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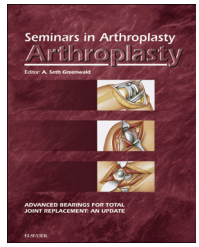

Failed unicompartmental knee replacement to total knee replacement conversion: Can you achieve a primary outcome?

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ABSTRACT

This review provides an overview of aetiology, diagnosis and management of failed UKRs and highlights key aspects of the decision making process and operative technique to ensure satisfactory outcome after UKR revision surgery.

With correct diagnosis and management, in the majority of revision UKR cases outcome similar to primary TKR can be achieved. Unexplained pain, aseptic loosening, infection, progression of arthritis and bearing dislocation are the commonest reasons needing further intervention after UKR. Key messages are about how to reduce the revision risk, methods to critically analyze a painful UKR and when and how to revise a UKR.

1. Introduction

Medial unicompartmental knee replacement (UKR) is an established option for symptomatic end-stage antero medial osteoarthritis (AMOA). It has many advantages compared to total knee replacement (TKR) including significantly less morbidity and mortality, tissue preservation, more rapid recovery with reduced hospital stay, and better implant function [1–4]. UKRs have some unique mechanisms of failure which one needs to be aware of. Bearing dislocation and progression of arthritis are two such complications. In addition, according to national joint registers [5] unexplained pain, and aseptic loosening continue to be reported as common reasons for revision of UKR.

In the majority of cases managing a failed UKR is straight forward as long as the surgeon diagnoses the problem correctly. This review provides an overview of possible aetiology, diagnosis and management of failed UKRs, and highlights key aspects of the decision making process and operative technique to ensure satisfactory outcome after UKR revision surgery.

2. Unexplained pain

Pain can be a problem and often leads to unnecessary revision. It is most commonly encountered over the proximal tibia and is anteromedial in distribution. This type of pain is not unusual in the first six months and usually settles spontaneously. Review of our patients showed that the incidence has decreased with time and is now 2% at one year follow-up [6]. In other series it has been higher, particularly with surgical

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inexperience. Other sites of pain are much less common. The New Zealand Joint Registry (NZJR) reports pain as a cause of revision in 38% of UKR revisions. The data from the NJR of England and Wales suggests 23% of UKR revisions are for pain. There are numerous proposed causes and many may be multifactorial. Unexplained pain is the most common presentation but there is increasing evidence [7,8] that inappropriate indications or bone overload may be the cause. Impingement, soft tissue irritation, cementing errors, pes anserinus bursitis, or neuroma have all been implicated.

As with a total knee replacement (TKR), one should not revise for unexplained pain. We have had three cases of Oxford UKR which on patient's persistence we revised for unexplained pain and all failed to improve. It is tempting for an inexperienced surgeon to offer revision surgery to a UKR patient who is complaining of pain. We analyzed Oxford Knee Score data at six months after UKR derived from the New Zealand Register. It confirmed that for each outcome score, the revision rate of UKR is about five times higher than that of TKR. This suggests that factors independent of outcome score increase the revision rate by five times. The most important factor is likely to be a different threshold for revision. The most striking difference in revision rate occurs in patients who are likely to have a worse score postoperatively than preoperatively (OKS $<$ 20). These patients have a 10% chance of being revised if they had a TKR and a 60% chance of being revised if they had a UKR.

One way to minimize the risk of persistent pain after UKR is to choose the correct patient for primary surgery. It is generally thought that UKR is best used in young patients with early arthritis. We strongly disagree with this and recommend that the Oxford UKR (OUKR) is only offered to patients with bone on bone arthritis. Cadaveric studies have shown that asymptomatic partial thickness cartilage loss (PTCL) is common [9]. So if a patient has pain and PTCL, the PTCL is not necessarily the cause of pain. In a study comparing [10] the outcome of patients with PTCL and matched patients with bone exposed (BE) or bone loss (BL), it was found those with PTCL had a worse outcome score and greater variability than BE and BL (OKS = 36 (SD = 10) vs. 43 (SD = 4) and 43 (SD = 5) respectively). Furthermore 21% of the PTCL group were worse or had no substantial improvement (ΔOKS $<$ 6) after the surgery, whereas all patients in the BE and BL groups reported substantial improvement. In that study, all the complications were pain related and all occurred in the PTCL group. Although some patients with PTCL do well with OUKR, a sizeable proportion do not. Until it can be predicted which will do well, it is sensible to avoid doing UKA in patients with PTCL. In the future, it may be possible to predict which will do well with a bone scan or MRI, but as yet this has not been shown to be possible. It is therefore important to be able to distinguish between those with PTCL and those with bone on bone. We do this with a series of radiographs including standing AP, varus stress or Rosenberg view. If there is preserved joint space on these views, we would then do an arthroscopy and only proceed to OUKR if exposed bone is seen on both sides of the joint. If there is not bone on bone, we would treat patients conservatively. The pain either tends to improve or the arthritis worsens in which case a UKA can be performed. There is another interesting study looking at unexplained pain. Niinimaki et al. [11] in a series of 113 OUKR from a Finnish center found that the re-operation rate was directly related to medial joint space on standing AP x-rays before surgery. The greater the joint space preservation prior to surgery, the higher the revision rate after surgery. If it was $\leq$2 mm, then the re-operation rate was six times lower than when the medial joint space was more than 2 mm. If the joint space was normal, the re-operation rate was 71%.

One must investigate pain, and try and treat these patients conservatively, as the pain tends to settle spontaneously. The surgeon should warn the patient before surgery that they are likely to have some pain for three to six months and that there is a small chance it may take one or even two years to fully settle. If patients have pain, advise them to decrease their level of activity and use a walking stick. If the pain is focal, it is worth trying a steroid injection. If the pain persists beyond six months and the patient is becoming anxious, it is worth requesting a second opinion from a surgeon who is experienced with OUKR, as they will tend to reassure the patient which is very helpful.

3. Aseptic loosening

Loosening is one of the commonest causes of failure in the national registers. In the NJR the loosening rate is 4.01 (CI: 3.73–4.32) per 1000 patient years [12]. It is much less common in the published series. For example, our series of 1000 cemented OUKR with up to 15-year follow-up, we have encountered one case each of femoral and tibial loosening [13]. A possible reason for the high rate seen in registers relates to misdiagnosis of physiological radiolucencies. Tibial loosening is often misdiagnosed. Radiolucent lines around the tibial component of the cemented OUKR are the rule not the exception, and the radiographic technique mainly determines how frequently they are observed. They are probably as common around the femoral component as well, but are more difficult to demonstrate. They do not appear to be the cause of symptoms nor evidence of loosening of the component. Therefore, we refer to these radiographic appearances as 'physiological radiolucency'. They can usually be distinguished from the pathological lucency that surrounds an infected or a loose component by thickness and the presence of the radiodense line. The physiological lucent line is almost always $<$2 mm thick and defined by a thin radiodense bone plate; the pathological lesion is thicker, and the margins of the radiolucent zone are characteristically ill defined. The physiological radiolucencies typically develop and consolidate over one to two years, and thereafter remain static.

Femoral loosening is often missed. The femoral loosening can present with subtle findings, so particularly if it is a one peg mobile bearing UKR, look around the peg for subtle findings. Flexion extension lateral x-ray is very helpful because you can find that a loose femoral component will piston in and out [14].

4. Infection

The incidence of infection after UKR is about half that after TKR [15]. The methods of investigation of suspected infection