Austin Arthritis

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Review Article

Unicompartmental Knee Arthroplasty: A Narrative Review of the Literature from Year 1988 to Year 2007

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Received: December 13, 2018; **Accepted:** January 17, 2019; **Published:** January 24, 2019

Abstract

A resurgence in the Unicompartmental Knee Arthroplasty (UKA) since Marmor's first procedure in the 1970's has occurred due to improved surgical technology, improved devices, and minimally invasive procedures. UKA appears to be a viable option for patients with osteoarthritis of the knee that involves only the medial compartment, including the younger and the more active patients. Excellent survivorship rates of 94% to 97% at 10 years have been reported in the literature. While the younger patient may require a second surgery in their lifetime, the conversion from the modern UKA to a Total Knee Arthroplasty (TKA) can be performed with minimal technical difficulties, and the patient can have high expectations for optimal outcomes. Functional outcomes (stairs, gait, kneeling) are better and return to physical activity more likely for the UKA patient than the TKA patient. It is unanimous amongst the reviewed authors that high impact running activities should be avoided for a joint replaced knee.

There are not figures and outcomes in this review of the literature.

Keywords: Unicompartmental Knee Arthroplasty; Knee OA; Functional Outcomes; Review; Literature

Introduction

A dramatic increase in the prevalence of osteoarthritis in adults 18 years and older is expected from 2005 to 2030. According to the Centers for Disease Control and Prevention, the prevalence of doctor-diagnosed arthritis is projected to increase from the current 46 million to nearly 67 million by the year 2030. Approximately 9.3% of the adult population, 25 million people are projected to report activity limitations due to arthritis. According to the report, working-age adults (45-64 years of age) will account for almost one-third of the cases [1]. The authors of a study of knee osteoarthritis and primary care physician's diagnoses, report that the prevalence of painful disabling knee osteoarthritis in the general population aged > 45 years is 12.5% [2]. The current management of this problem consumes a significant portion of health care resources, and the estimated increase poses a major challenge to the health care system. Prevention, life-style changes, and disease self-management may help reduce the burden, however the primary course of management has been medical. Analgesics for pain relief, braces and orthoses for load redistribution, exercises to maintain function, viscosupplementation and nutritional supplements such as glucosamine and chondroitin sulfate make up the main thrust of medical management. Surgical intervention is reserved, as a last resort option when pain becomes debilitating and function is impaired [1,3].

Surgical replacement of the knee improves function by decreasing pain and reducing deformity. TKA has long been considered the gold standard for management of advanced osteoarthritis of the knee. UKA was first introduced in 1973 by Leonard Marmor [4], but did not gain wide acceptance due to poor early results, high failure rates and technical demands of the procedure [5,6]. The causes of early failure are multifactorial and include poor patient selection and surgical technique [3-5,7], inadequate implant design [8], polyethylene wear [9] and poor understanding of knee kinematics and alignment influences [10,11]. A resurgence of interest in the UKA is due in part to improved devices, surgical technique, survivorship results and new minimally invasive techniques [12-14]. In a review of literature of unicompartmental knee replacement, Bert [15] concludes that UKA is a successful procedure in a moderately active older patient population with only unicompartmental knee pain. The author further states the importance of strict patient selection criteria, and that the patient should understand the prosthetic device will not last forever [15]. Improved mid and long term results of the UKA, comparable with the excellent and well-known results after TKA, have contributed to the use of UKA on the younger, the active, and the obese population [12-14,16-19]. According to the Millennium Research Group's US markets for reconstructive devices 2001 and 2002, as cited in Springer et al [6] and Naal et al [12], 2500 UKAs were performed in the United States in 1996 and 1997, making up approximately 1% of all knee arthroplasties. In 2000 and 2001 this proportion increased to 6%, or 33,900 UKA procedures [6,12].

Advantages of UKA Vs TKA

In a review by Satku [3] of UKA as a surgical option, arthritis was predominately in one compartment in 5% to 20% of patients who underwent TKA. According to Marmor [4] it is illogical and contrary to basic orthopedic principles to remove and replace an entire structure if only one portion is damaged. A revision may be required in the future, but preservation of the normal structures should be pursued whenever possible [4]. The advantages of the UKA over the TKA include a preservation of bone stock, maintenance of more normal joint kinematics due to ACL sparing techniques, better proprioception, better Range of Motion (ROM), and faster recovery

Citation: Bernardino S. Unicompartmental Knee Arthroplasty: A Narrative Review of the Literature from Year 1988 to Year 2007. Austin Arthritis. 2019; 3(1): 1016.

[20]. Meek et al [21] report that a possible advantage of the UKA is the ability to convert a failed UKA to TKA, thereby delaying the eventual TKA by up to a decade. White et al [22] notes that timely replacement of the deteriorating medial compartment with varus correction, before the cruciate ligament has stretched, may prevent lateral compartment breakdown. Recent advances in minimally invasive surgical techniques have also helped renew the interest in the UKA. Smaller incisions, limited quadriceps disruption, decrease in morbidity, and decreased rehabilitation time are all benefits of the minimally invasive technique [18]. The use of UKA, particularly the minimally invasive technique, has also increased in the younger active population as an alternative to high tibial osteotomy [20,23]. In a cost-effectiveness analysis between UKA and TKA procedures for unicompartmental knee osteoarthritis, the authors report that the UKA procedure is more cost effective over the TKA if survival rates are a minimum of 12 years [24].

Indications

Restoration of function and relief of pain that interferes with the patient's quality of life is the primary indication for knee arthroplasty [4,12]. For the UKA it is pain localized to one compartment with corresponding radiographic evidence of unicompartmental disease [25]. Resurfacing only the involved portion of the knee with degenerative changes is the basic premise of a UKA. This allows the relatively normal articular structures to remain intact [5]. It is generally accepted that surgical outcomes improve when careful patient selection criteria are followed. In an early study by Kozinn and Scott [26], they reported that unicondylar knee arthroplasty is a useful and reliable alternative for the treatment of unicompartmental degeneration of the knee in selected patients. They suggest the following parameters for the best patient selection criteria: age 60 or more; weight less than 82kg (180lbs); low activity level; no pain at rest (pain at rest may indicate inflammatory component to disease); pre-operative range of movement of 90 degrees with 5 degrees or less flexion contracture; and angular deformity of the knee should be less than 15 degrees and passively correctable. Several other authors have used these parameters for patient selection guidelines in their research of UKA surgical outcomes [7,12].

Since the introduction of the UKA, many improvements have been made in prosthesis design and less invasive surgical techniques, and good long-term results have been reported [27,28]. Swienckowski and Pennington [13] reported on surgical technique of the UKA in patients sixty years of age or younger and concluded that UKA was associated with pain relief and excellent function in a younger, active patient population. The authors' criteria for inclusion were: non-inflammatory unicompartmental arthritis; contained mature osteonecrosis; at least 90 degrees of knee flexion; an intact anterior cruciate ligament; a flexion contracture of less than 10 degrees; maximum varus or valgus < 20 degrees that can be passively corrected to five to seven degrees of valgus with the knee in maximally allowed extension; outer bridge changes no greater than grade I or II in the opposite compartment or the patellofemoral articulation; and no age restriction if otherwise qualified, refractory to conservative care.

According to a review of the literature by Engh and Ammeen [29], unicompartmental knee arthroplasty is not recommended for patients with an ACL-deficient knee and a history of instability due to high failure rates from polyethylene wear. The authors examined 4 device types, both fixed and mobile bearing devices, and concluded that the increased sliding motion caused by the deficient ACL ligament lead to accelerated polyethylene wear. Tabor et al [14] reported on the long-term outcomes of UKA and concluded that age less than 60 and obesity do not appear to be contraindications to the procedure. Kort et al [18] also found that UKA was an important option for patients 60 years or younger, but reported that obesity was a contraindication to the procedure due to technical difficulties, risk of complications, and early failure rates. In a review of the Finnish Arthroplasty Register as much as 25% of all UKAs were implanted in patients aged between 50 and 59 years [30]. The authors concluded that younger patients (< 65 years) were at a 1.5 fold increased risk of revision compared to older patients (> 65 years).

Survivorship

Failures of the UKA have many causes. In a retrospective study of UKA device types and survival rates, the authors reported ten year survival rates ranging from 81% to 53% when comparing four device types: the Oxford meniscal bearing unicondylar (81%); the Miller-Gallante II unicondylar (79%); the Duracon (78%); and the PCA (53%) [30]. Naudie et al [28] reported 94% and 90% respectively on five and ten year survival rates of the Miller-Gallante device. Additionally, Argenson [27] reports 10 year survival rates of the Miller-Gallante UKA to be 94%. In an early study evaluating the efficacy of an uncemented UKA prosthesis, Bernasek et al [8] concluded that this prosthetic design was prone to loosening, persistent pain, and high failure rate (39%). In a matched study of UKA and TKA patients, survivorship rates at five years were reported to be far superior for the TKA patients (100%) compared with the UKA patients (88%) [31]. The two groups were matched for age, gender, body mass index, pre-operative active range of motion and pre-operative Knee Society scores [31]. Excellent survivorship results of 95.7% at 15 years were reported by Berger et al [7] in their prospective study of 59 patients with medial unicompartmental arthroplasty of the knee. The authors noted progressive patellofemoral arthritis was the primary mode of failure despite the pristine appearance of the patellofemoral articulation at the time of the initial procedure. Murray et al [32] reported on the ten year survival rates of the Oxford medial unicompartmental arthroplasty using the fully congruous mobile polyethylene bearings. These authors reported excellent survivorship results of 97%, with no failures due to polyethylene wear or aseptic loosening of the tibial component. The authors felt that their high success rate was due to strict patient selection criteria, and that the surgical team had previous experience with meniscal bearings before starting unicompartmental knee replacement [32].

Alignment has been cited by numerous authors as an important prognostic factor in the survival of UKA [9-11,33]. Limb alignment affects not only the wear of the unreplaced compartment, but also the polyethylene of the resurfaced compartment. Hernigou and Deschamps [10] found an increased risk of degenerative changes in the opposite compartment when there was an overcorrection in valgus of the preoperative deformity (hip-knee-ankle angle >180deg). Severe under-correction of the varus deformity (hip-knee-ankle angle <170deg) was associated with increased polyethylene wear in the tibial component and recurrence of the deformity [10]. Engh et al [33] noted that polyethylene wear will increase with time as well as with the weight and activity level of the patient. In their study of polyethylene wear in TKA and UKA, the authors found that malalignment or malposition of a unicompartmental implant may lead to damaging wear patterns and rapidly destroy the polyethylene [33]. Kasodekar et al [11] report on radiographic alignment and a four year survival rate of 91.7%, and concluded that long-term outcomes of UKA are influenced by positioning and alignment of the prosthesis. Swienckowski and Page [9] reported a direct relationship between placement of the tibial component and clinical results, finding that 90-degree placement in the coronal plane and 80 degree placement in the sagittal plane had the best clinical results.

Age has been implicated as a factor in outcomes and survivorship of knee arthroplasties by many authors [14,17,18,30]. In a study of the Oxford phase III unicompartmental knee replacement in patients under 60 years of age, Kort et al [18] concluded that age 60 or younger was not a contraindication to the procedure. Tabor and his colleagues [14] found that there was no significant difference in survivorship based on age over or under 60 at the time of surgery. Cartier et al [34] reported that the ten year follow-up results of UKA surgery were no worse for the younger patients than the older patients, with average survivorship rates of 93%. In a study of patients sixty years of age or younger and physically active, Swienckowski and Pennington [13] reported excellent results in 93% of their UKA patients at eleven year follow-up. In a minimum twenty-one year follow-up of a relatively older age group, O'Rourke et al [20] reported that the UKAs in these patients performed well. Survivorships were reported of 96%, 85%, and 72% at 5, 15, and 25 years respectively. The authors did note that the patients most at risk for revision were younger than 65 at the time of surgery [20]. The author also noted that while the younger population may be at greater risk for revision, the UKA can be an intermediate intervention before the TKA [20].

Conversion of UKA to TKA

Harryson et al [17] found a higher cumulative revision rate of both UKA and TKA patients under 60 years, but because UKA is less invasive, less costly, has a lower risk of complication, and has a faster recovery time, the authors recommend UKA procedures as a good solution for primary knee arthroplasties only. In a review of converted failed modern unicompartmental knee arthroplasties to TKAs. Levine et al [5] noted the majority of failures were due to polyethylene wear. Their data suggest that failed modern UKA can be successfully converted to TKA. The authors believe that newer devices and new bone conserving UKA resurfacing techniques offer favorable conversion results comparable to primary TKA [5]. Johnson et al [35] examined the survivorship of total knee replacements converted from UKAs and found that the procedure was much less demanding than a revision of a TKA. The authors concluded that appropriate patients should be allowed the benefit of a UKA knowing that most offer excellent long term survival rates, and should a revision be required, that it can be performed with high expectations that the outcome will be comparable to an initial TKA in both function and survivorship [35].

Springer et al [6] evaluated conversion of UKA to TKA in a small number of patients (18) and found that conversion of UKA to TKA took place on average of 100 months (8.3 years) and the most common mode of failure (12 patients) was polyethylene wear. The authors also reported that conversion arthroplasty did affect knee flexion; pre-operative average flexion was 113 degrees and post-operative was 111 degrees [6]. Several authors have reported that the conversion of UKA to TKA can be a technically demanding procedure that depends on how conservative the initial procedure was and the mode of failure [6,36]. In their study, Springer et al [6] reported that they encountered bone loss in 77% of the knees at the time of conversion. Early reports of UKA failures and difficulty with conversion to TKA occurred due to early (1970s) non-bone conserving UKA devices and the use of UKA with rheumatoid arthritis patients. Rheumatoid arthritis patients do not meet today's accepted patient selection inclusion criteria for the UKA device, as outlined by Kozinn and Scott [26]. In a ten year follow-up study of UKA surgery, Cartier et al [34]. reported that UKA revision either to another UKA or a TKA need not be problematic if a resurfacing UKA is used and failure is addressed in a timely manner. The Oxford device, with a mobile bearing, thin polyethylene surface, allows bone preservation of the medial compartment [36]. Saldanha et al [36] noted good short-term results of UKA to TKA revision were based on the primary UKA device employed.

Rehabilitation & Outcomes

Little is written in the orthopedic literature about post-surgical rehabilitation following a unicompartmental knee arthroplasty. Kozin and Scott [26], widely accepted as the pioneers in identifying standard patient selection criteria, report that care and rehabilitation following a UKA is similar to that of a TKA. Constant passive motion may or may not be used, and physical therapy should be initiated on the first or second postoperative day. Protected weight bearing and walking should be started as soon as possible, active assisted muscle strengthening and ROM exercises should begin on the second postoperative day. Physical therapy should progress until the patient can actively flex the knee to 90 degrees and independently ascend and descend stairs. These authors also recommend considering manipulation at 14 days if ROM goals are not met [26]. In a study of gait and clinical measurements, Borjesson et al [37] reported that post-operative rehabilitation started on the day of surgery with continuous passive motion. Full weight bearing, active exercise and Activities of Daily Living (ADL) training was initiated on the first post-operative day under the supervision of a physical therapist. After discharge from the hospital, patients were seen in outpatient rehabilitation 10 times for a program of 10 specific exercises designed to increase ROM of the knee and muscle endurance of the whole leg [37].

Several clinical outcome measurement tools have been described in the literature for assessing functional improvements following surgical intervention of the knee. The American Knee Society Score (KSS) [38] is a clinician-based tool commonly cited in orthopedic literature. The KSS is divided into separate knee and patient function scores. The Oxford 12-item knee score [39] which is a patient-administered questionnaire that is short, valid, reliable, and designed specifically for use with knee surgery. Kleijn et al [40] reported on the performance based knee test, the Dynasport ® Knee Test, which is an accelerometer-based system that objectively measures functional aspects of gait during various tasks of daily life. The authors report that the younger, more active patient values functional improvement more than clinician based scores, and that the Dynasport Knee Test (DKT) was able to more accurately account for higher knee flexion range of motion and the impact on functional recovery [40].

ROM

In a matched study comparing results of UKA versus TKA outcomes in active ROM, Knee Society Score, and survivorship rates, the authors reported better ROM with the UKA patients (mean ROM at 5 years = 104 degrees), but no difference in clinical outcomes based on the KSS at 6, 18, 36, and 60 months post-operatively [31]. Naudie et al [28], reporting on UKA with the Miller-Galante prosthesis, found improved KSS knee and function scores, and an average ROM of 125 degrees (range = 95 to 145 degrees) at five and ten year follow-up. Kasodekar et al [11] reported favorable mid-term results of the UKA with improved knee and Knee Society Scores (KSS), and average ROM improvements from 121.9 degrees to 133.8 degrees. In patients less than 60 years of age with UKA, Kort et al [18] reported post-operative knee flexion average Range of Motion (ROM) was 125 degrees. In a study of patients managed with a modern unicompartmental arthroplasty that was cemented and performed with instrumentation and a metal-backed prosthesis comparable to that used for total knee arthroplasty, the average arc of flexion was 128 degrees [27].

Function: gait, kneeling, stairs

Restoration of function is a primary goal of knee arthroplasty. ADL function includes walking, stair climbing, sit-to-stand ability, and kneeling. Typical knee flexion angles of 50-60 degrees are seen during stair climbing, and as much as 90-120 degrees when rising from a chair [41]. In a study of functional improvements after unicompartmental knee replacement, Kleijn et al [40] found that functional recovery continues beyond 6 months and even up to two years. They reported that the average knee flexion ROM leveled off at one year at 120.5+11.7, but that quadriceps muscle recovery may take longer to recover due to pre-operative atrophy secondary to osteoarthritis [40]. In a study of gait and clinical measurements in knee osteoarthritis patients after surgery, UKA patients at one year post-operative reported no pain with walking, had an average of -3/121 passive knee extension and flexion, and participated in moderate physical activity [37]. The authors also noted that the UKA patients increased their walking speed the way healthy people do, which is by increasing both step frequency and step length for both legs.

In a study comparing three types of knee surgeries and post-operative kneeling ability and the ability to descend stairs, the UKA patients performed better than the TKA and PatelloFemoral Replacement (PFR) patients at one year [42]. Kneeling ability was difficult and painful for most patients pre-operatively with 80-85% of patients reporting it was impossible or extremely difficult to kneel. It continued to be challenging for all the groups post-operatively in this study, with 23% of UKA patients reporting easy or little difficulty kneeling versus 15% of TKA patients. Stair climbing ability was significantly better for the UKA group at one year, with approximately 86% of the patients reporting easy or little difficulty with descending stairs versus 70% for TKA [42]. Weale and colleagues [23] reported on 31 UKA patients compared with 130 TKA patients and found that the UKA patients were better able to descend stairs and slightly better at kneeling than the TKA patients, but the patient's perceptions of functional outcome, based on the Oxford 12-item knee questionnaire, showed the results from the Oxford UKA were no better than those from AGC total knee replacement.

Proprioception & Kinematics

It is generally accepted that tricompartmental total knee arthroplasty significantly alters the kinematics of the knee. Engh and Ammeen [29] report that evidence from laboratory studies of gait analysis, video fluoroscopy, and implant retrieval analysis indicate that TKA motion patterns across the articular surface is very different compared to the healthy, ACL-intact knee. One of the noted benefits of UKA is the preservation of the patellofemoral joint, the anterior cruciate and posterior cruciate ligaments, meniscus, and articular cartilage of the unaffected compartment, thereby retaining normal proprioception and kinematics of the knee [26]. In a study of fixed-bearing unicompartmental design, assessing closed-kinetic-chain knee kinematics and quadriceps tension, Patil et al [41] report knee kinematics (rotation and roll) during knee flexion were similar to an intact knee. These encouraging results of this cadaver study suggest unicompartmental design may offer the potential to restore or preserve normal kinematic function better than the tricompartmental knee replacement. The authors conclude that the restoration of normal knee function may benefit patient rehabilitation, extensor function, implant survival, and wear [41].

Patient's Perceptions

There was no difference in patient's perception of functional outcomes, using the Oxford knee score, between UKA and TKA patients, however patients receiving unicompartmental replacement were better able to descend stairs and had slightly better ability to kneel [23]. In contrast, Walton et al [19] found a significant difference between the Oxford knee score of patient's perceived functional improvement between TKA and patients with the minimally invasive UKA. They also found UKA patients were significantly more likely to return to or increase their level of sporting activity postoperatively than TKA patients. These authors also universally advised their patients to cease high-impact activities such as jogging [19].

Return to Sport

Several authors have noted their concerns over patients returning to physical activity following a joint replacement, and that it must be balanced out by the potential overall health benefits of exercise on cardiovascular, metabolic, and musculoskeletal systems [12,16,43-45]. Many studies examining physical activity and sports after joint replacement have reported on TKA only, [43-45] and some highlights are reported here. Due to the biomechanical differences between the TKA and UKA, we can not simply transfer TKA recommendations to the UKA patient. Several TKA studies have been referenced for general information and background.

In a review of current literature and exercise recommendations after total joint replacement, it is generally advised to avoid jogging, tennis, and running sports due to concerns that these activities cause excessive stress in the polyethylene joint bearings risking delamination and polyethylene wear, prosthetic loosening, and increased revision rates [43-45]. Loads during these high impact activities can reach up to 8-10 times body weight (BW), with running at 16km/hr reaching 14 BW [44,45]. The peak loads of these activities generally occur between 40 and 60 degrees of knee flexion, where many of the modern TKA designs do not have high conformity, and which the contact area is stressed beyond the yield point [44]. Walking, swimming, and cycling are exercise activities that are generally accepted and encouraged activities after TKA [43-45] Cycling peak loads were found at approximately 80 degrees of flexion, but the tibiofemoral load is approximately 1.2 BW and therefore not overly stressful on the implant. Tibiofemoral peak loads during power walking can reach up to 4 BW at 20 degrees of flexion, but because at that ROM a mobile bearing prosthetic design demonstrates near conformity, the stresses never exceed the yield point of the polyethylene [44]. In a retrospective review of participation in sports after total knee replacement, Bradbury et al [43] reports 65% of patients that participated in sports before surgery returned to regular sports after surgery. The authors also report that the patients were more likely to return (91%) to low-impact activities such as lawn bowling, than high-impact activities such as tennis (20% returned). In a literature review of exercise recommendations after total joint replacement, Kuster [45] notes that patients should be encouraged to be physically active after a total joint replacement; that the wear on the prosthesis is a function of how it is used and not time. Further, exercise increases muscle strength and coordination (reduces risk of falls); and improves prosthetic fixation; and that even high impact activities (hiking, skiing, tennis) may be performed on an occasional basis but not used for regular endurance exercise.

UKA has been gaining in popularity, and a younger, more active patient population has been undergoing the surgery. There is, however, a lack of literature regarding sporting activities following a UKA procedure. Walton et al [19] compared TKA and UKA patients on return to sport and work, and found that UKA patients were significantly (P = .0003) more likely to increase or maintain their pre-operative level of sporting activity following surgery than TKA. Fisher at al [16] looked at sporting and physical activity following Oxford medial unicompartmental knee arthroplasty, and reported 93% of patients were able to return to their regular sporting or physical activity following surgery. The two main activities were swimming and golf, with approximately 35% of the patients returning to cycling, dancing, hiking, or lawn bowling. Three patients also returned to gym, squash, and jogging. This is a higher rate of return to sporting activities than previously reported for TKA (65%) [43], and the authors attribute that to the Oxford UKA device, which functions mechanically in a more physiological manner than the TKA [16].

A study by Naal and his colleagues [12] in the American Journal of Sports Medicine evaluated the return to sports and recreational activity in a mostly Swiss patient population after unicompartmental knee arthroplasty. They found that the vast majority of UKA patients were able to return to sports and recreational activity. In their study, these authors demonstrated a return to activity rate after UKA of about 95%, which is better than rates after TKA. Ninety percent of these patients stated that surgery had maintained or improved their ability to participate in sports. The top five sports that the patients (men, women, older than 66 years, under 66 years) participated in were hiking, cycling, swimming, downhill skiing, and exercise walking (5% of the younger group played tennis). Hiking and cycling were the most common sports, with approximately 51% of patients participating in one of the two activities [12]. The vast majority of patients treated with UKA in this study were very active and they were able to return to sports and recreation following surgery. The authors note that the primary indication for knee arthroplasty is still pain relief and improved function, but that patient's expectations are rising regarding the return to unrestricted daily activities and the restoration of the ability to participate in sports. At times, these expectations are unrealistically high, and prosthetic wear remains a major concern for long-term implant survival. In this current study, the follow-up period of 1-2 years is too short to formulate a valid conclusion regarding prosthetic wear and loosening in physically active patients after UKA [12].

Conclusion

There has been a resurgence of interest in unicompartmental knee arthroplasty (UKA) for treatment of medial unicompartmental knee osteoarthritis (OA). Improved prosthetic design, minimally invasive surgical techniques, and strict patient selection criteria have resulted in improved survivorship and functional outcomes. A review of orthopedic literature was conducted regarding the advantages of UKA versus total knee arthroplasty (TKA); UKA indications; survivorship; conversion of UKA to TKA; rehabilitation and outcomes. The UKA appears to be a viable option for patients with knee medial compartment OA, including younger and active patients. Survivorship rates of 94% to 97% at 10 years have been reported.

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Austin Arthritis - Volume 3 Issue 1 - 2019
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Citation: Bernardino S. Unicompartmental Knee Arthroplasty: A Narrative Review of the Literature from Year 1988 to Year 2007. Austin Arthritis. 2019; 3(1): 1016.