occurs within 48 hours or a 50% creatinine rise over a 7-day period. Patients suffering from AKI have a longer hospital stay and a higher 90-day mortality. In a significant proportion of AKI cases the renal function never returns to normal, resulting in chronic kidney disease.[20,21] Multiple factors, including nephrotoxic drugs commonly administered after hip surgery and dehydration, can contribute to AKI following surgery. Some authors have associated enhanced recovery after hip surgery with AKI. Risks factors for AKI include:[22]

- higher age
- pre-existing renal impairment
- hypertension
- cerebrovascular and peripheral vascular disease
- hypertension
- drugs.

A multitude of drugs can contribute including angiotensin-converting enzyme blockers and angiotensin receptor blockers. Flucloxacillin and gentamicin are commonly used as antibiotic prophylaxis but can lead to interstitial nephritis resulting in AKI.[20]

Cerebrovascular events, stroke and acute myocardial infarction

Cerebrovascular events following hip surgery are rare at 0.4% as are myocardial infarctions.[3] Cardiovascular risk continues into the weeks post-discharge. Predictors of myocardial infarction in the perioperative period included diabetes mellitus, age, hypertension and pre-existing cardiac disease. Continuing medication such as aspirin and indeed using it as deep vein thrombosis prophylaxis has been shown to reduce mortality from cardiovascular complications.[23]

Pain

Pain around the hip can arise from multiple sources and aetiologies, especially when multiple pathologies such as knee and hip osteoarthritis or spinal pathology occur in the same patient. It requires skill to ensure the true cause is found before embarking on any treatment. In addition to obtaining a careful history and performing a thorough examination, diagnostic joint injections can assist in diagnosing the main source of pain without exposing the patient to irreversible surgery with a comparatively higher risk profile.

A detailed summary of the assessment of painful hip arthroplasty has been provided elsewhere.[24,25]

Pain after hip surgery can again have a variety of causes with specific history and examination findings. These can include:

- aseptic loosening
- infection
- heterotopic ossification
- trochanteric bursa irritation
- mechanical iliopsoas irritation.

After THA aseptic loosening is the most common cause for the occurrence of pain in the groin (acetabulum) and thigh (femoral component). Persistent pain after hip replacement as a recorded reason for revision surgery is usually associated with other factors such as aseptic loosening or infection as an indication for revision of THA.[5]

Based on small case series, iliopsoas irritation has been reported in approximately 4% of painful THA. Patients describe groin pain with specific activities such as climbing stairs or getting out of a car. On examination the pain can be reproduced with resisted active hip flexion and hyperextension of the hip-stretching iliopsoas over the prominent structure (acetabular rim, extruded cement, prominent acetabular component extruding beyond the bony rim of the acetabulum) like a rope.[26] Treatment includes conservative management with physiotherapy to stretch iliopsoas, therapeutic injections of the tendon, arthroscopic debridement, tenotomy and revision of the acetabular component or surgical removal of the causative factor such as trimming protruding screws or removing extruded cement.[26–28]

Opioid dependence

Opioids and postoperative opioid dependence after orthopaedic procedures is becoming more recognized. Opioids are commonly prescribed in the immediate postoperative period after hip surgery with a view to reducing the dose prior to discharge. Increased pain sensitivity has been described even with short-term opioid use and there is concern that opioid use after surgery can lead to long-term opioid use.[29] Indeed THA increases the risk that patients will use opioid medication in the long term in opioid naïve patients. Other risk factors for long-term opioid use after surgery include preoperative opioid use, depression and age over 50 years.[29] Although, techniques such as multimodal anaesthesia have reduced opioid use in the first 24 hours after surgery it is not yet clear whether such combinations of regional anaesthesia with two or more medications reduces long-term postoperative opioid use. Hence, it may in future become necessary to counsel patients preoperatively about opioid dependence.

Constipation, ileus

Cessation of bowel motility is common after orthopaedic procedures. It is associated with a sympathetic stress response to surgery, opioid use, immobility and depending on the procedure manipulation of the bowels. It results in reduced postoperative intake, discomfort, pulmonary complications and prolonged hospital stay.[30]

Commonly used opioids cause increased non-propulsing contractions and affect water and electrolyte resulting in delayed gastrointestinal transit and hard, infrequent stools. The patient experiences side effects such as constipation, nausea, vomiting, dry mouth, gastrooesophageal reflux, abdominal cramping, spasms, and bloating.[31]

Thromboembolic disease

The rate of deep vein thrombosis and pulmonary embolism remains just under 1%.[3] New guidelines have been published for the prevention of thromboembolic complications in orthopaedic surgery including orthopaedic trauma.[32]

Death

Death within 90 days following elective surgery of the hip remains a very rare occurrence. The rate of death following hip arthroplasty in Scotland was 0.2% in 2017.[3]

Fracture

Periprosthetic fractures can occur intraoperatively or postoperatively. Open reduction and internal fixation for periprosthetic fractures and revision of implants for periprosthetic fractures account for 24.6% and 31.1% of revision surgeries.[2] The National Joint Registry reports an overall periprosthetic fracture rate for all implants of 0.69/1000 per year. However, the highest number is reported in hybrids (0.89/1000) and the lowest in cemented prosthesis (0.48/1000).[5] Most periprosthetic fractures 1.69/1000 occur in the first year after surgery.[5]

Heterotopic ossification

Though not immediately evident and still poorly understood it is likely that the processes that lead to heterotopic ossification commence in the early postoperative period. Heterotopic ossification about the hip has been associated with spondyloarthropathies, revision surgery and transtrochanteric approaches. A postoperative course of indomethacin for 2–4 weeks or a single session of radiotherapy may reduce the risk.[33–35]

Late complications

Hip instability and dislocation

Joint instability and dislocation in an established, previously stable prosthesis is associated with component wear. Whereas an initial closed reduction of the implant is always indicated, ultimately, if this fails, revision of one or both components is indicated. Revision can include an exchange of liner, exchange of liner and head to facilitate increasing the head size and revision of the acetabular component to a constrained component such as a dual mobility cup. In some patients, a revision of both components is necessary.[36–38] Ultimately, the treatment of prosthetic joint instability and dislocation depends on careful analysis of cause and assessment of patient factors including co-morbidity, performance status and patient expectation.

Minimizing complications

Complications are not inevitable or affixed at a specific rate. Complications are linked to the surgeon's skill, the team, available facilities, systems and patient factors (Figure 1).

Patient optimization

Patients often suffer from multiple medical conditions. In an era of increasing body weight, obesity and its associated problems there is a corresponding increase in the risk profile. Depending on the type and urgency of orthopaedic procedures around the hip, addressing patient factors can be difficult.

Factors that have been identified as increasing surgical risk and complications include anaemia, renal impairment, renal osteodystrophy (poor bone quality with resulting higher fracture risk and poorer bone healing), extremity oedema (wound problems), malnutrition, metabolic syndrome and liver disease.[30]

Malnutrition is associated with poor wound healing and infection. It should be considered regardless of the patient's BMI. Indeed 40% of obese patients (BMI> 30 kg/m^2) are malnourished. Screening for malnutrition is essential as it is rarely obvious.[30]

Inflammatory conditions can increase the risk of complications for any procedure around the hip. Some inflammatory diseases require the patient to take disease-modifying medication. Such medications require targeted, careful planning of a temporary cessation of medication, and even a potential stress dose supplement for glucocorticoids.[30] Furthermore, patients with rheumatoid arthritis and spondyloarthritis are at increased risk of postoperative myocardial infarction, as they have higher rates of (subclinical) cardiovascular disease than the general population.[33] Other rheumatologic conditions such as psoriatic arthritis pose a risk of infection from psoriatic plaques that are highly colonized with bacteria and may need optimization prior to surgery, with help from the dermatologist.[33]

No remedy has yet been identified for the effects of age and in patients older than 80 years, 70% have hypertension, 23% have diabetes and 11% have peripheral vascular disease. Despite the higher incidence of myocardial infarction, pneumonia, urinary retention and death, patients undergoing hip arthroplasty have similar improvement in outcome scores as younger patients.[39,40] Orthogeriatricians or combined geriatric and orthopaedic care significantly improve outcomes in hip fracture care. This is combined approach is less common in elective hip surgery despite improving morbidity and mortality for older patients.[40]

Obesity has become an expanding challenge to the orthopaedic surgeon and financial challenge to healthcare systems worldwide. Patients with a BMI of or greater than 30 kg/m^2 are considered obese and in addition to this, being a significant risk factor for non-communicable diseases such as diabetes and cardiovascular problems, it is also associated with a significant burden of musculoskeletal disorders including osteoarthritis.[41] Obesity is associated with increased anaesthetic risks and overall complications.[42] It contributes to difficulties in managing multiple systems during hip surgery. For example it causes obstructive sleep apnoea and it results in a picture of restrictive lung disease with reduced airway compliance. Obesity and increased BMI are also associated with increased early and late infection rates with significantly higher risk of complications for the morbidly obese and super obese.[42,43] Furthermore, in hip arthroplasty the dislocation risk is increased in obese patients due to increased soft tissue bulk creating impingement and thereby alternating the forces acting on femoral component.[44] Rates of aseptic loosening, requiring revision hip arthroplasty, are also significantly increased in obese patients.[42] Despite obesity many patients who have not yet undergone any bariatric procedure suffer malnutrition, including protein, vitamin D and iron deficiencies.[45] Furthermore, obesity has an effect on the immune system resulting in stunted inflammatory response to acute trauma that[46] Many centres now restrict hip surgery for patients with a BMI over 40 kg/m^2.

Despite the increased risks associated with obesity compared to a non-obese population, the overall absolute risk is still low and the overall improvement in function and pain relief is similar between obese and non-obese patients undergoing hip arthroplasty, hence the benefit of successful hip surgery to the obese patient is significant.[42,47] Therefore, multidisciplinary management of these patients to optimize weight through supervised weight loss programmes or bariatric surgery prior to hip surgery can have significant benefits to the morbidly obese patients general health and risk profile. However, there is now overwhelming evidence that the majority of morbidly obese patients cannot lose weight and maintain the weight loss in the long term

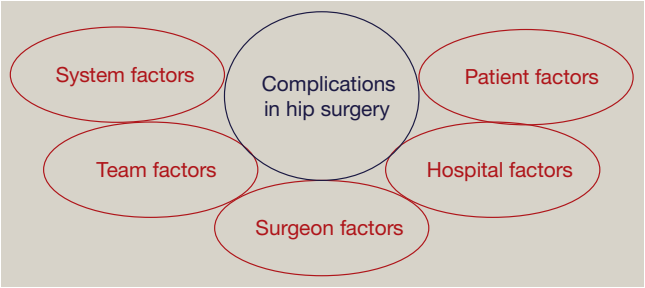

Figure 1 Complications are not inevitable or affixed at a specific rate but are linked to the surgeon's skill, the team and available facilities.

without support. Therefore, the management of such patients does require a strong multidisciplinary team and working relationship with the dieticians and bariatric surgery team. This also facilitates optimal timing for each individual undergoing hip surgery following different bariatric procedures. Patients who underwent bariatric surgery prior to THA had lower 90-day readmission rates if the joint replacement was carried out at least 6 months after the bariatric procedure. The benefits of bariatric surgery prior to elective hip surgery extend beyond weight reduction as it has positive effects on the chronic medical problems associated with obesity.[48]

In trauma procedures around the hip preoperative weight optimization is not possible and therefore the impaired nutritional state, anaesthetic risks and challenges in patient assessment, positioning, surgical exposure and rehabilitation need to be managed. Patients experience longer operative times, increased blood loss, wound infections and thromboembolic events.[49] Reoperation rates for wound problems and loss of reduction in surgery around the hip and pelvis are significantly higher in the obese patient.[49,50] There is limited evidence to suggest that the use of vacuum-associated closure devices and early return to theatre for persistent leakage improves infection rates.[49] The procedure choice may be limited based on body habitus and some manufacturers are now making weight-specific jigs for trauma.

Avoiding failing implants

Several implants had catastrophic failures in recent years despite the publication of promising randomized controlled trials.[51] Such failures became evident in hard data through the national joint registries but compulsory inclusion of radiostereometric analysis (RSA) assessment into the assessment each new or modified implant may facilitate prediction of failing implants. RSA, due to its ability to detect early movement, is becoming increasingly recognized as an adjunct in the early assessment of new arthroplasty and fracture fixation implants or minor modifications to existing ones.[52,53]

Standardized reporting of complications and adverse events not only for hip arthroplasty but for all procedures combined with outcome monitoring through national databases could identify problems with patient selection, surgical techniques, implants and postoperative care regimes.[54] These standardized report regimes should also include patient-reported outcome measures. This could ensure that complications and outcome measures are relevant to what consider find significant rather than limiting the recording of complications and adverse events to those that surgeons and researchers deem relevant hence addressing the Montgomery ruling.[55]

In the absence of a national database for a particular procedure each surgeon should monitor their own complication rates as part of clinical governance and appraisal.[6]

Summary

In summary, complications of surgery around the hip are multifactorial and risk reduction requires a multidisciplinary approach that extends beyond the patient, surgeon and their team to a working environment with supporting open structures that facilitate best standards of care. Should complications occur the authors recommend an honest early discussion with the patient and discussing cases openly with colleagues ensure best possible outcomes for the individual patient. ◆

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