controversial topics in surgery

Management of osteoarthritis of the knee

Andrew Price and Robin Allum

I cannot be alone amongst knee surgeons to have noted the irony of being paid to take the ACL out in the morning and put it back in the afternoon.

I wince at excising a perfect ACL during a TKR not to mention taking a slice of beautiful articular cartilage from the uninvolved side, knowing how inadequate our efforts are at restoring these structures in a younger knee. The attraction of a dedicated arthroplasty for unicompartmental arthritis is obvious and is gaining popularity with a wealth of devices now available.

The problem is, though they are less invasive with less impact on the joint and they do allow for a much more normal feeling knee, we cannot all get consistent results with UCAs, not all UCAs perform in the same way, disease progression is

an issue and overall the revision rate is higher. In the words of the nursery rhyme: 'When they are good they are very, very good and when they are bad they are horrid'.

This is the dilemma we face in managing a patient with isolated disease: do we go for the very, very good and risk failure or do we play safe with a more reliable but more destructive and less natural a result? With the recent publication from the National Joint Registry quoted below, this is a perfect time to review the pros and cons from two immensely experienced colleagues from either end of the Thames Valley.

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The case for partial knee replacement

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Total knee arthroplasty (TKA) is a successful operation. Knee osteoarthritis is an increasing healthcare burden and the number of arthroplasty procedures implanted each year is estimated to increase exponentially over the next 10 years.

At present in the UK, over 90% of these procedures are performed as total knee replacements mirroring similar findings in other countries.¹ Over the last 10 years, there has been increased interest in partial knee replacement as an alternative treatment option for knee osteoarthritis. Although each of the three compartments of the knee can

be treated with partial replacement, the commonest form of partial replacement involves the medial side of the joint (Fig. 1). The indications for medial unicompartmental knee arthroplasty (UKA) have been defined more clearly and many patients who undergo TKA do meet the criteria for a UKA procedure. This article will outline the argument for increased use of UKA on the medial side of the knee in place of total knee replacement.

In building the case for the use of unicompartmental knee replacement, four important areas should be considered: (i)

Figure 1 (A) An anteroposterior radiograph of a knee demonstrating anteromedial osteoarthritis. This pattern of disease is the commonest indication for UKA (B).

the immediate patient benefits; (ii) the long-term clinical outcome of UKA implants; (iii) the number of patients who are eligible for the procedure; and (iv) the health economics of UKA use.

Patient benefits following UKA

There are a number of reported benefits for patients undergoing medial UKA, when compared to TKA patients. The procedure is usually performed through a short incision with minimal damage to the soft tissue envelope around the knee. Patients, therefore, mobilise faster, recovering from surgery with less morbidity and a shorter length of stay in hospital.² Blood loss at surgery and the risk of transfusion is reduced. The latest report from the UK National Joint Register highlights a reduction in infection rate by 50% and similar reduction in mortality at one month when compared to TKA.¹ There is evidence to suggest that patients enjoy improved clinical function after UKA compared to TKA.^{5,4} Newman *et al.*,⁵ in the only published randomised controlled of UKA versus TKA, reported a better range of motion in UKA patients together with a better 'feel'.⁶ This may reflect the better kinematic function of UKA, where retention of ligaments affords more physiological movement.⁷ When seen together, the benefits of UKA over TKA appear to be significant; however, more information to support this is required. The National Institute for Health Research (NIHR) has recently funded a large £2.5 million randomised controlled trial (Total versus partial Knee Arthroplasty Trial, 2009) to investigate this further.

Improved long-term results of UKA

Short-term advantages for patients with UKA must be supported with evidence that UKA is a durable procedure. Historically, the long-term survival results of UKA are not as good as TKA with an increase in revision rate, most noticeably

seen in Joint Registers.⁸ There are a number of reasons that explain these results: (i) catastrophic polyethylene wear with early UKA designs; (ii) primitive instrumentation producing errors in implantation such as overcorrection of deformity with subsequent progression of disease; and (iii) the use of inappropriate indications for UKA such as an absent anterior cruciate ligament or inflammatory arthritis, which have all been linked to early UKA failure.⁹ Surgical inexperience has also been linked to an increased revision rate for what is generally accepted as a technically demanding procedure.¹⁰ Any discussion about revision rates for UKA must also address the generally acknowledged lower threshold for revision in UKA compared to TKA.¹¹ The scale of surgery and functional consequences for the patient in revising a TKA to a revision prosthesis may raise the threshold for this surgery. Whereas revision of a UKA to a TKA, where outcome is more predictable, is considered more straightforward.

To improve the long-term results of UKA, the orthopaedic community has addressed the issues outlined above. Unicompartamental implants and instruments have been improved. More sophisticated implantation methods have been introduced and this has allowed the successful uptake of minimally invasive surgery in UKA.² Polyethylene manufacture has improved and early failure for catastrophic wear has been largely eliminated. The Oxford mobile bearing UKA is a good example of how low wear rates can now be achieved with UKA, where a full congruent articulation reduces contact stress, resulting in low wear.¹² The indications for the procedure are better understood; anteromedial osteoarthritis of the knee has been identified as the main indication. Intact ligaments, correctable deformity and full-thickness cartilage on the lateral side have been identified as mandatory requirements. Centres that have been able to adopt strict criteria have demonstrated that very good long-term survival can be achieved, with reduced progression of arthritis in the retained compartments.¹⁵ Over the last 10 years, there has been a greater emphasis on surgeons learning and retaining the technical skills required to use UKA successfully. Instructional courses are now commonplace and surgeons are more aware of the need to up-date skills.

These changes have culminated with more recent reports of excellent clinical outcome and long-term survival for both fixed and mobile bearing UKA into the second decade after implantation.^{6,15} These results add significant weight to the case for UKA, demonstrating that UKA on the medial side of the knee is a definite intervention and not a pre-total knee replacement procedure.

Number of patients with knee osteoarthritis suitable for UKA treatment

An important part of the case for UKA, is that many patients could potentially benefit from the advantages it offers.

Despite only a small proportion of patients who currently undergo knee arthroplasty receiving UKA, recent studies have shown that 36–45% may meet modern indications for the procedure.¹⁴ Previously, it has been suggested that a much lower proportion of patients met the criteria.¹⁵ This is an important finding, as it could potentially increase the number of UKA procedures that a surgeon may perform. If UKA represented only 5–10% of knee arthroplasty practice, gaining experience and confidence with the procedure would be challenging. However, a figure of 40% would establish UKA as a more routine procedure for knee surgeons and centres, with an expected improvement in outcome.¹⁰

Health economic benefits

The final part of the case for UKA rests on assessing the health economics of its use. A number of studies have clearly demonstrated the cost effectiveness of UKA when compared to TKA in similar patient groups.¹⁴ It has been suggested that a greater uptake of UKA by arthroplasty surgeons could provide savings for the NHS of up to £50 million.

Summary

The case for greater use of medial UKA in knee arthroplasty surgery rests on the benefits for patients of faster recovery, less morbidity, less mortality and better functional outcome when compared to TKA. This has been supported by improved long-term results and recognition of the large number of patients who meet the criteria for UKA. Medial UKA should, therefore, be seen as a definitive treatment for medial osteoarthritis and not as a pre-total knee replacement procedure. In a similar way, strong arguments for partial knee replacement in the lateral and patellofemoral joint are also emerging.

Acknowledgement

The Nuffield Orthopaedic Centre NIHR Biomedical Research Unit supported this work.

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The case for total knee replacement or should all knee replacements be total?

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With no prospect in sight of a cure for degenerative joint disease, there is huge and increasing demand for surgical treatment. Life expectancy is increasing and also the level of activity of older patients is increasing. The knee is

arguably the most vulnerable joint in the body and certainly the most frequently injured. More knees are now being replaced than hips, the most recent (6th) National Joint Registry (NJR) Annual Report records 75,629 knee and

71,367 hip procedures.¹ In the US, the projected demand change for knee replacement by 2030 is estimated at 673%.² There is no reason to suspect that England and Wales will be any different which means approximately 500,000 per annum or 1000 every morning and afternoon 5 days a week, 50 weeks a year!

Clearly, also, it is important that we get it right. There has been increasing interest over the last few years in unicompartmental knee replacement (UKR) as against total knee replacement (TKR) for osteoarthritis localised to one compartment of the knee. TKR is not a strictly correct term as not all surgeons resurface the patella. There is possibly a certain logic in only replacing diseased tissue. The medial compartment is most commonly the site of isolated replacement, the patellofemoral compartment less so and the lateral compartment rarely. Enthusiasts for UKR quote such advantages as shorter hospital stay, quicker recovery and better function. The main drawback is, of course, progression of the degenerative joint disease in the other compartments necessitating revision surgery.

Is TKR a reliable procedure? The answer is a definite yes. There are a number of reports now of the long-term success with very recently a 98% implant survival at 20 years.³ Can UKR do better than this? There is no proof that it can. Indeed there are concerns regarding an increased failure rate. The 6th NJR Annual Report shows patients who had a UKR to have the highest revision rate with UKR 7.2% and patellofemoral 8.3% at 3 years against 1.7% receiving a PFC Sigma, the most commonly used TKR.¹ In an NJR-based review of 80,697 patients undergoing primary knee replacement between 2003 and 2006, again the revision rate was highest in those receiving a UKR (2.8% at 3 years against 1.4% receiving a cemented TKR).⁴ The revision rate did not decrease with time suggesting the problem is related to the implant rather than the surgeon on a 'learning curve'. Moreover, in a sample of 10,000 patients from the NJR in 2003, UKR patients were less likely to be satisfied with their joint replacement than patients with a cemented TKR.⁵

This is an international, not just a national, trend. The Australian Joint Registry (209,316 knee procedures registered since 1999) 2008 report states that UKR has continued to decrease in use for a number of years, and that there is approximately twice the revision rate of TKR at any age.⁶ The Australian database of over 1000 patellofemoral UKRs shows a revision rate of 13.8% at 5 years. From Finland, Koskinen *et al.*⁷ reported 1886 primary UKRs and 48,607 primary TKRs from the National Joint Registry, 1980 to 2003 inclusive. UKRs had a survival rate at 15 years of 60% and TKRs 80%. There was no cost benefit with UKR, in fact the reverse. Again, results of UKR did not improve over time. In Sweden, over 30 years of Joint Registry experience shows that UKR has a substantially higher cumulative revision rate than TKR.⁸ Around the world this is a massive experience.

Notwithstanding these figures, is there logic behind limited anatomical replacement for what is by nature a progressive disease? Over the years there has been considerable debate regarding the indications for UKR particularly with respect to the degree of disease that is acceptable in the other compartments. There is a school of thought that believes isolated medial unicompartmental replacement can be carried out even in the presence of quite significant patellofemoral disease.^{9,10} The fact that isolated patellofemoral arthroplasty is a well-recognised procedure, however, means that many surgeons believe that patellofemoral disease warrants replacement in its own right. They cannot both be right or to quote Dire Straits 'Two men say they're Jesus one of them must be wrong'.¹¹ Maybe they are both wrong? Maybe all knee replacements should be total!

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