Oxford® Partial Knee Value Analysis Brief

Clinical and Economic Value of Partial Knee System

ZIMMER BIOMET

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1. Executive Summary

1.1 Current Trends and Unmet Need

- A study by Hansen *et al.* (2018) evaluated 5% sample of the Medicare data (Part B) and MarketScan Commercial and Medicare Supplemental databases and concluded that the rate at which the procedure (UKA) was performed increased in the Medicare population from 24.5 to 36.5 (per 100,000 persons) over a 10 year period and in the MarketScan cohort from 5.9 to 7.4 (per 100,000 persons) over an 8.5 year period.[3]

- Despite strong annual growth rates in UKA utilization and the high percentage of patients meeting the inclusion criteria for UKA, it has been estimated that partial knee procedures only comprise 8% of the knee arthroplasty market in the UK.[4]

    - The Oxford® Partial Knee is intended for use in individuals with osteoarthritis or avascular necrosis limited to the medial compartment of the knee and is intended to be implanted with bone cement.

- Two studies conducted a registry based cohort study of 41,986 and 23,400 medial cemented Oxford UKA respectively to conclude that high-volume centers and surgeons specializing in UKA had superior results following UKA compared with their low-volume counterparts.[7,13]

1.2 Clinical and Economic Benefits

- In 2020, National Institute of Health Care and Excellence (NICE) published a guidance[16] covering comprehensive care recommendation, rationale and evidence[17] for planned knee, hip or shoulder replacement and highlighted clinical and health economic benefits of UKA vs TKA.

- Beard *et al.* (2019) conducted a multicenter, randomized controlled trial aiming to assess the clinical and cost effectiveness of TKA versus UKA and concluded that in their within-trial cost-effectiveness analysis, UKA was more effective (0·240 additional quality-adjusted life-years, 95% CI 0·046 to 0·434) and less expensive (–£910, 95% CI –1503 to –317) than TKA during the 5 years of follow-up.[19]

- A multicenter retrospective study by Kievit *et al.*[24] (2019) found that more UKA patients return to work within 3 months (73% versus 48%) compared to TKA patients ($p < 0.01$);of all 157 UKA patients, a total of 117 (75%) returned to work with 27% returning within 4 weeks and a further 73% within just 3 months.[24]

1.3 Oxford® Partial Knee

- With over 45 years' clinical heritage, the Oxford Partial Knee is the most widely used,[28] clinically proven[20,29] partial knee system in the world. Oxford Partial Knee has shown survivorship of 95% at 15 years[32] and 91.0% at 20 years.[29]

    - Microplasty Instrumentation simplifies the surgical technique, providing for accurate and reproducible implant positioning.[33] The bone-conserving approach to tibial preparation resulted in a greater number of thinner, 3 mm and 4 mm, bearings implanted (92% vs. 84%; p=0.001)[33] compared to Phase 3 Instrumentation, which has demonstrated better survivorship than bearings 5 mm or thicker.[20]

2. Background

2.1 Unicompartmental Osteoarthritis and Unicompartmental Knee Arthroplasty Incidence

Unicompartmental Osteoarthritis (UOA) "is a degenerative condition characterized by abnormal articular cartilage in the medial or lateral part of the tibiofemoral joint, which may be associated with meniscal disruption, ligamentous instability, and limb malalignment".[1]

The American Academy of Orthopedic Surgeons (AAOS) classifies compartments of the knee as follows:[2]

- Medial Tibiofemoral Compartment – the inside part of the knee where the tibia (shin bone) meets the femur (thigh bone).
- Lateral Tibiofemoral Compartment – the outside part of the knee where the tibia (shin bone) meets the femur (thigh bone).
- Patellofemoral compartment – the front of the knee between the patella (kneecap) and femur (thigh bone).

The most common symptom of UOA of the knee is "pain confined to the affected compartment, associated with swelling, effusion, instability, impingement, crepitus, stiffness, and/or malalignment. Radiographic findings of UOA of the knee may include joint space narrowing, squaring of the femoral condyle, subchondral sclerosis, inter condylar spurring, joint line osteophytes, and varus or valgus malalignment of the affected limb".[1]

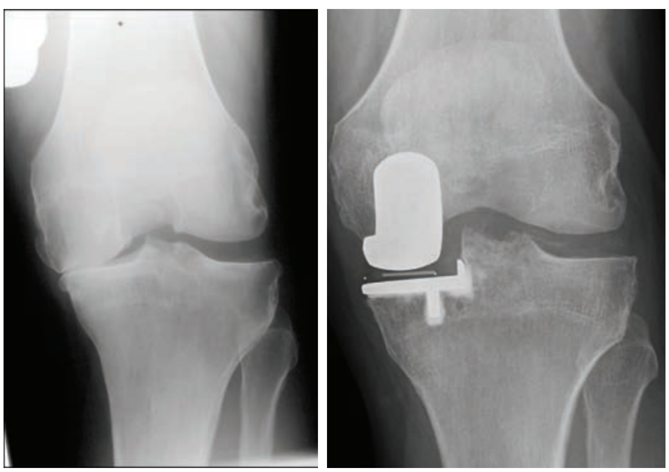

Figure 1: X-rays of a good candidate for partial knee replacement. (Left) Severe osteoarthritis limited to the medial compartment. (Right) The same knee after partial knee replacement. *source:* /www.orthoinfo.aaos.org/en/treatment/unicompartmental-knee-replacement

Hansen *et al.* (2018) evaluated 5% sample of the Medicare data (Part B) from 2002 to 2011 and MarketScan Commercial and Medicare Supplemental databases from 2004 to June 2012 to understand the prevalence of UKA in elderly (≥65 years) and younger (<65 years) populations, respectively.[3] A general upward trend appeared in the total number of UKA performed in both the Medicare and the MarketScan databases, during the 10-year period of this study.[3] The rate at which the procedure (UKA) was performed increased in the Medicare population from 24.5 to 36.5 (per 100,000 persons) over a 10-year time period and in the MarketScan cohort from 5.9 to 7.4 (per 100,000 persons) over an 8.5-year time period.[3]

2.2 Current Trends: Unicompartmental Osteoarthritis Treatment

In a consecutive series of 200 patients, Willis-Owen *et al.* (2009) found that 48% of patients were candidates of UKA; however the usage of UKA lies around 8% of all primary knee arthroplasties.[4] It has been proposed that one primary reason for this wide variation is that surgeons interpret the evidence about the relative benefits and risks of UKA and TKA differently.[5]

> A study[6] in the United Kingdom suggested that 21% of patients undergoing TKA meet the criteria for UKA. Arno *et al.* (2011) concluded that 21% of the patients showed healthy lateral cartilage, intact anterior cruciate ligament and posterior cruciate ligament, lack of patello-femoral arthritis, preoperative range of motion (ROM) greater than 90, and genu varum less than 10°.[6]

A study[6] in the United Kingdom suggested that 21% of patients undergoing TKA meet the criteria for UKA. Arno *et al.* (2011) concluded that 21% of the patients showed healthy lateral cartilage, intact anterior cruciate ligament and posterior cruciate ligament, lack of patello-femoral arthritis, preoperative range of motion (ROM) greater than 90, and genu varum less than 10°.[6] Commonly quoted reasons for advocating TKA over UKA for the management of UOA include degenerative disease advancement in other joint compartments[4] and observations that UKA shows higher revision long-term.[5]

> Saldanha *et al.* (2007), in their multicenter study, claimed that due to the advantages of UKA over TKA the revision of failed UKA to TKA is technically easier than revision of failed TKA. The study concluded that "the complexity of operation and complications encountered during UKA revision and the clinical outcome compare favorably with those of TKA revision".[9]

Liddle *et al.* (2015) proposed that since National Joint Registries report higher revision rates for UKA, surgeons are more highly selective and offer UKA to a smaller proportion (up to 5%) of patients.[7] A systematic literature review looking at outcomes after revision of UKA, by Siddiqui and Ahmad (2012), claimed that proponents of UKA felt they could 'buy time' for the patient by performing a seemingly smaller operation, which is easier to revise than a TKA.[8] Saldanha *et al.* (2007), in their multicenter study, claimed that due to the advantages of UKA, like preservation of soft tissue as well as bone stock and better function with improved range of motion and more natural gait, over TKA the revision of failed UKA to TKA is technically easier than revision of failed TKA. The study suggested that the complexity of operation and complications encountered during UKA revision and the clinical outcome compare favorably with those of TKA revision.[9]

3. Evidence Showing Optimal UKA Outcome

3.1 Oxford® Partial Knee: Ideal Indications Of Use

Indications

The Oxford® Partial Knee is intended for use in individuals with osteoarthritis or avascular necrosis limited to the medial compartment of the knee and is intended to be implanted with bone cement.

Contraindications

- Infection, sepsis, and osteomyelitis
- Use in the lateral compartment of the knee.
- Rheumatoidarthritis or other forms of inflammatory joint disease
- Revision of a failed prosthesis, failed upper tibial osteotomy or post-traumaitc arthritis after tibial plateau fracture.
- Insufficiency of the collateral, anterior or posterior cruciate ligaments which would preclude stability of the device.
- Disease or damage to the lateral compartment of the knee
- Uncooperative patient or patient with neurologic disorders who are incapable of following directions.
- Osteoporosis
- Metabolic disorders which may impair bone formation.
- Osteomalacia.
- Distant foci of infections which may spread to the implant site
- Rapid joint destruction, marked bone loss or bone resorption apparent on roentgenogram
- Vascular insufficiency, muscular atrophy, neuromuscular disease
- Incomplete or deficient soft tissue surrounding the knee.
- Charcot's disease
- A fixed varus deformity (not passively correctable) of greater than 15 degrees.
- A flexion deformity greater than 15 degrees.

In a prospective evaluation of 165 consecutive patients (228 knees), Stern *et al*. (1993) performed intraoperative evaluation of the knees, and patients were believed to be suitable candidates for UKA if they fulfilled the Kozinn and Scott criteria. The study concluded that only 6% of knees fulfilled all of the stringent selection requirements and were considered to be suitable candidates for UKA.[11] A study by Pandit *et al.* (2011) aimed to determine whether contraindications published by Kozinn and Scott[10] in 1989 should apply to patients with a mobile-bearing UKA.[12] Out of a prospective series of 1000 UKAs, 678 UKAs (68%) were performed in patients who had at least one potential contraindication and 322 (32%) in patients deemed to be ideal. The survival at ten years was 97.0% (95% CI 93.4 to 100.0) for those with potential contraindications and 93.6% (95% CI 87.2 to 100.0) in the ideal patients, highlighting that the use of a mobile-bearing UKA in patients with contraindications gives results which are no worse than in those considered to be ideal for UKA.[12]

3.2 Literature Review: Volume Outcome Relationship

Liddle *et al.* (2015) investigated the volume-outcome relationship for surgeons using the National Joint Registry for England and Wales (NJR) and concluded that when usage groups (UKA proportion of all knee arthroplasties performed) were studied, they concluded that for every 10% that usage increased in low usage group (≤ 20%), the risk of revision decreased by 21%.[7] The study also found in the low usage group that the five year survival for patients undergoing UKA at facilities with ≤5%, 20%-40% and 40%-60% usage was 90% (95% confidence interval (CI) 88.4 to 91.6) 94% (95% CI 93.7 to 94.5) and 95% (95% CI 93.9 to 96.1) respectively.[7]

Liddle et al. (2015) and Baker et al. (2013) conducted a registry based cohort study of 41,986 and 23,400 medial cemented Oxford UKA respectively to conclude that high-volume centers and surgeons specializing in UKA had superior results following UKA compared with their low-volume counterparts.7,13

Another registry based cohort study[13] of 23,400 medial cemented Oxford UKAs was performed by Baker *et al.* (2013) where they studied relation between both facility and surgeon volume and UKA revision rates. Centers with the lowest volume were defined as those with fifty or fewer procedures and highest volume were those with more than 400 procedures over the eight-year study period.[13] The study showed that low volume centers showed 1.62 (95% CI, 1.42 to 1.82) revisions per 100 component years compared with 1.16 (95% CI, 0.97 to 1.36) revisions per 100 component years at high volume centers. Similarly, low volume surgeons showed 2.16 (95% CI, 1.91 to 2.41) revisions per 100 component years compared with 0.80 (95% CI, 0.62 to 0.98) revisions per 100 component years with high volume surgeons.[13]

Other detailed studies that analyzed the relation between UKA usage volume and revision following UKA are detailed in the table below:

S.No.	Author Reference	Study Details	Results
1	Badawy *et al* *(2014)*[14]	Norwegian Arthroplasty Register data based study where 4,460 cemented medial Oxford III implants used from 1999 to 2012 were analyzed. Cox regression was used to estimate risk ratios (RRs) for revision comparing 4 different volume groups: 1–10, 11–20, 21–40, and > 40 UKA procedures annually per hospital.	Hospitals performing more than 40 procedures a year showed lower risk of revision than those with less than 10 UKAs a year; unadjusted RRs of 0.53 (95% CI: 0.35–0.81) at high volume hospitals vs 0.59 (95% CI:0.39–0.90) at low volume hospitals.
2	Hamilton *et al* *(2017)*[15]	Meta-analysis to study interaction of caseload and usage and its relation to outcomes of UKA. MEDLINE (Ovid), Embase (Ovid), and Web of Science (ISI) were searched for consecutive series of cemented Phase 3 Oxford medial UKA.	The lowest revision-rates were achieved with caseload >24 UKA/y (0.88% pa; 95% CI, 0.63-1.61) and usage >30% (0.69% pa; 95% CI, 0.50-0.90). Usage was more important than caseload; with high usage (≥20%), the revision-rate was low (0.85% pa; 95% CI, 0.65-1.08). Even with low caseload of ≤12 UKA/y and with low usage (<20%), the revision-rate was high (1.58% pa; 95% CI, 0.57-3.05).

4. Implications of Unicompartmental Knee Systems

In June 2020, National Institute of Health Care and Excellence (NICE) published a guidance[16] that covered comprehensive care recommendation, rationale and evidence[17] for planned knee, hip or shoulder replacement. The guidance stated that compared to TKA UKA led to:[17]

1. Less painful and faster recovery with shorter length of stay (LOS)
2. Rarer complications such as infections, blood clots, heart attacks or stroke
3. Overall cost savings

4.1 Clinical Implications

Liddle *et al.* (2014) conducted a retrospective study to compare the rates of adverse outcomes after matching 75,996 TKA patients with 25,334 UKAs, using propensity scoring techniques, from the National Joint Registry for England and Wales (NJR), Hospital Episode Statistics (HES), and the Office for National Statistics (ONS).[18] This study showed that both mortality rate and mean LOS was significantly lower for UKA (cumulative mortality rate 0·06%, 0·03–0·12 and LOS 4·14 days) compared to TKA (cumulative mortality rate 0·24%, 95% CI 0·19–0·29 and LOS 5.52 days; 95% CI 1·33–1·43, p<0·0001).[18]

Beard et al. (2019) conducted a multicenter, randomized controlled trial aiming to assess the clinical and cost effectiveness of TKA versus UKA and concluded that in their within-trial cost-effectiveness analysis, UKA was more effective (0·240 additional quality-adjusted life-years, 95% CI 0·046 to 0·434) and less expensive (–£910, 95% CI –1503 to –317) than TKA during the 5 years of follow-up. 19

A more recent study in 2019 by Beard *et al.* (2019) conducted a multicenter, randomized controlled trial aiming to assess the clinical and cost effectiveness of TKA versus UKA to help provide robust evidence to guide treatment selection for late-stage isolated medial knee osteoarthritis (which otherwise showed high variation in treatment choice between UKA and TKA).[19] They concluded that in their within-trial cost-effectiveness analysis, UKA was more effective (0·240 additional quality-adjusted life-years, 95% CI 0·046 to 0·434) and less expensive (–£910, 95% CI –1503 to –317) than TKA during the 5 years of follow-up.[19]

A prospective 15-year survival and 10-year functional outcome study of consecutive series of 1000 minimally invasive Phase 3 Oxford medial UKAs by Pandit *et al.* (2015) concluded that at 10 years, the mean Oxford Knee Score was 40 (SD 9; range: 2 to 48) and 79% of knees (349) had an excellent or good outcome.[21] The ten-year rate of survival was 94% (95% confidence interval (CI) 92 to 96).[20]

Other Evidence/Review Summary

S.No.	Author Reference	Study Details	Results
1	Brown *et al.* *(2012)*[21]	A retrospective review of a total of 2235 consecutive primary TKA and 605 consecutive primary UKA procedures and the purpose was to compare the incidence of postoperative complications that occurred within 90 days of surgery.	The overall risk of complications for patients undergoing TKA was 11.0%, compared with 4.3% for patients undergoing UKA (P < .0001). Patients undergoing TKA were also more likely to be discharged to a rehabilitation facility (18.0% vs 3.1%; P < .0001) and experienced a longer LOS after their procedure (3.3 days vs 2.0 days; P < .0001) than patients undergoing UKA.
2	Shankar *et al.* *(2016)*[22]	A retrospective review of 128 patients who underwent primary TKA (n = 64) or medial UKA (n = 64) for osteoarthritis by a single, fellowship trained surgeon between July 1, 2010 and June 30, 2011.	Both operative (81.4 vs 112.2 P< 0.001) and anesthesia time (125.7 vs 156.4 P< 0.001) for UKA were significantly less than that for TKA. The length of stay was also found to be shorter in UKA (2.2 vs 3.8 P< 0.001).

4.2 Financial and Socio-Economic Implications

Shankar *et al.* (2016) performed a retrospective review of 128 patients who underwent UKA or TKA for osteoarthritis, in which sixty-four patients in each group were matched based on sex, age, race, body mass index, Charlson Comorbidity Index, and insurance type and clinical data were obtained from medical records while costs were obtained from hospital billing.[22] The study concluded (bivariate analyses) that hospital direct costs were lower for UKA ($7893 vs. $11,156; p < 0.001) as were total costs (hospital direct costs plus overhead; $11,397 vs. $16,243; p < 0.001). Supply costs and implant costs were similarly lower for UKA ($701 vs. $781; p < 0.001, and $3448 vs. $5006; p < 0.001).[22]

Callout Box Infographics (creative team): A multicenter retrospective study by Kievit et al.24 (2019) found that more UKA patients return to work within 3 months (73% versus 48%) compared to TKA patients (p < 0.01);of all 157 UKA patients, a total of 117 (75%) returned to work with 27% returning within 4 weeks and a further 73% within just 3 months.24

Ghomrawi *et al.* (2015) aimed to compare the cost effectiveness of UKA with that of TKA across the age spectrum of patients undergoing knee replacement with respect to lifetime costs, quality-adjusted life-years (QALYs) and incremental cost-effectiveness ratios (ICERs) from a societal perspective using a Markov decision analytic model.[23] The study showed that total lifetime societal savings in the year 2015 ranged from $56 to $336 million when the percentage of older patients qualifying as candidates for UKA varied from 10.0% to 21.0%.[23] A multicenter retrospective study by Kievit *et al.*[24] (2019) found that more UKA patients return to work within 3 months (73% versus 48%) compared to TKA patients (p < 0.01);of all 157 UKA patients, a total of 117 (75%) returned to work with 27% returning within 4 weeks and a further 73% within just 3 months.[24]

Other Evidence/Review

S.No.	Author Reference	Study Details	Results
1	Burn *et al* (2017)[25]	Data from the National Joint Registry (NJR) for England and Wales primarily informed the analysis. A lifetime Markov model was built with patients passing through clinically and economically important health states as time passes. The key simplifying assumptions of the model are that patients can have only two revisions and that only one revision can occur in a year. While reoperations are not incorporated as a model state, their likelihood and costs are incorporated into the unrevised state.	The provision of UKA was expected to lead to a reduction in costs (male: <60: £−1223, 60–75 years: £−1355, 75+ years: £−2005; female: <60 years: £−601, 60–75 years: £−935, 75+ years: £−1102 per patient over the lifetime). Regardless of surgeon usage, costs associated with UKA are expected to be lower than those of TKR (<10%: £−127, ≥10%:£−758).
2	Kazarian *et al* (2018)[26]	Markov decision analytic model was used to assess lifetime costs and quality-adjusted life years (QALYs) as a function of age at the time of initial treatment (ATIT) of patients with end-stage unicompartmental knee osteoarthritis undergoing TKA, UKA, and non-surgical treatments (NST). Cost-effectiveness and incremental cost-effectiveness ratios (ICERs) were calculated and compared with a willingness-to-pay threshold of 50,000 U.S. dollars.	The preferential use of UKA in all U.S. patients with unicompartmental osteoarthritis would result in an estimated lifetime societal savings of 987 million to 1.5 billion U.S. dollars per annual wave of patients undergoing treatment.
3	Peersman *et al* (2014)[27]	Markov model was developed to compare the cost-effectiveness of UKA vs TKA for unicondylar osteoarthritis using a Belgian payer's perspective. Threshold analysis and probabilistic sensitivity analysis were performed to assess the model's robustness.	UKA was associated with cost reduction compared with primary TKA of –€2,807 and a utility gain of 0.04 QALYs. The cost-effectiveness of UKA was higher in the elderly population. In patients aged <55, 55–65, 65–75, and ≥75 years, the cost reduction of UKA compared with TKA was –€1,565, –€2,327, –€2,883, and –€3,220, respectively, while the incremental effectiveness was 0.07, 0.05, 0.06, and 0.05, respectively.

5. Oxford® Partial Knee

With over 45 years' clinical heritage, the Oxford Partial Knee is the most widely used,[28] clinically proven[20,29] partial knee system in the world. PKA patients have demonstrated increased patient satisfaction,[30]* better self-perceived functionality[31] and fewer postoperative complications[21]* compared to total knee patients. Oxford Partial Knee has shown survivorship of 94% at 15 years[32] and 91.0% at 20 years[29]

With over 45 years' clinical heritage, the Oxford Partial Knee is the most widely used,[28] clinically proven[20,29] partial knee system in the world. Oxford Partial Knee has shown survivorship of 94% at 15 years[32] and 91.0% at 20 years[29]

1. Partial knee patients are more likely to forget their artificial joint in daily life and consequently may be more satisfied[30]
2. A multi-center study demonstrated decreased morbidity and complications of PKA compared to TKA[21]*
3. Proven and reproducible technique with Microplasty® Instrumentation[33]
4. Retention of the ACL is reported to result in better proprioception[34]
5. Best-in-class continuous education programme
6. PKA is a cost effective[4,35,36] treatment for unicompartmental osteoarthritis

Microplasty Instrumentation simplifies the surgical technique, providing for accurate and reproducible implant positioning.[33] The soft-tissue referencing Microplasty Instrumentation references the posterior femoral condyle to set the amount of tibial resection. This bone-conserving approach to tibial preparation resulted in a greater number of thinner, 3 mm and 4 mm, bearings implanted (92% vs. 84%; p=0.001)[33] compared to Phase 3 Instrumentation, which has demonstrated better survivorship than bearings 5 mm or thicker.[20]

**Study included Oxford Partial Knees as well as other 'non-Biomet' partial knees*

Figure 2: Oxford® Partial Knee

Clinical Summary

Sources	N at study start#	Survivorship
Bergeson, A., *et al*. Medial mobile bearing unicompartmental knee arthroplasty early survivorship and analysis of failures in 1000 consecutive cases. *Journal of Arthroplasty*. 2013.[37]	1000 knees	95.2% at a mean of 44.4 months
Jones, L., *et al*. 10 year survivorship of the medial oxford unicompartmental knee arthroplasty. A 1000 patient non-designer series- the effect of surgical grade and supervision. *Osteoarthritis and Cartilage*. 20:S290-S291. 2012.[38]	1085 knees	91% at 10 years
Keys, G., Ul-Abiddin, Z., Toh E. Analysis of first forty Oxford medial unicompartmental knee replacements from a small district hospital in UK. *Knee*. 11:375-377. 2004.[39]	40 knees	95.5% at mean of 10 years
Lim, H., *et al*. Oxford phase 3 unicompartmental knee replacement in Korean patients. *Journal of Bone and Joint Surgery*. 94-B(8). 2012.[40]	400 knees	94% at 10 years (cumulative survival)
Lisowski, L., *et al.* Ten- to 15-year results of the Oxford Phase III mobile unicompartmental knee arthroplasty. *Bone Joint* J 2016; (10 Suppl B):41–7.[41]	138 knees	90.6% at 15 years
Lombardi, A., *et al.* Is recovery faster for mobile-bearing unicompartmental than total knee arthroplasty? *Clinical Orthopedics and Related Research*. 467(6):1450-7. 2009.[42]	115 knees	94% at a mean of 30 months
Matharu, G., *et al.* The Oxford medial unicompartmental knee replacement: survival and the effect of age and gender. *The Knee*.913-917. 2012.[43]	459 knees	93% at 8 years (cumulative survival)
Murray, D., *et al.* The Oxford medial unicompartmental arthroplasty: a ten-year survival study. *Journal of Bone and Joint Surgery*. 80-B:983-989. 1998.[44]	143 knees	97.7% at 10 years (cumulative survival)
Pandit, H., *et al.* The clinical outcome of minimally invasive Phase 3 Oxford unicompartmental knee arthroplasty. A 15-year follow-up of 1000 UKAs. *The Bone and Joint Journal*. 97-B:1493–1500. 2015.[20]	1000 knees	91% at 15 years
Pandit, H., *et al*. Minimally invasive Oxford phase 3 unicompartmental knee replacement. Results of 1000 cases. *The Bone and Joint Journal*. 93-B:198-204. 2011.[45]	1000 knees	96% at 10 years (cumulative survival)
Price, A., Waite, J. Svard, U. Long-term clinical results of the medial Oxford unicompartmental knee arthroplasty. *Clinical Orthopaedics and Related Research*. 435:171-180. 2005.[46]	439 knees	93.9% at 15 years (cumulative survival)
Price, AJ., Svard, U. A second decade lifetable survival analysis of the Oxford unicompartmental knee arthroplasty. *Clinical Orthopaedics and Related Research*. 469:174-179. 2011.[29]	682 knees	91.0% at 20 years (cumulative survival)
Rajasekhar, C., Das, S., Smith, A. Unicompartmental kneearthroplasty. 2 to 12-year results in a community hospital. *The Bone and Joint Journal*. 86:983-985. 2004.[47]	135 knees	94.04% at 10 years (cumulative survival)
Svard, U., Price, A. Oxford Medial 1. Unicompartmental Knee Arthroplasty. A Survival Analysis of an Independent Series. *Journal of Bone and Joint Surgery.* 83: 191-94, 2001.[32]	124 knees	95.0% at 10 years (cumulative survival)
White, S., Roberts, S., Jones, P., The twin peg Oxford partial knee replacement: the first 100 cases. *The Knee.* 19(1) 36-40. 2012.[48]	108 knees	100% at 2 years
White, S., Roberts, S., Kuiper, J. The cemented twin-peg Oxford partial knee replacement survivorship: A cohort study. *The Knee*. 22(4):333-7. 2015.[49]	288 knees	98% at 9 years (cumulative survival)
Yoshida, K., *et al.* Oxford Phase 3 Unicompartmental Knee Arthroplasty in Japan – Clinical Results in Greater Than One Thousand Cases Over Ten Years. *The Journal of Arthroplasty*. 28(9) 168-171. 2013.[50]	1279 knees	94.9% at 10 years (cumulative survival)

 # All patients are Oxford Partial Knees unless stated otherwise

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