

Hints and tips in revision hip surgery

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Abstract

Revision total hip arthroplasty has excellent results but is challenging surgery. A myriad of considerations and complications face the surgeon but careful planning and careful execution of that plan can reduce the likelihood of failure. This review article attempts to give practical advice on managing preoperative planning, intraoperative considerations and postoperative complications for the reader.

Keywords Arthroplasty; complication; hip; planning; revision

Introduction

The authors have tried in this article to give a step-wise practical assessment of the key problems that are encountered in planning and executing revision total hip arthroplasty (THA). The article is set out into three key areas of interest – preoperative planning, intra-operative techniques and postoperative problems. This format will help trainee surgeons organize their thoughts for examinations and surgeons in performing these demanding operations.

Preoperative planning

History

In some cases, it is clear why the patient is coming for a revision hip replacement (such as fracture or dislocation), however in other cases it is not so clear, making directed history-taking important. It is useful to know how and when the primary arthroplasty was inserted and its subsequent course.

Infection needs to be ruled out on all problematic hip replacements and one must maintain a high index of suspicion. It is important to ask about the original surgery, were there any wound problems and the need for any further surgery?

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As hip arthroplasty is generally such a successful operation at alleviating a patient's pain, if a patient presents with new or continuous pain after having a primary arthroplasty, then it is often a good indicator that there is some underlying pathology. Asking patient where their pain is located and its nature can yield a lot of information about its aetiology. Pain in the groin often indicates intra-articular hip pathology or psoas impingement, whereas pain on the lateral aspect of the thigh may indicate abductor failure. Pain in buttocks, needs a more guarded assessment, as it may be related to acetabular problems but spinal pathology needs to be ruled out. Patients complaining of thigh pain may be related to femoral loosening or transfer pain in uncemented stems.

Information about the primary surgeon and institution is important when planning revision surgery, as it may allow retrieval of the previous operation reports, which may contain important information such as approach and implants used and any difficulties the primary surgeon encountered during the original surgery. Enquiring about patient expectations is very important from any revision surgery is vital, as the patient may have unrealistic expectations from any surgery.

Examination

Examination in a problematic hip is important although care is required in patients with recurrent hip instability. Carefully watching the patient walk to the examination room, gives valuable information about limps, walking aid requirement and general mobility. Leg length discrepancy is a common complaint (before and after revision surgery) and therefore it is important to document it preoperatively, as patients will often want this improving. Inspecting previous incisions and general skin condition may indicate what approach the previous surgeon used and influence future incisions for revision surgery.

Tenderness of the greater trochanter can indicate either abductor tear or failure and should prompt assessment of the abductor function with Trendelenburg testing. Assessing active and passive movements should be examined and psoas irritation can be assessed by the patient performing an assisted and unassisted leg raise. Those who have psoas pathology have pain reproduced with unassisted leg raise, whereas they do not with assisted leg raise. It is important to document the function of the sciatic nerve preoperatively.

Investigations

Investigations will be directed from your working diagnosis. All patients need a plain X-ray of the pelvis to confirm diagnosis and as a planning tool for your revision surgery. It may allow the surgeon to establish which implants are in situ and electronic reference aids are available such as www.whichorthopaedicimplant.com which can help plan the appropriate tools to be available at surgery. The X-ray allows appreciation of the implant position (hip centre/acetabular version and inclination/femur alignment), leg length discrepancy, femoral offset and bone loss. Assessment of the patient's natural offset on the X-ray can be compared to an unreplaced side or previous X-rays; increased offset can contribute to soft tissue pain and reduced offset can lead to instability and weakness.

All patients that are being worked up for a revision of hip surgery should have basic bloods including C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) and raised levels

require further investigation. The role of α defensin levels remain controversial but may aid the diagnosis of infection.

Computed tomography (CT) scan of the pelvis helps to quantify bone loss and may allow more accurate appreciation of bone defects which are often greater than seen on X-ray. In cases of instability, a CT scan of the pelvis continued down to the knees can give you accurate measurements of the version and position of the femoral and acetabular implants. Hybrid single photon emission computed tomography (SPECT/CT) can add further information than a CT about implant loosening, increased bone turnover, or hyperaemia in infection.

Magnetic resonance imaging (MRI) scan is rarely used in revision surgery due to the metal artefact but this can be reduced by using metal artefact reduction software (MARS). Large head metal-on-metal (MoM) implants, which fail can cause an aseptic lymphocyte-dominant vasculitis-associated lesion (ALVAL) and require a MRI scan preoperatively. It is important to know where the pseudo-tumour is located so it can be excised at the time of surgery. The destruction can be catastrophic in bone and soft tissue and in some cases this inflammation can completely destroy the hip abductors and therefore a higher level of constraint may be required for the reconstruction. MRI can also be useful if abductor failure is suspected, which can be caused by tendon tears or denervation by damage to the superior gluteal nerve. MRI can show fatty atrophy/infiltration of the abductor muscles that have not been functioning, though tendon insertion may be difficult to visualize on MRI due to metal artefact even on MARS sequences. Therefore, additional information may be required by ultrasound of the insertion if tears/detachment is suspected and an electromyography (EMG) study if denervation is suspected.

Assessment in theatre is sometimes required to perform a joint aspiration/injection/examination of stability under anaesthetic. Joint aspiration is useful and accurate way of diagnosing infection prior to revision, especially if combined with histological analysis with a biopsy. In one study, biopsy and a combination of bacteriological and histological analysis had a sensitivity of 87.5%, specificity of 100% and accuracy of 95% whereas, bacteriological assessment of synovial aspirate revealed a sensitivity of 50.0%, specificity of 91.7%, and accuracy of 75%.¹ Aspiration fluid can be tested for presences of α defensin, leukocyte esterase and synovial CRP which have been shown to increase diagnostic accuracy. Further information can be gleaned from diagnostic local anaesthetic injections and examination under anaesthetic, which can confirm instability and possible causes such as femoral impingement.

Equipment and operative planning

As revision surgery is complex and has the potential for large intraoperative complications, it is important to have the patient medically optimized preoperatively. When planning a revision procedure, it is good practice to discuss the case with a colleague with larger revision departments regularly undertaking complex arthroplasty multidisciplinary meetings (MDT) where all revision cases are discussed and outcomes documented. This represents optimal practice and ensures all the necessary investigations have been undertaken, surgical plans reviewed, potential alternative options discussed, and gives medicolegal protection through professional consensus.

The surgical plan should be divided into surgical steps of approach, implant removal and reconstruction. Approach decision will be dictated by previous approaches, experience and anticipated ease of implant removal. Planning of equipment requirements is vital for implant removal to ensure a successful operation. Consideration of equipment required for extended trochanteric osteotomy, cement removal, uncemented stem removal and acetabular component removal. Some implants have specific instruments to aid removal and standard revision instruments often have a variety of osteotomes and extraction devices with slap hammers to aid extraction. For acetabular removal, devices such as Explant[®] Acetabula Removal System, is excellent with size-specific blades and especially useful in uncemented revisions to minimize iatrogenic bone loss. The use of ultrasonic cement removal devices also reduces the risk of perforation of the cortex in cemented femoral revisions.

When planning the reconstruction, it is important to have a plan B or plan C as things can quickly change during revision surgery. Having adequate back-up plans allows for a variety of implants to be available and a detailed knowledge of the implants routinely available to their institution is mandatory to allow ordering of loan equipment if necessary. The degree of anticipated bone loss should guide whether bone graft (structural or morcellized), metallic acetabular augments, cup cages and distally fixed femoral implants will be required. In the severest cases of bone loss, oncology implants such as proximal femoral endoprosthesis, three-dimensional, custom-made implants or pedestal cups may be required.

If the indication for revision is infection, then the appropriate antibiotic, identified from the preoperative bacteriology, for cement (spacer or mantle) or resorbable adjuncts (e.g. Stimulan) needs to be available. Consideration should be given to the use of coated implants (such as silver) in the presence of infection. If the indication for revision is instability, then consideration should be given to the use of lipped or constrained liners, posterior liner augment devices, large diameter heads or tripolar cups.

Reconstruction of the mechanism during the reconstruction is often neglected in planning and this can significantly improve patient function, lessen pain and provide more implant stability. Fracture of the greater trochanter can be present preoperatively or intraoperatively with femoral component removal. A variety of manufacturers provide trochanteric plates either integral to their revision system or separate to them. Reconstruction of the abductor function can be undertaken with a variety of surgical techniques, including allograft reconstruction or muscle transfers (anterior gluteus maximus transfer), and should be considered preoperatively.

Strategy planning for infection

When planning revision surgery for infection, the surgeon must decide if they are going to perform a debridement, antibiotics and implant retention (DAIR), single-stage revision or a two-stage revision. The decision often depends upon surgeon experience, institutional bias or historical data, however, many larger units now protocolize patient treatment depending on the host comorbidities, the virulence of the bacteria and the length of preceding symptoms. A multitude of papers advocate DAIR/one-stage or two-stage strategies and it is beyond the remit of this

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