

Revision hip arthroplasty in the rheumatoid patient

Abstract

Revision hip surgery is a technically demanding and time consuming speciality requiring advanced surgical techniques and equipment. In the rheumatoid patient surgery may be further complicated by immunosuppression, poor bone stock and altered bony anatomy. This review will outline primary and revision hip arthroplasty scenarios with specific reference to the rheumatoid patient and comparison to the larger osteoarthritis cohort.

Volume 6 Issue 5 - 2016

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Received: October 24, 2016 | **Published:** November 30, 2016

Introduction

Rheumatoid arthritis is the most common of the inflammatory arthritides affecting 0.8% of the North American population. Although there is some evidence that the rate of major joint replacement in the rheumatoid population has stabilized,¹ after primary and secondary osteoarthritis, rheumatoid arthritis is still the most common cause of total hip arthroplasty surgery. Data from the Scandinavian arthroplasty registers have shown that 3-15% of all prosthetic joint replacements in the hips and knees were done in rheumatoid arthritis patients.^{2,3}

Rheumatoid arthritis can be further divided into Adult onset and Juvenile rheumatoid arthritis. Given their younger age and increased functional demands, the rates of revision hip surgery in the juvenile population are understandably higher.^{4,5}

Results of primary total hip replacement

Although both rheumatoid arthritis and osteoarthritis are associated with chondral loss and joint space narrowing, rheumatoid arthritis is further characterized by periarticular erosions and osteopaenia. Specific to hip arthroplasty, the softer bone in rheumatoid patients can lead to thinning of the acetabular floor and medial migration of the socket (protrusio acetabuli). These differences in pathoanatomy, particularly the poorer bone quality in rheumatoid arthritis patients could be expected to lead to differences in component fixation and subsequent revision rates.

In a metanalysis of 40 studies Ravi et al.⁶ demonstrated that compared to patients with osteoarthritis, patients with rheumatoid arthritis are at a higher risk of dislocation following total hip arthroplasty and also at a higher risk of infection following total knee replacement.

Analysis of joint arthroplasty registry data however, primarily from Scandinavia, has yielded conflicting results. Rud-Sorenson et al.⁷ in a study from the Danish Hip Registry found no difference in cup revision between rheumatoid arthritis and osteoarthritis and indeed a better survival rate for stems in rheumatoid patients. Schrama et al.⁸ in a prospective, population-based study on 108,786 hip and knee joint arthroplasties from the Norwegian Arthroplasty Register showed a higher rate of revision for infection after total knee replacement but not total hip replacements. In total hip replacement the only increase in revision rate for infection was demonstrated from approximately six years onward after the primary surgery.

Radiological and anatomical considerations in the native rheumatoid hip

A thorough understanding of primary hip arthroplasty in the rheumatoid setting is necessary before undertaking revision surgery.

As mentioned above, protrusio acetabulae is common in the rheumatoid patient secondary to softening of the acetabular roof, medial migration of the femoral head and subsequent reactive bone remodelling. It can be defined as protrusion of the acetabular floor medial to the ilioischial (Kohlers line). Protrusio can make dislocation of the hip difficult and indeed the femoral neck may need to be cut in situ. In addition protrusio may bring the sciatic nerve closer to the hip that the surgeon should bear in mind. The surgical goal in the protrusio setting is to restore the centre of hip rotation and reconstruct the medial acetabular floor if necessary.

Segmental avascular necrosis of the femoral head may be present due to primary disease, or as a complication of steroid therapy.

Preoperative work-up

Patients with rheumatoid arthritis have a systemic polyarticular disease, with extra-articular manifestations such as anaemia as well as specific comorbidities such as cardiovascular disease, which require careful preoperative assessment for optimal outcomes and fewer adverse events.⁹ In the scenario where the hip and knee are symptomatic and warrant joint reconstruction, the hip is usually addressed prior to the knee. Total hip replacement restores correct femoral alignment and length, facilitating correct implant alignment at subsequent total knee replacement.¹⁰ However in practice the hip may become symptomatic relatively late in the rheumatoid disease process, and patients may commonly have had knee and foot procedures first. Obviously the presence of a distal femoral stem from a revision knee replacement should be identified.

Surgical planning in the revision setting

Like any form of complex surgery, success lies in the formulation of a detailed preoperative plan.

Bone graft should be available in all revision cases, milled femoral heads for impaction bone grafting, and whole femoral heads where indicated for bulk allografting of acetabular rim defects. Strut grafts can be used to support uncemented femoral stem revision

in conjunction with cables. This is particularly useful following extended trochanteric osteotomy or in the periprosthetic femoral fracture setting.

Acetabular bone loss can be assessed using various classification systems including those of Paprosky¹⁰ based on the ability to impact a hemispherical shell, and the D'Antonio classification favoured by the American Academy of Orthopaedic Surgeons (AAOS).¹¹ Although detailed information can be inferred from plain radiographs and computerised tomography (CT) scans, only at the time of surgery will the quality of the acetabular bone stock be fully appreciated and so it is best to plan for all possible eventualities.

Revision hip arthroplasty techniques

Well-fixed cemented polyethylene acetabular components can be removed using the Moreland poly extractor or alternatively the cup can be reamed out and then the cement carefully split. Cementless cups can be removed with minimal bone loss using an explant system, if screws are present then the liner will have to be removed first and then repositioned once the screws have been removed.

In deciding which implants to consider, a surgeon should always use systems with which they are most familiar with and ideally have a proven track record. However in contrast to primary joint registries many revision components, though extensively tested in the laboratory setting, have limited clinical follow-up.

As well as the cup rotating within the acetabulum, the prosthesis can also migrate proximally or medially. Proximal migration is more common with valgus implanted stems and medial migration with varus implanted stems.

The introduction of highly porous multi-hole shells has revolutionized acetabular revision surgery. Trabecular metal cups and augments can gain good primary and secondary fixation even with a reduced host bone-implant contact area. The quality of host bone and potential for bony ingrowth should be assessed at the time of surgery. Impaction bone grafting and cup/cage constructs can be used for more extensive acetabular defects.

Both cemented and uncemented stems are available depending on the anatomy of the proximal metaphysis and the available bone stock. Where there is a lack of proximal support a distal isthmic fit can be achieved using uncemented modular cone/conical stems. Modularity gives flexibility but complications have been reported including subsidence and implant breakage.

Complications

Any condition that reduces bone density can increase the risk of periprosthetic fracture in primary and revision hip arthroplasty. Both increasing age and osteopenia are risk factors for fracture in the rheumatoid population.

Historically patients with rheumatoid arthritis have been considered to be more prone to infection due to the nature of the disease and treatment with the traditional disease-modifying anti-rheumatic drugs such as methotrexate. The impact of newer medications such as Tissue Necrosis Factor (TNF) alpha inhibitors is unclear. Berbari et al.¹² in a study of 200 episodes of infection in 160 rheumatoid hip and knee arthroplasties from the Mayo clinic showed that the most common causative organism was *Staphylococcus aureus* and that patients did best when treated with two stage revisions. This is in contrast to the most common causative infected organism in non-rheumatoid patients, coagulase-negative *Staphylococcus*.

Traditionally aseptic socket loosening has been identified as an issue in cemented primary hip arthroplasty in rheumatoid arthritis.^{13,14} This has also been seen in revision cases.¹⁵

Conclusion

Revision hip surgery is a technically demanding and time consuming speciality requiring advanced surgical techniques and equipment. In the rheumatoid patient surgery may be further complicated by immunosuppression, poor bone stock and altered bony anatomy, and all of these factors need to be considered when planning revision surgery.

Acknowledgments

None.

Conflicts of interest

None.

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