**Introduction**

There has been renewed interest in patellofemoral joint (PFJ) replacement in recent years, following the development of second-generation prostheses and the publication of good midterm results. Young patients with isolated patellofemoral arthritis represent a difficult clinical problem and the availability of proven alternatives to total joint replacement is an important surgical advance. However, in the older population, it is not clear whether isolated PFJ replacement offers any advantage over total knee replacement (TKR).

PFJ arthritis occurs in isolation in approximately 10% of patients with arthritis of the knee. The patients tend to be younger, with a preponderance of females. When non-operative measures are no longer effective, there are various operative interventions available, including: arthroscopic debridement, lateral release, re-alignment, partial lateral patellar facetectomy, microfracture, mosaicplasty/autologous chondrocyte implantation, patellectomy, patellofemoral replacement, and TKR.

Patients with patellofemoral pathology have often had multiple surgical interventions before undergoing joint replacement, a fact that reflects the difficulty in treating this condition in the younger patient. Isolated lesions in specific locations in the patellofemoral articulation may be amenable to re-alignment procedures, chondrocyte implantation, microfracture or partial lateral facetectomy. However, once the disease process involves both sides of the joint and is more extensive, the results of such procedures are less predictable. It is for these patients that joint replacement may be indicated.

Patellofemoral replacement has existed since the 1950s when McKeever reported a series of 40 patients with patellar resurfacing using a Vitallium prosthesis screwed onto the patella. In the 1970s, Blazina et al. and Lubinus introduced femoral components combined with the resurfaced patella. However, results were mixed, with high rates of revision, complications and progression of arthritis, requiring revision to TKR.

Second generation PFJ replacements have existed since the 1990s with an evolved design rationale. The femoral component has a broad, symmetrical trochlear flange that narrows distally, ensuring that the patella engages during flexion but is relatively unconstrained in extension. The majority of literature concerning this type of patellofemoral replacement relates to the Avon implant (Stryker, Howmedica Osteonics, New Jersey) and there exist several published series, both from the originating centre in Bristol and also several independent centres. The Femoro Patella Vialli (FPV) (Wright Medical, UK) has a similar design concept.

The ideal patient for PFJ replacement is one with severe signs and symptoms of isolated patellofemoral disease. These correlate with radiologically proven arthritis, best demonstrated on tangential views of the patellofemoral joint. Nicol et al. found the lowest rates of progression of femorotibial arthritis in patients with pre-existing trochlear dysplasia as an underlying cause for their patellofemoral arthritis, defined as sulcus angle of greater than 145° over three readings. In addition, CT and MRI can aid in the assessment of both the patellofemoral articulation and the femorotibial compartments. There should be no fixed flexion deformity or malalignment. Prior arthroscopy and direct inspection of the knee joint at the time of surgery also have a role in assessing the suitability of partial rather than full joint replacement. There have been case reports in the literature suggesting that PFJ replacement can be combined with chondrocyte grafting of isolated lesions found at the time of surgery, in cases where the patient was thought to be otherwise suitable for PFJ replacement.

**Results of patellofemoral joint replacement**

Early reports regarding PFJ replacement have been mixed. Kooiman, Driessen and van Horn reported the outcome of 56 first generation PFJ replacements in 51 patients at a mean of 15 years. They found an early re-operation rate of 18% and a revision rate of 15.5% for complications relating to the prosthesis. A further 30% were ultimately revised because of progression of femorotibial arthritis at a mean of 15.6 years. In those knees that were not revised, functional results were reported to be good or excellent in 86% and durable during the follow-up period. Other mid- to long-term follow up studies of first-generation PFJ replacements have also revealed high rates of re-operation (26% to 63%) and revision (19% to 51%).

The longest follow-up for PFJ replacements in the literature using the Avon PFJ replacement (Stryker, Mahwah, New Jersey) is from Ackroyd et al. in 2007. They reported on 109 consecutive patients with a 4.2% rate of failure in the first five years, and an 80% rate of success based on Bristol knee scores at five years. Progression of disease was noted in 28% of patients, and re-operation occurred in eight knees, including four revisions to TKR: there were a further 11 revisions after five years. In 2010, Odeniya et al. reported on 50 Avon PFJ replacements with 100% survival at five years. Radiological progression of disease
occurred in 22% and three patients had revisions performed after the five-year mark. In 2009, Starks, Roberts and White3 reported on 37 Avon PFJ replacements with two-year follow-up demonstrating high post-operative functional knee scores, two re-operations and no revisions. In the same year, Leadbetter et al7 reported on a multicentre trial involving the Avon prosthesis in 79 knees. The mean age was 58 years and there had been 81 previous operations. A Knee Society Score (KSS) of more than 80 was achieved in 84% of patients, and there were six revisions to TKR with a mean follow-up of three years.

With respect to other patellofemoral implants, in 2008 Mohammed et al17 reported on a series of 101 arthroplasties using the Lubinus, Avon and FPV systems with a mean follow-up of four years. They reported on 35 re-operations and four revisions to TKR. All of the revisions and 43% of the re-operations were in patients who had undergone joint replacement using the Lubinus implant.

From the Australian joint registry, the best performing PFJ replacement is the Avon with a five-year rate of revision of 9.9%,16 compared with the overall rate of revision rate all PFJ replacements of almost 15%. By comparison, the five-year rate of revision for unicompartmental knee replacements (UKR) is 8.8%, and for TKR is 3.8%. In younger patients, who are a more comparative population, the rate of revision for UKR in patients less than 65 years old is 10.8%, and for TKR is 5.62%.

TKR for isolated patellofemoral joint arthritis remains the gold standard and several series have been reported in the literature. In 2002, Mont et al19 reported on a series of 30 TKRs in 27 patients, with a mean age of 73 years, and reported no re-operations or revisions. All but one case had excellent or good results with a KSS of more than 80. In 2007, Meding et al20 reported on a series of 33 TKRs in patients aged less than 60 years (mean 52 years) and isolated PFJ arthritis. Follow-up at a mean of 6.2 years demonstrated no re-operations or revisions and a mean KSS of 88. Interestingly, Thompson et al21 in 2001, presented a series of 33 patients with isolated patellofemoral arthritis, with a mean age of 73 years, who underwent TKR without patellar resurfacing with good-to-excellent results and no revisions at a mean follow-up of 20 months. An important additional finding in these studies was the high rate of lateral release required and that extra care was required to optimise patellofemoral tracking including distal realignment in some cases.22 23 TKR appears to be a reliable procedure in this patient group but these studies did not address the implications of TKR in the younger patient and the problems of subsequent revision.

In 2006, Lonner, Jasko and Booth23 reported on a series of 12 patients who underwent revision of patellofemoral replacement to TKR. In all patients, a primary knee replacement could be performed without stems or augments: the patellar component was retained and the outcome scores were not compromised when compared with primary TKRs.

As well as ease of revision, there are some other theoretical advantages of PFJ replacement as it is less invasive, and is associated with a shorter operating time and a quicker rehabilitation. The preservation of the femorotibial compartments and cruciate ligaments results in improved gait and knee kinematics.8 The implication is that a PFJ replacement may provide a more functional knee in the younger, higher demand patient.

Summary
It is clear from a review of the literature that PFJ replacement is associated with a higher revision rate than TKR, although it is comparable to unicompartmental knee replacement. However, patients having PFJ replacement are often younger than those undergoing TKR and may have had multiple surgical procedures before joint replacement. Dissatisfaction with TKR is known to occur in approximately 10% to 20% of patients where no relatively simple revision procedure can generally be offered.25 Therefore, it is conceivable that rates of revision of PFJ replacement may also be increased because of the availability of a relatively straightforward secondary procedure for dissatisfied patients.

The currently published short- and mid-term series on second-generation patellofemoral prostheses are encouraging, with high retention of prosthesis and good functional results. It is unclear whether offering a PFJ replacement in an older patient offers any functional advantage when the revision rates are likely to be higher. In the younger patient, when the risks of offering TKR outweigh the benefits, PFJ replacement is a reasonable option.

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References