بسم الله الرحمن الرحيم

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بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

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Cemented versus Cementless Unicompartmental Knee Arthroplasty (Systematic Review & Meta-Analysis)

A Systematic Review & Meta-Analysis

Submitted for Partial Fulfillment of Master Degree in
Orthopedic Surgery

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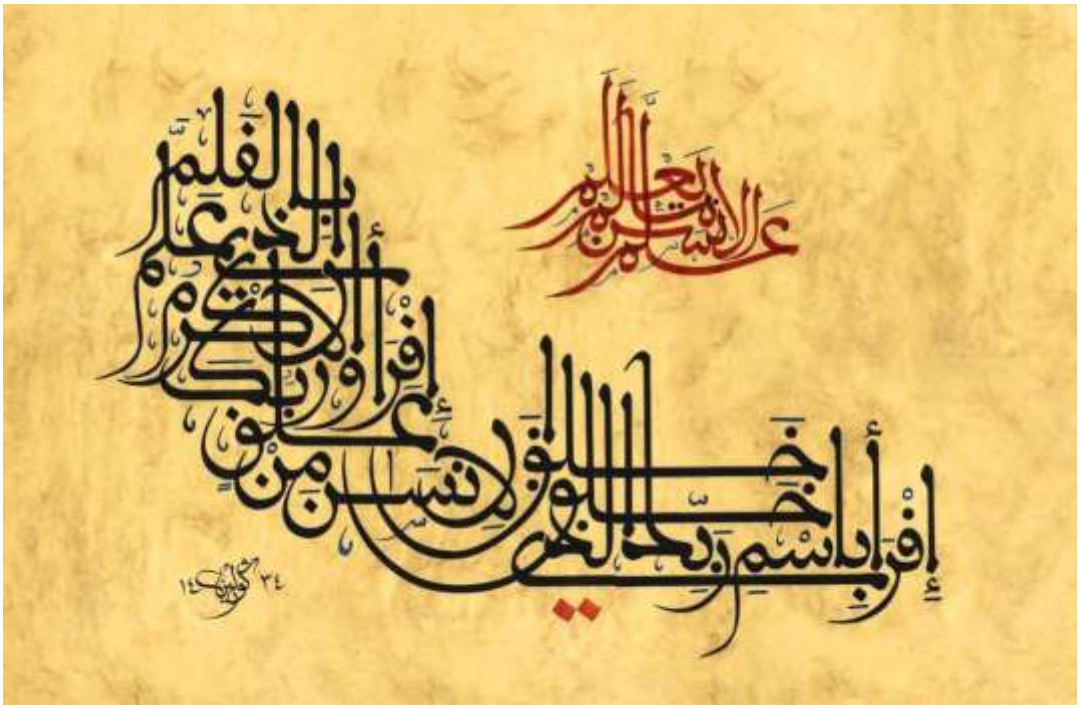
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List of Abbreviations

Abb.	Full term
AMOA	*Symptomatic anteromedial knee osteoarthritis*
CI	*Confidence interval*
KSS	*Knee Society Score*
OKS	*Oxford Knee Score*
OUKR	*Oxford Unicompartmental Knee Replacement*
PA	*Per annum*
PF CAT	*Physical function computerized adaptive test*
PRIMSA	*Preferred reporting items for systematic reviews and meta-analyses*
PRO	*Patient's reported outcomes*
PROM	*Passive range of motion*
SE	*Standard error*
SMD	*Standard mean difference*
TKR	*Total knee replacement*
UKO	*Unicompartmental Knee Osteoarthritis*
UKP	*Unicondylar knee prosthesis*
UKR	*Unicompartmental knee replacement*
WOMAC	*Western Ontario and McMaster universities arthritis index*

INTRODUCTION

The exact treatment of choice for primary unicompartmental knee osteoarthrosis of the knee is still controversial. Most of the options available to the orthopedic surgeon include arthroscopic or open debridement, high tibial osteotomy (HTO), McKeever hemiarthroplasty, total knee arthroplasty (TKA), unicompartmental knee arthroplasty (UKA), and arthrodesis[1]. HTO has excellent short-term results and perfect outcomes but deterioration may follow regardless of the alignment achieved at the time of osteotomy assessment[2,3]. The primary rehabilitation from this intervention is much more extensive than that from other surgical procedures.

UKA is a resurfacing procedure of the arthritic femoral and tibial condyles that aims to recreate the natural tibial slope and maintain the joint line maintenance, many studies comparing UKA to HTO have proven that UKA provides more consistent pain relief than HTO[4,5]. On the other hand, revisions after HTO have also shown a greater clinical success rate than those after UKA[6].

UKA is an effective well-established treatment option for late end-stage, symptomatic anteromedial knee osteoarthritis (AMOA) and less commonly for lateral compartment osteoarthritis[7]. It is confined to a single compartment that has failed to respond to conservative management[8]. While Unicompartmental Knee Replacement (UKR) offers substantial

benefits over total knee replacement (TKR)[9-11], being associated with significantly lower perioperative morbidity and mortality[12,13], smaller incision, less soft tissue injury, minimal bone stock resection, less blood loss, as well as lower infection rate, lower cost, shortened hospital stay, faster recovery, better range of movement (ROM) in addition to superior function, preservation of both cruciate ligaments, complete preservation of patellofemoral articulation, maintaining normal knee kinematics, stability, and mechanical alignment, rapid return to work and sport, subjective preference and satisfaction for a normal feeling and natural function of the knee[1,14]; controversy on the validity and durability of UKA, remains because it has higher revision rates[15], particularly for aseptic loosening[16-18].

Several studies showed excellent long-term survival and clinical outcomes[19-25]. However, the higher revision rates in UKA in many other studies[26-28]are a concern. The difference between UKA and TKA in revision rate is likely to be multi-factorial. A major issue seems to be the ease to choose for revision of a unicondylar knee prosthesis (UKP) compared to a revision of a total knee prosthesis (TKP).

A registry data of a deeper analysis has revealed how experience or usage or surgeon's volume intended as the proportion of cases that are UKR in a surgeon's practice per year, influences the outcome of the procedure. Surgeons achieve acceptable revision rates if performing UKR

procedures in more than 20% of their knee arthroplasties, and achieve optimal results if performing around 50%. In contrast, usage of less than 20% results in a high revision rate[29]. This analysis can explain the good results reported in big cohort studies and randomized controlled trials and their discrepancy with those reported in national registries. However, these studies are mostly from the designers and some authors have expressed concern regarding the accessibility and benefits of such results in non-designer centers[30].

John Goodfellow used UKA first time in 1976 (phase1)[31]. The insert eliminates the tangential forces acting on the tibial surface, reducing polyethylene wear and tear and thus improving implant survival i.e. The use of a fully congruous meniscal bearing prosthesis can reduce wear to a very low rate in the knee arthroplasty[32-35]. The Oxford UKA was first used clinically in 1982[31]. At first, Surgeons had used a spherical reamer in 1987 (phase 2)[36,37], then they have used five sizes of femoral components, and right and left-sided tibial components have been available for clinical application (phase 3) since 1998.

Cemented and cementless techniques are the two types of fixation used for implant components. Cementation via bone cement (polymethyl methacrylate) has been the only option available for many years before introducing the cementless version of the UKA in 2004. Cementation in UKA may be technically challenging because the surface area is reduced and

the operative exposure is decreased. Cemented components are commonly performed using a minimally invasive technique that relies on bone cement to fix the components to surrounding trabecular bone; whereas, cementless components rely on the principle of press-fit fixation and osseointegration[38-40]. The current gold standard for knee replacement is cemented fixation[16-18], given the poor results of the first cementless knee replacements[41-42]. Good long-term survival rates (98% at ten years[43] and 91% at 20 years[44]) have been reported for the cemented Oxford UKA (Oxford UKA, Zimmer Biomet, Bridgend, Swindon, United kingdom), which show that a low rate of the revision can be achieved with this device. These higher progress levels have been attributed to better surgical techniques, proper improved instruments, newer implant designs, and careful patient selection[45]. Independent third-party studies recorded slightly inferior results, with ten-year follow-up survival ranging only from 83% up to 90% [7].

These vague differences are debated in the literature as a result of the learning curve problem. Centers using UKA with more volume, higher caseloads, and larger experience have better results than centers using UKA less frequently[46]. A recent Cochrane review[47]noted that cemented tibial components migrate less than cementless components in the first two years, but those cementless components may have a lower risk of aseptic loosening in the longer term. There has been a recent increase in interest in cementless fixation given

the need for fixation to last a patient's lifetime with rising life expectancies[48]. Additionally, the merits of less pain and little wear, more natural biological fixation, bone growth induction, avoidance of loosening of tibial or femoral components[10,42,49], cementation errors, third body particles in the joints, a reduction in radiolucent lines (RLLs), also described as physiological radiolucencies that considered as an indication of fibrocartilage at the interface and are seen in nearly over half of cemented UKR tibial components[50]; In the presence of pain, these can be misinterpreted as aseptic loosening and causing pain leading to revision even though some studies urged no relation[50], radiolucency either partially or uniformly under implants may be due to stress shielding caused by using an inadequate cement technique[51]are certainly attractive. Thus reducing the revision rate discrepancy between the National Joint Registries and high volume centers. RCTs comparing cemented and cementless UKRs found no statistically significant variation in functional outcomes, but the prevalence of partial and complete radiolucencies was decreased with cementless implants[52].

RLLs can be physiological or pathological. Physiological RLLs are well defined, 1–2-mm thick, and combined with a radiodense line[50], in contrast to pathological RLLs that are > 2-mm poorly defined, thick, and have no radiodense line[53]. Pandit et al. found that radiolucency less frequently occurs in uncemented UKAs (6.3%) versus (75%) in cemented UKAs[51].

Cemented UKAs have been adopted to reveal a higher occurrence of radiolucencies due to the probable incomplete cementation, thermal osteonecrosis, and formation of fibrous tissue[84]. Liddle et al. found that the physiological radiolucencies are usually misinterpreted on radiographs[54]. These physiological radiolucencies are defined as narrow, conservative, and representative of an incomplete layer of fibrocartilage that does not impact implant survival in a negative manner. The vertical wall of the tibial component is not coated with porous titanium In the Oxford medial UKA, so in post-operative radiograph evaluation; it often shows adjacent radiolucencies that can be ignored safely. Thus, the presence of RLLs may lead to a higher incidence of misinterpretation in cemented UKA compared with cementless implant resulting in faulty prosthesis revisions in a potential well-fixed and good-functioning arthroplasty[94].

These trials were not sufficient to compare revision rates. However, data from the New Zealand joint Registry (NZJR) suggest a lower revision rate for the cementless UKR compared to the cemented UKR[53]. The variation in the revision rate seen in the NZJR is not clear if due to differences in components of implants or other factors. For example, it might be that the more experienced surgeons, who perform a larger volume of interventions are substantially using cementless components and hence have lower revision rates. In February 2013, a published study analyzed the results of six years' follow-up of