Top tips and pitfalls in revision knee arthroplasty surgery

Andrew Porteous

Abstract

Revision knee replacement is challenging for the patient and surgeon alike, but providing a clear cause for failure of the primary prosthesis is identified, then good improvement and outcome can be achieved. Patient selection and diagnosis are important factors in making the decision to revise a knee. Specific aspects of history taking, examination and investigations are discussed to allow the surgeon to recognize patterns of failure that may be amenable to surgery. Once a decision to proceed to revision has been made, the important aspects of preoperative planning and our protocol for surgical reconstruction are described. In standard revisions, it should be possible to achieve the same alignment, sizing, balance, stability, fixation and joint line restoration as a primary knee replacement, with the expectation of a very good outcome. In multiply revised, infected or stiff knees, or where there is significant bone loss, compromises may need to be made to prioritize fixation and stability over aiming for normality. The vast majority are still improved by surgery, but expectations should be lowered for this salvage group of patients.

Keywords diagnosis; knee arthroplasty; revision; surgical technique

Introduction

Revision total knee arthroplasty (TKA) carries huge implications for the patient and the health service. Numbers are growing worldwide and over 47 000 revision knee replacements have now been recorded on the National Joint Registry, with approximately 6000 being performed each year.[1] Each revision TKA is a longer and more difficult operation than a primary, with increased risk, cost and inpatient stay. The burden on any health system is therefore significant. It also implies on-going symptoms and 'failure' of a common procedure that the patient was expecting to improve their pain and function. If the failure occurs after 15 years of excellent function, the psychology of the patient will be very different to that of a patient who has always had problems or in whom the primary TKA fails because of early complications or surgical error. Treating this group of patients requires an understanding of the psychology and issues relating to chronic pain, whilst using a combination of clinical skills and investigations to answer the two key questions: 1) 'Is there a definite problem with the knee replacement?' and 2) 'Can revision correct the problem and provide an improvement?'

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This article is not an exhaustive review of the topic, but aims to summarize some of the literature and experience and tips that have shaped our unit's approach to assessment, diagnosis and surgical technique, and that have been drawn in part from my own experience of over 500 revision knee procedures over 12 years, as well as input from colleagues in our unit, in the UK and abroad.

Patient selection & expectation

Unhappiness with a knee replacement does not necessarily warrant a revision. Patient dissatisfaction may be as a result of unrealistic expectations, where the patient and surgeon are often partly to blame. The surgeon for not adequately setting the expectation level, and the patient for often not believing that the 'average' outcome described will apply to them. The 70-year-old patient who is absolutely symptom-free, playing three rounds of golf per week but complains bitterly that they get an ache after playing four, needs to remember that they struggled to play at all before the surgery and they definitely do not warrant a revision.

As clinicians, we are all used to looking for the warning signs that may suggest a patient is not a good candidate for surgery, e.g. depression, anxiety, chronic pain at multiple sites, or poor social support. In the setting of revision TKA, this does not necessarily mean they should not be offered surgery, e.g. an implant may be infected or have gross loosening or collapse that warrants surgery, but it does mean that you need to be even more convinced that there is a very good reason for revision.

The same applies to patients who have "a pain problem". Most patients who need revision will have pain. The key is identifying if there is a problem with the knee replacement that could be causing the pain or if pain itself is the only problem. Simplistically, pain problems can be localized (such as a Chronic Regional Pain Syndrome [CRPS] or from neuroma of the infrapatellar branch of the saphenous nerve) or as part of a central pain sensitization.[2–4] Unfortunately, if there is a genuine problem with the knee replacement causing pain, this can worsen and prolong a more generalized central sensitization problem. While these 'pain issues' do concern and confuse orthopaedic surgeons, they are actually easy to detect on simple examination, and our role should be to exclude an underlying problem with the implant that may be causing pain and to provide onward referral to a Pain Specialist. If there is a good reason to operate in combination with a pain problem, then optimizing pain management first is worthwhile. If there is a subtle or debatable reason to operate together with a pain problem, then optimize pain treatment and do not rush into surgery in the first year — many pain problems do improve with treatment and/or time.[5] If you find no reason to revise but purely a pain problem, then you must have an exit strategy for discharge to the Pain Clinic or the General Practitioner. In this situation, do not be bullied into operating and beware the patient coming back to have multiple clinic visits with multiple junior members or your team. Someone is likely to list the patient for revision, which is then very difficult to reverse. A simple way to protect against this is to not allow anyone to be listed for revision without discussion with the consultant first. Surgeons are also more likely to be 'blind' to problems with knee replacements that they have done personally. If you are unsure, a second opinion from an experienced colleague can be very re-

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assuring to both you and the patient. The patient needs to be convinced that you believe they have a problem and you are doing everything you can to see if surgery may be able to help. Patients are grateful for your efforts, reassurance and explanation, even if you tell them there is no surgery that would help.

With an appropriate reason for surgery and a competently performed revision, most patients get good improvement (mean improvement of about 13 points on Oxford Knee Score, with over 60% improving by more than 11 points)[6] although absolute scores and long-term survivorship are usually slightly lower than those seen with primary knee replacement.

Diagnosis

Reaching a diagnosis is extremely important as it helps determine if you are going to offer surgery in the first place, as well as how urgent or extensive the surgery is likely to be, and the likely chance of success.[7,8] The common diagnoses vary with time from implantation. Polyethylene wear, aseptic loosening, instability and infection are the commonest over a 10-year period. Within five years of implantation, the most likely causes are infection, instability and mal-alignment, while osteolysis and aseptic loosening are rare. Unfortunately, over 50% of revisions are undertaken within two years, and about 50% of these may be attributed to 'surgeon error'.[9,10]

History

There are key factors in the history that can lead an experienced clinician directly to the diagnosis of a painful knee replacement. The patient's co-morbidities that place them at higher risk for infection (Table 1) steer you towards a more detailed exclusion of infection for that case, as does any peri-operative history of ongoing wound ooze, haematoma, washout or antibiotics given in Primary Care. The fact that a patient has a pain-free TKA on the other side or the fact that they have had some years of pain-free use of the knee before symptoms started, make one more likely to believe that there is a genuine problem with the implant and thus a good chance of a successful outcome with revision.[8] A history of large doses of opioid analgesia usage can point towards a chronic pain problem. Instability may present with a history of clunking or giving way, but will also usually be associated with greater difficulty descending stairs, recurrent effusions and episodes of sharper impingement pain around the joint line. Mal-alignment, mal-rotation or oversizing of implants is likely to give a joint that has always been painful with movement and often associated with stiffness. A history of the original alignment of the knee is important: a valgus knee left in 3° of valgus may be perfectly happy, while a patient who was in 10° of varus pre-operatively is likely to be very unhappy with 3° of valgus. Early loosening usually presents with start-up pain that eases after a short distance but then recurs if the patient walks much further. The initial history, therefore, has to take on a structured approach to asking about the knee before surgery, the patient's co-morbidities, the peri-operative period and the progression and nature of symptoms with time. Recognizing these patterns of history and symptoms will usually direct your examination to confirm your suspicion about the diagnosis and will go a long way towards helping you decide if you believe the patient has a genuine problem with their knee.

Factors known to increase the risk of TKA infection

- Previous knee surgery
- Diabetes
- Chronic renal or liver failure
- Post-traumatic osteoarthritis
- Inflammatory arthritis
- Immunosuppressive treatment
- Heavy smoking and alcohol use
- Morbid obesity
- Intravenous drug usage
- Peripheral vascular disease/lipodermatosclerosis/ulcers/cellulitis

Table 1

Examination

This begins with observing the gait as the patient walks in, particularly if it is antalgic or stiff, or if the foot progression angle is asymmetrical. Any coronal mal-alignment that is clinically significant can usually be observed from the end of the bed unless the patient is very obese (Figure 1). Simple observation of the knee can tell you if it is swollen or synovitic, in which case you know there is a genuine problem. Increased warmth persisting beyond about three months post-operatively is also abnormal. Numbness lateral to the scar is 'normal', but hyperaesthesia and a positive Tinel's test can suggest a neuroma that can be confirmed with a trial injection of local anaesthetic subcutaneously. More generalised hypersensitivity, allodynia, tenderness over the medial proximal tibia and extreme patient reaction to gentle testing, are all features suggestive of a pain problem. Assess quadriceps muscle wastage, straight leg raise and tracking or tenderness around the patella. Assessment of laxity should be performed as if one were examining a sports injury, i.e. test the collaterals and sagittal plane movement and

Figure 1 Valgus mal-alignment of the right total knee replacement is obvious clinically.

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