International Journal of Orthopaedics

Online Submissions: http://www.ghrnet.org/index.php/ijo
doi:10.17554/j.issn.2311-5106.2017.04.201

Int. J. of Orth. 2017 February 28; 4(1): 684-688
ISSN 2311-5106 (Print), ISSN 2313-1462 (Online)

REVIEW

Patients Unicondylar Knee Replacement vs. Total Knee Replacement

Hedra Eskander

Hedra Eskander, Orthopaedic surgery Fellow, St. George private hospital, Sydney, NSW, Australia

Conflict-of-interest statement: The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper.

Correspondence to: Hedra Eskander, Orthopaedic surgery Fellow, St. George private hospital, Sydney, NSW, Australia.
Email: hedraeskander@gmail.com
Telephone: +0405243597

Received: November 23, 2016
Revised: January 31, 2017
Accepted: February 3 2017
Published online: February 28, 2017

ABSTRACT

The aim of this review article is to analyse the clinical effectiveness of total knee replacement (TKR) compared to unicondylar knee replacement (UKR) on patients. In terms of survival rates, revision rates and postoperative complications. The keywords used were: knee arthroplasty. Nearly three thousand articles were found on 25 August 2016. Of those, only twenty-five were selected and reviewed because they were strictly focused on the topic of this article. Compared with those who have TKR, patients who undergo UKR have higher revision rates at 5, 10 and 15 years. The reported overall risk of postoperative complications for patients undergoing TKR is 11%, compared with 4.3% for patients undergoing UKR. In conclusion, UKR have higher revision rates than TKR. However, an increased risk of postoperative complications after TKR.

Key words: Knee arthroplasty

Eskander H. Patients Unicondylar Knee Replacement vs. Total Knee Replacement. *International Journal of Orthopaedics* 2017; 4(1): 684-688 Available from: URL: http: //www.ghrnet.org/index.php/ijo/article/view/1932

INTRODUCTION

Osteoarthritis commonly affects the knee joint, resulting in joint space narrowing and development of osteophytes and sclerosis of the underlying subchondral bone. Total knee arthroplasty is now considered the surgical treatment of choice for osteoarthritis of the knee. It is indicated in patients over age 65 with degenerative arthritis in one or two or three compartments of the knee (Figure 1).

Although the majority of TKAs have been performed for patients older than 65 years, a substantial number of TKAs are being performed on younger patients as well. Osteoarthritis may involve only one compartment of the knee joint. Unicompartmental osteoarthritis of the knee occurs in the medial compartment in about one-third of patients and in the lateral compartment in about 3% of patients[1]. The optimal treatment for osteoarthritis of the medial compartment or lateral compartment of the knee joint is still controversial. In patients with involvement of the medial or lateral compartment of the knee there are various surgical options. Including arthroscopy and joint debridement, high tibial osteotomy, unicompartmental knee arthroplasty or total knee arthroplasty.

Unicompartmental knee arthroplasty is indicated in patients under age 65 with involvement of either the medial or lateral compartment. Nowadays, Unicompartmental knee arthroplasty can be used in older people as well because, it is a less stressful operation with less pain and less risk of bleeding (Figure 2).

Total knee arthroplasty (TKA) is a proven procedure for the treatment of advanced knee arthrosis. However, as much as 20% of these patients have isolated unicompartmental osteoarthritis amenable for a unicompartmental replacement[2]. Unicompartmental knee arthroplasty (UKA) has been performed since the 1970s for these

patients with an aim of replacing only the diseased compartment of the knee joint and preserving the bone stock.

A-Unicompartmental Knee Arthroplasty (UKA)

Is an established procedure but has been controversial for three decades. Initial results in the early 1970's were discouraging, however, Introduction of newer techniques of exposure and design. Improvements have made this procedure quite popular in recent years. UKA is now being performed with increasing frequency in younger patients[3].

Indications

Original selection criteria was: (1) Elderly Patient; (2) Non-inflammatory osteoarthritis; (3) Mechanical axis deformity <10 (varus); (4) Intact ACL without M-L subluxation; (5) Flexion contracture <15 degrees; (6) Body weight < 80-90 kilograms; (7) P-F joint may have grade II-III changes; However, only 6% of patients fulfil these selection criteria [3].

Contraindications: (1) Patients with inflammatory types of arthritis, such as rheumatoid arthritis, are not regarded as good candidates for partial knee replacement. With inflammatory arthritis, more than one compartment is usually involved; (2) Previous HTO with overcorrection; (3) Sepsis; (4) Cruciate ligament lesion; (5) Medial or lateral subluxation (usually associated with a torn ACL); (6) Tibial or femoral shaft deformity; (7) Flexion contracture greater than 15°; (8) Varus deformity greater than 15° (medial unicompartmental knee arthroplasty); (9) Valgus deformity greater than 20° (lateral unicompartmental knee arthroplasty); (10) Flexion less than 110° [4]; (11) Patellofemoral joint arthritis.

Progression of osteoarthritis in the patellofemoral joint after unicompartmental knee arthroplasty is rare, according to some studies. In the Swedish Registry, no unicompartmental knee arthroplasties have required revision for patellofemoral problems[5].

Murray *et al* reported that residual postoperative pain was independent of the state of the patellofemoral joint, and no knee surgery was revised because of patellofemoral problems[6-8]. Unicompartmental arthroplasty improves the mechanical axis and patellar tracking and allows more normal kinematics and rapid quadriceps rehabilitation. For these reasons, osteoarthritis of the patellofemoral joint may not be considered an absolute contraindication.

However, other investigators and surgeons have reached the opposite conclusion; thus, many consider patellofemoral disease to be an absolute contraindication for unicompartmental knee replacement. For more information: The initial results of UKA were very encouraging but later proved disappointing and many surgeons abandoned the procedure. The causes of the early failures are multi-factorial and include poor patient selection and surgical technique[9], inadequate implant design, polyethylene wear[10], inaccurate instrumentation and poor understanding of the knee kinematics[11].

Benefits and Risks Associated with Partial Knee Replacement

There are benefits to having a partial knee replacement. With this surgical procedure, there is: (1) less bone and soft tissue dissection; (2) less blood loss; (3) fewer complications; (4) faster recovery of range of motion; (5) better range of motion overall.

There are also risks associated with partial knee replacement. The risks include: (1) A higher revision (repeat or re-do) rate for partial knee replacement than total knee replacement; (2) potentially worse function after revision of partial knee replacement than total knee replacement; (3) revisions can be more complicated than primary surgeries[12].

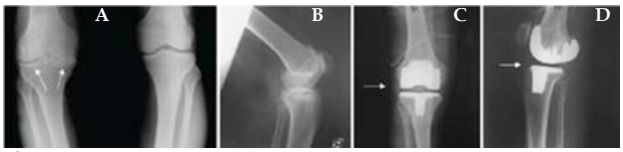

Figure 1 Anteroposterior and lateral views (a and b) of a 72 year old woman with osteoarthritis of both compartments of the knee with joint narrowing, subchondral sclerosis and osteophyte formation (arrows), treated by total knee arthroplasty (arrows c and d).

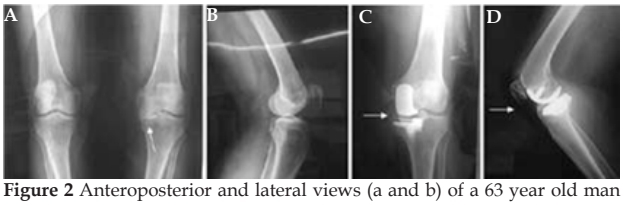

Figure 2 Anteroposterior and lateral views (a and b) of a 63 year old man with localized osteoarthritis of the medial compartment of the knee with joint narrowing, cysts and osteophyte formation and subchondral sclerosis (arrow), treated by unicompartmental knee arthroplasty (arrows c and d).

Complications

These complications include inadequate pain relief, deep venous thrombosis in 1% to 5% of patients, infection in less than 1% of patients, and unexplained pain about the knee.

Late complications include loosening of a component, subsidence of the component, degeneration of the other compartment resulting in pain, infection, polyethylene wear, and possible dislocation of the polyethylene component in a mobile-bearing knee replacement. The main concern associated with partial knee replacement is a possible need to have surgery again if another compartment becomes affected. Arthritis of the other compartment, usually is an error of the surgeon In this case, (e.g. over correction to the affected side using unsuitable big size) the patient would have their partial knee prosthesis removed, and it would be replaced with a total knee prosthesis[12].

LIMITATIONS PREVENTING THE WIDESPREAD ADOPTION OF THE UNICOMPARTMENTAL KNEE

Arthroplasty Procedure in Clinical Practices

While UKA may have advantages as a surgical option for selected patients who meet the operative criteria detailed previously, TKA remains a popular operation for unicompartmental pathology. The widespread performance of UKA has been limited by the technical difficulty of performing the procedure. In particular, UKA has less tolerance for acceptable component positioning when compared to TKA, as improper component positioning, by as little as 2°, can result in UKA failure (Figure 3)[13-18]. Failures of UKA occur when there is medial-lateral mismatch, inadequate stability of the components, heterogeneous polyethylene wear, improper patient selection (such as performing UKA for bilateral osteoarthritis), aseptic loosening, and tibial Subsidence (Figure 4A and 4B)[19].

Robot-assisted UKA

Although results can be optimized with careful patient selection and use of a sound implant design, the most important determinant of success of UKA is component alignment. Studies have shown that component malalignment by as little as 2° may predispose to implant

failure after UKA. Robot-assisted UKA has been projected to address this issue, which combines patient specificity and navigation. Short-term results for robot-assisted UKA are promising, although long-term results are awaited to determine implant survivorship and functional outcome[20-21].

B-TOTAL KNEE REPLACEMENT

Indications: (1) Osteoarthritic destruction of the knee is the commonest reason for total knee replacement. This is a disease of synovial joints characterized by degenerative and reparative processes and is seen in 40 percent of 40-year-old's on radiographic examination. However, only 50 percent of these will be symptomatic. Osteoarthritis may be primary or secondary; (2) Mechanical derangement such as previous meniscal or cruciate ligament damage, pyogenic infection, ligamentous instability, and fracture into a joint are among the common causes of the secondary type; (3) Other causes of cartilage destruction include rheumatoid arthritis, haemophilia, the seronegative arthritis, crystal deposition diseases, pigmented villonodular synovitis, avascular necrosis and the rare bone dysplasia; (4) TKR can be used also for degenerative arthritis of one compartment of the Knee in case of instability.

Contraindications

Absolute contraindications to total knee replacement include: (1) Knee sepsis including previous osteomyelitis, a remote source of ongoing infection; (2) Extensor mechanism dysfunction; (3) Severe vascular disease; (4) Recurvatum deformity secondary to muscular weakness; and (5) the presence of a well-functioning knee arthrodesis.

Relative contraindications include: (1) medical conditions that preclude safe anaesthesia, the demands of surgery and rehabilitation; (2) skin conditions within the field of surgery e.g psoriasis, a neuropathic joint and obesity.

Complications: (1) Thromboembolism: This includes deep vein thrombosis (DVT), with subsequent life-threatening pulmonary embolism (PE); (2) Infection: Factors relating to a higher rate of infection after TKA include rheumatoid arthritis, skin; (3) Patellofemoral complication: Patellofemoral complications include patellofemoral instability, patellar fracture, patellar component failure, patellar clunk syndrome, and extensor mechanism tendon rupture. All have been cited as the common reasons for re-operation. These can be avoided by attention to detail, meticulous technique and the avoidance of component malposition; (4) Neurovascular complication: Arterial thrombosis after total knee replacement is a rare (0.03-0.17%) but devastating complication, frequently resulting in amputation. Several authors have recommended performing TKA without the use of a tourniquet in patients with significant vascular disease. Such patients should undergo a vascular surgery consultation prior to their knee replacement._Peroneal nerve palsy is the commonly reported nerve palsy after total knee replacement. It usually occurs in the correction of combined fixed valgus and flexion deformities, as are often seen in patients with rheumatoid arthritis. 50% undergo spontaneous recovery and 50% undergo partial recovery with conservative treatment. Some good results have been obtained with surgical decompression; (5) Peri prosthetic fractures: Supracondylar fractures of the femur are not common after total knee replacement (0.2% to 1%) They are seen if the anterior femoral cortex is notched and weakened during surgery and in patients with osteoporosis, rheumatoid arthritis, poor flexion, revision arthroplasty, and in neurological disorders. Treatment is with internal fixation or revision total knee arthroplasty. Tibial fractures are uncommon.

Figure 3 Wrong Component sizing or positioning may lead to edge loading (A) resulting in increased wear and implant failure (B).

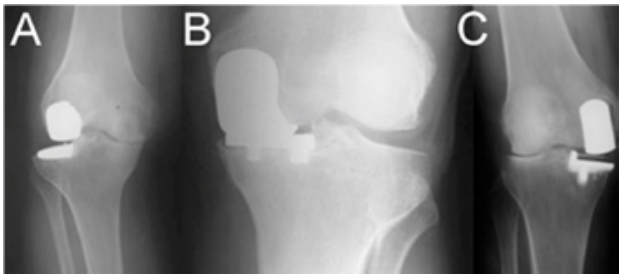

Figure 4 Disease progression of the other compartment from overstuff ng, over-correction or misbalance (A), Early loosening (B) and wrong component positioning May lead UKA failure.

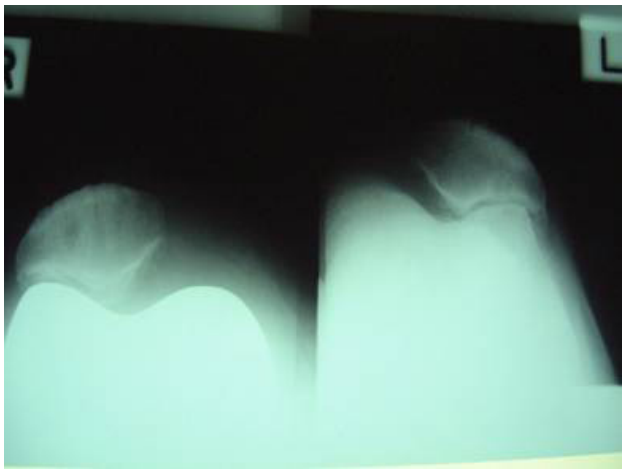

Figure 5 X-ray showing patellofemoral instability after total knee replacement .

OUTCOME AND PROGNOSIS OF TOTAL KNEE REPLACEMENT

The Oxford researchers, funded by Arthritis Research UK and the Royal College of Surgeons, used data from the National Joint Registry for England and Wales on the adverse outcomes of more than 100,000 patients who had undergone knee surgery. Up to half of knees that require replacement, usually because of severe osteoarthritis, can be treated with either partial or total replacements. Total knee replacement is one of the most common surgical procedures carried out, with over 76,000 performed annually in the UK. Only 5% of patients require revision surgery over a 10-

year period. Because of the higher revision rate of partial knee replacement surgery – which has traditionally been regarded as the most important factor in determining the choice of implant – its use in the treatment of end-stage osteoarthritis is controversial, with only about 7,000 being performed annually in the UK.The researchers found that although the risk of life-threatening complications from knee replacement surgery is very small, people who undergo total knee replacement are four times more likely to die in the first month after surgery compared to those who have partial knee replacement and 15% more likely to die in the first eight years.

Patients undergoing total replacement are twice as likely to have a blood clot, heart attack or deep infection; three times as likely to have a stroke; and four times as likely to need blood transfusions – compared to those having partial replacement. Patients who had a partial knee replacement are 40% more likely to have a re-operation, known as revision surgery, during the first eight years after the replacement[22].

Most patients seem satisfied with their knee replacements and if relief of pain is the main indication for surgery then this should indeed be the case. Satisfactory knee function is usually restored after total knee replacement and the majority is able to return to low impact sporting activity[23]. Long term studies confirm satisfactory functional scores and show 91% to 96% prosthesis survival at 14- to 15-year follow-up. There does not appear to be any difference between PCL-retaining and PCL-substituting designs. Cementless designs do not have the same length of follow up but studies showing 10-12 years report 95% prosthesis survival[24].

CONCLUSION

The total knee replacement and the partial knee replacement are both surgeries that can change the lifestyle of a person living with osteoarthritis or another knee condition that causes continuous pain. While there are many risks involved with this surgery and a long recovery process, the outcome is worth the work in most cases. The total knee replacement is a more invasive surgery where the bone is cut away and the entire joint is replaced with a prosthesis. Recovery is difficult, and usually takes six to eight weeks of intense physical therapy. A partial knee replacement is slightly less invasive, because only one compartment of the knee is cut and replaced, which allows for a quicker recovery and decreased risks. Because only one compartment is replaced, it is less common than a total knee replacement since many patients have injury in more than one compartment and are not eligible for this surgery. The patient still needs physical therapy, but should be able to walk without assistive devices sooner. Both surgeries have their limitations, as full range of motion may never be reached and the patient should refrain from participating in high impact sports such as running. This is because the large amount of force on the knee can degrade the prosthesis more quickly, causing a need to have it replaced sooner.

RECOMMENDATIONS

The total knee replacement and the partial knee replacement are both effective at reducing pain in the knee. However, both surgeries are useful for different populations. There is more information about the total knee replacement because it is more common, and generally this would be beneficial to the patient and their wellbeing.

REFERENCES

1. Ledingham J, Regan M, Jones A, Doherty M. Radiographic patterns and associations of osteoarthritis of the knee in patients referred to hospital. *Ann Rheum Dis* 1993; **52**: 520-6 [PMID: 8346979]
2. Robertsson O, Knutson K, Lewold S, Lidgren L. The Swedish KneeArthroplasty Register 1975-1997: An update with special emphasis on 41,223 knees operated on in 1988-1997. *Acta Orthop Scand* 2001; **72(5)**: 503-13. [PMID: 11728079]; [DOI: 10.1080/000164701753532853]
3. Laskin RS. Unicompartmental tibiofemoral resurfacing arthroplasty. *J Bone Joint Surg Am* 1978; **60(2)**: 182-5. [PMID: 641081]
4. Insall J, Aglietti P. A five to seven-year follow-up of unicondylar arthroplasty. *J Bone Joint Surg Am*. 1980 Dec. **62(8)**:1329-37. [PMID: 7440612]
5. Knutson K, Lewold S, Robertsson O, et al. The Swedish knee arthroplasty register. A nation-wide study of 30,003 knees 1976-1992. Acta Orthop Scand. 1994 Aug. **65(4)**: 375-86. [DOI: 10.1302/2046-3758.37.2000289]
6. Murray DW, Goodfellow JW, O'Connor JJ. The Oxford medial unicompartmental arthroplasty: a ten-year survival study. J Bone Joint Surg Br. 1998 Nov. **80(6)**: 983-9. [PMID: 9853489]
7. Murray DW. Mobile bearing unicompartmental knee replacement. Orthopedics. 2005 Sep. **28(9)**: 985-7.
8. Weale AE, Murray DW, Crawford R, et al. Does arthritis progress in the retained compartments after 'Oxford' medial unicompartmental arthroplasty? A clinical and radiological study with a 4. Bert JM. Unicompartmental knee replacement. Orthop Clin North Am, [DOI: 10.1007/s00264-009-0869-z]
9. Bernasek TL, Rand JA, Bryan RS. Unicompartmental porous coated anatomic total knee arthroplasty. Clin Orthop 1988; **236**: 52-9. [DOI:10.1007/978-4-431-68529-6]
10. Lindstrand A, Stenstrom A. Polyethylene wear of the PCA unicompartmental knee. Acta Orthop Scand 1992; **63(3)**: 260-2. [PMID: 1609586]
11. Swienckowski J, Page BJ. Medial unicompartmental arthroplasty of the knee — Use of the L-cut and comparison with the tibial inset method. Clin Orthop 1989; **239**: 161
12. Borus T, Thornhill T. Unicompartmental knee arthroplasty. J Am Acad Orthop Surg. 2008 Jan. 16(1):9-18. [PMID: 18180388
13. Tanavalee A, Choi YJ, Tria AJ. Unicondylar knee arthroplasty: past and present. *Orthopedics* 2005; **28(12)**: 1423-33; quiz 1434-5. [PMID: 16366081]
14. Conditt MA, Roche MW. Minimally invasive robotic-arm-guided unicompartmental knee arthroplasty. *J Bone Joint Surg Am*, 2009; **91 Suppl 1**: 63-8. [PMID: 19182027]; [DOI: 10.2106/JBJS.H.01372]
15. Pearle AD, Kendoff D, Musahl V. Perspectives on computer-assisted orthopaedic surgery: movement toward quantitative orthopaedic surgery. *J Bone Joint Surg Am* 2009; **91 Suppl 1**: 7-12. [PMID: 19182014]; [DOI: 10.2106/JBJS.H.01510]
16. Banks SA, Harman MK, Hodge WA. Mechanism of anterior impingement damage in total knee arthroplasty. *J Bone Joint Surg Am* 2002; **84-A Suppl 2**: 37-42. [PMID: 12479337]
17. Whiteside LA. Making your next unicompartmental knee arthroplasty last: three keys to success. *J Arthroplasty*, 2005; 2**0(4 Suppl 2)**: 2-3.
18. Bert JM. Unicompartmental knee replacement. *Orthop Clin North Am* 2005; **36(4)**: 513-22. [PMID: 15991117]
19. Borus T, Thornhill T. Unicompartmental knee arthroplasty. *J Am Acad Orthop Surg* 2008; **16(1)**: 9-18.
20. Roche M, O'Loughlin PF, Kendoff D, Musahl V, Pearle AD. Robotic arm-assisted unicompartmental knee arthroplasty: preoperative planning
21. Pearle AD, O'Loughlin PF, Kendoff DO. Robot-assisted unicompartmental knee arthroplasty. *J Arthroplasty* 2010 Feb; **25(2)**: 230-7. [PMID: 19056227]; [DOI: 10.1016/j.arth.2008.09.024]
22. Alex Liddle, an Arthritis Research UK clinical research fellow

at Oxford University who ran the study 2009; 10-5 [PMID: 19340377]
23. Morgan H, Battista V, Leopold SS. Constraint in primary total knee arthroplasty. *J Am Acad Orthop Surg* 2005; **13**: 515-524
24. Buechel FF. Long-term outcomes and expectations: cementless meniscal bearing knee arthroplasty: 7 to 12 year outcome analysis, Orthopedics 1994; **17**: 833

Peer reviewers: Ray Marks, Kejian Lian