Routine patellar resurfacing using an inset patellar technique

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Abstract The management of the patella in total knee arthroplasty still causes controversy. Whether or not to resurface the patella in primary total knee arthroplasty remains unclear. In this study we examined 220 consecutive total knee replacements, by a single surgeon, where the patella was routinely resurfaced using the inset technique. All patellae were suitable for resurfacing. Patellar thickness was not altered in 54.5% of patellae. In 97.2% the patella was within 2 mm of the original thickness. There were no significant complications. In this study we have found that the inset technique of patella resurfacing in total knee replacement is a simple and safe resurfacing procedure.

Introduction

The management of the patella in total knee arthroplasty (TKA) still causes controversy. Whether or not to resurface the patella in primary TKA remains unclear [1].

Surgeons who leave the patella unresurfaced avoid the potential complications of patellar fracture, patella tendon injury, avascular necrosis, loosening and wear of the patellar component but may predispose their patients to a higher incidence of anterior knee pain [2]. Surgeons who routinely resurface the patella aim to reduce the incidence

of anterior knee pain and reoperation, but risk patellar component-related complications [2–6].

Modern patellar component designs are all-polyethylene. Patellar implantation procedures use either onlay or inset techniques. The inset technique promotes ease of placement, component medialisation that reduces the need for lateral release, reduced bone removal and increased strength at the fixation interface with increased resistance to shear stresses [7, 8].

In this prospective study of 220 consecutive total knee replacements (TKRs) by a single surgeon we found that routine resurfacing of the patella using the inset technique is a simple and safe procedure.

Patients and methods

Between September 2001 and August 2007, 220 consecutive TKAs were performed by the senior author (IK) using the PFC TKR system (DePuy, Johnson & Johnson Professional Inc., Warsaw, IN, USA). Every patella was resurfaced using the inset patella technique. There were 92 (41.8%) men and 128 (58.2%) women. The indications for operation were advanced degenerative change with severe pain on weight-bearing, impaired function and limitation of daily activities. There were 184 (83.6%) patients with primary osteoarthritis (OA), 28 (12.7%) patients with rheumatoid arthritis (RA), three (1.4%) patients with inflammatory arthritis, two (0.9%) patients with psoriatic arthritis, two (0.9%) patients with gouty arthritis and one (0.45%) patient with osteonecrosis (Table 1).

Each TKA was performed using the same technique. A cemented PFC posterior cruciate sacrificing implant was used in every case. In all cases the femoral component was lateralised and externally rotated. Overstuffing was avoided and all lateral patellofemoral bands

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Table 1 Study demographics

Period	Sept 2001–Aug 2007
Prosthesis	PFC posterior cruciate sacrificing
Total number	<i>n</i> =220
Male	<i>n</i> =92 (41.81%)
Female	<i>n</i> =128 (58.18%)
Average age	66.2 years (39–83 years)
Pre-op. diagnosis	
OA	184 (83.63%)
RA	28 (12.72%)
Inflammatory arthritis	3 (1.36%)
Psoriatic arthritis	2 (0.90%)
Gouty arthritis	2 (0.90%)
Osteonecrosis	1 (0.45%)

were released. Prior to patellar reaming a direct measurement of patellar thickness was taken using calipers *ca* (Fig. 1). No attempt was made to assess patellar wear as all patellae were resurfaced regardless of wear. The reamer was positioned to allow for an adequate bony rim. The system has a depth gauge device to enable intentional thickening or narrowing of the patella. After application of the appropriate sized jig, the patella was reamed to produce a cancellous inlay surface with a single circular peg hole. A trial reduction was performed prior to cementing. One cement mix was used. The tibial implant was cemented first followed by the femoral implant and finally the patellar implant. After implantation calipers were again used to directly assess the patellar thickness (Fig. 2). Note was taken in all cases of the initial patellar thickness, patellar thickness with the trial component in situ and the patellar thickness post-cementation of the patellar implant. The patellar size (25, 28 or 32 mm) was recorded. Prior to closure, the knee was flexed to test for

Fig. 1 Calipers were used to directly measure the width of the patella before insertion of the patella prosthesis. Measurements were recorded in the operation notes **Fig. 2** Calipers were used to directly measure the width of the patella after insertion of the patella prosthesis. Measurements were recorded in the operation notes

proper patellar tracking, using the ‘no thumb rule’. A lateral release was performed if necessary.

Results

There were 220 consecutive TKRs carried out over the period of the study by a single surgeon. The inset patella technique was used in all cases. Prior to preparation of the patella a direct measurement of the patellar thickness was taken using calipers. The average patellar thickness was 22.8 mm (range: 19–31 mm); in male patients the average thickness was 24.0 mm (range: 19–31 mm), and in female patients the average thickness was 22.0 mm (range: 19–26 mm). In OA the average thickness was 23.0 mm and in RA the average thickness was 21.7 mm (Table 2).

Table 2 Patellar thickness

Average of initial patellar thickness	
All	22.83 mm
Male	24.03 mm
Female	21.97 mm
OA	23.05 mm
RA	21.71 mm
Inset patella used	
25 mm	<i>n</i> =105 (47.72%)
28 mm	<i>n</i> =102 (46.37%)
32 mm	<i>n</i> =13 (05.90%)
Change in patellar thickness (pre- to post-op.)	
No change	<i>n</i> =120 (54.54%)
Increase by 1 mm	<i>n</i> =65 (29.54%)
Increase by 2 mm	<i>n</i> =25 (11.36%)
Increase by 3 mm	<i>n</i> =4 (01.81%)
Increase by 4 mm	<i>n</i> =2 (00.90%)
Decrease by 1 mm	<i>n</i> =4 (01.81%)

Of the three patella diameters available, there were 105 (47.72%) size 25 mm patella implants used, 102 (46.37%) size 28 mm and 13 (5.90%) size 32 mm.

The change in patellar thickness was calculated by comparing the direct measurements before reaming and after patella implantation. In 218 of the cases, the senior author wanted the patellar thickness to remain unchanged. Patellar thickness was not changed in 120 (54.54%) patients. There was an increase in width of 1 mm in 65 (29.54%) patients, an increase of 2 mm in 25 (11.35%), an increase of 3 mm in four (1.81%) and an increase of 4 mm in two (0.90%). In the two cases where severe erosion of the patella was noted prior to reaming, with a patellar thickness of 19 mm in both cases, the thickness was intentionally thickened by 4 mm. There was a decrease in patellar thickness of 1 mm in four (1.81%) patients.

Abnormal lateral patellar tracking was recorded in 12 (5.45%) of the patients with 10 (4.54%) requiring a lateral release. The two patients with abnormal tracking who did not require lateral release corrected after suturing of the capsule. Lateral release was required in seven (3.8%) patients with OA, in two (7.14%) patients with RA and one (50%) patient with gouty arthritis. Eight women (6.25%) compared to two (2.17%) men required lateral release.

Parametric Pearson test analysis was performed to determine reproducibility and reliability of maintaining patellar thickness pre- and post-patellar resurfacing using the inset technique. The Pearson correlation between the thickness of the patella pre- and post-resurfacing demonstrated strong correlation ($r^2=0.82$, 95% confidence interval: 0.88–0.93, $p<0.001$). When we correlated the incidence of lateral release to various intra-operative mechanical parameters (valgus femoral cut, spacer size, difference in patellar thickness pre- and post-resurfacing), we demonstrated no predictive factors for lateral release using non-parametric Spearman test analysis, $r=0.3629$, 0.2561, 0.001, respectively.

When we compared timing of surgery against surgical experience we found that nine (90%) of the knees requiring lateral release were in the first 55 patients and one (10%) in the second 55 patients, with no lateral releases performed in the third and fourth groups of 55 patients. We attribute this to an improvement in component positioning as the surgeon became more experienced with the implant and technique.

There was one complication of the technique. In one case the cement cured quickly due to high theatre temperature and the fix of the patella prosthesis was not adequate. The patella implant was removed, the patella reamed and the implant recemented. There was no incidence of patella fracture.

To date there has been no incidence of post-operative fracture or loosening of the patellar component.

Discussion

The inset patella design was first proposed by Freeman et al. in 1989. The new design aimed to provide better resistance to shear stress and less reduction in overall patellar strength than the onlay design. This has since been proven in a recent cadaver study [8]. There has been one comparison study of inset and onlay patellar implants with the same knee design. It showed that patellar tracking problems occurred less frequently with the inset design, with fewer knees requiring a lateral retinacular release and less patellar subluxation or tilt seen on the axial radiograph. The disadvantages of this technique are that it is seen as technically more difficult and more bone is removed during insertion.

In this study we prospectively analysed the inset patella resurfacing technique in 220 consecutive TKRs by a single surgeon. We found that this technique was suitable for all 220 patellae with no major intra-operative complications. This suggests that despite the reservations in the literature, this technique should be possible in most, if not all patellae. Over the time of the study the incidence of lateral retinacular release dramatically decreased, suggesting that there is a learning curve associated with this technique.

When a comparison was made between the thickness of the patella prior to preparation and with the prosthesis cemented in situ, we found the patellar thickness was not altered in 54.5% of patellae and in 97.2% the patella was within 2 mm of the original thickness. Attention to surgical detail during preparation and cementing of the patella is essential to ensure that the patella is not inadvertently thickened. An increase in patellar thickness could have a detrimental effect on patellofemoral mechanics and lead to pain or instability.

Conclusion

In this study we examined 220 consecutive TKRs, by a single surgeon, where the patella was routinely resurfaced using the inset technique. All patellae were suitable for resurfacing. Patellar thickness was not altered in 54.5% of patellae. In 97.2% the patella was within 2 mm of the original thickness. There were no significant complications. In this study we have found that the inset technique of patella resurfacing in TKR is a simple and safe resurfacing procedure.

References

1. Badhe N, Dewnany G, Livesley PJ (2001) Should the patella be replaced in total knee replacement? *Int Orthop* 25(2):97–99

2. Parvizi J, Rapuri VR, Saleh KJ, Kuskowski MA, Sharkey PF, Mont MA (2005) Failure to resurface the patella during total knee arthroplasty may result in more knee pain and secondary surgery. *Clin Orthop* 438:191–196
3. Pakos EE, Ntzani EE, Trikalinos TA (2005) Patellar resurfacing in total knee arthroplasty. A meta-analysis. *J Bone Joint Surg Am* 87 (7):1438–1445
4. Waters TS, Bentley G (2003) Patellar resurfacing in total knee arthroplasty. A prospective, randomized study. *J Bone Joint Surg Am* 85-A(2):212–217
5. Wood DJ, Smith AJ, Collopy D, White B, Brankov B, Bulsara MK (2002) Patellar resurfacing in total knee arthroplasty: a prospective, randomized trial. *J Bone Joint Surg Am* 84-A(2):187–193
6. Hernández-Vaquero D, Alvarez-González UJ, Fernández-Corona C, García-Sandoval MA, Rubio-González A (1996) Patellar complications after total knee arthroplasty. *Int Orthop* 20(2):103–106
7. Lachiewicz PF (2004) Implant design and techniques for patellar resurfacing in total knee arthroplasty. *Instr Course Lect* 53:187–191
8. Rosenstein AD, Postak PD, Greenwald AS (2007) Fixation strength comparison of onlay and inset patellar implants. *Knee* 14(3):194–197