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Review

Outcomes of cementless unicompartmental and total knee arthroplasty: A systematic review

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ABSTRACT

Background: Aseptic loosening is a common failure mode in cemented unicompartmental knee arthroplasty (UKA) and total knee arthroplasty (TKA). This led to the development of cementless designs but the historical outcomes were poor. Recent developments in cementless designs have improved outcomes, but the current status is unknown. Therefore, a systematic review was performed to assess recent outcomes of cementless knee arthroplasty.
Methods: A search was performed using PubMed, Embase and Cochrane systems and national registries for studies reporting outcomes since 2005. Fifty-two cohort studies and four registries reported survivorship, failure modes or functional outcomes of cementless UKA and TKA.
Results: Nine level I studies, six level II studies, three level III studies, 34 level IV studies and four registries were included. Three hundred eighteen failures in 10,309 cementless TKA procedures and 62 failures in 2218 cementless UKA procedures resulted in extrapolated five-year, 10-year and 15-year survivorship of cementless TKAs of 97.7%, 95.4% and 93.0%, respectively, and cementless UKA of 96.4%, 92.9% and 89.3%, respectively. Aseptic loosening was more common in cementless TKA (25%) when compared to UKA (13%). Functional outcomes of cementless TKA and UKA were excellent with 84.3% and 84.5% of the maximum possible scores, respectively.
Conclusions: This systematic review showed that good to excellent extrapolated survivorship and functional outcomes are seen following modern cementless UKA and TKA, with a low incidence of aseptic loosening following cementless UKA.
Level of evidence: Level IV.

Contents

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1. Introduction

Unicompartmental knee arthroplasty (UKA) and total knee arthroplasty (TKA) are two reliable arthroplasty treatments for unicompartmental and tricompartmental osteoarthritis (OA), respectively. Different fixation methods for these treatments consist of cemented fixation of femoral and tibial components, cementless fixation of both components or hybrid fixation (i.e., cementless femoral component with cemented tibial component). Cemented fixation is most commonly used, according to national registries with an incidence of 56% to 94% [1–4]. Recent systematic reviews reported excellent 10-year survivorship of cemented UKA and TKA (91.7% and 95.3%, respectively) [5,6].

It has been suggested that poor cement fixation could lead to aseptic loosening [7,8], which is the most common failure mode in cemented UKA [9] and TKA [8]. Over the last decade, there has been an increase in interest for cementless fixation in UKA and TKA [4,7,10]. Historically, however, results of cementless prosthesis fixation were disappointing, with revision rates up to 20% at early to mid-term follow-up for UKA [11–13] and TKA [14–16]. Recent improvements, such as coating of the prostheses with bioactive materials, should improve osseous ingrowth and biological cementless fixation [17] and therefore improve outcomes of cementless UKA and TKA.

Studies systematically reviewing outcomes of cementless UKA and TKA over the last decade are, however, lacking or partially based the conclusions on older studies [5]. Therefore, the goal of this systematic review was to assess recent outcomes of cementless UKA and TKA with regard to (I) survivorship, (II) failure modes and (III) functional outcomes in recent studies. We hypothesized that for both procedures excellent survivorship and functional outcomes have been reported in the recent literature. Secondly, we hypothesized that the incidence of aseptic loosening is lower using cementless designs when compared to cemented UKA and TKA in the literature.

2. Methods

2.1. Search strategy

A search in the electronic databases PubMed, Embase and Cochrane Library was performed for studies reporting outcomes of cementless UKA and TKA. The search algorithm for this search was "(cementless OR uncemented) AND (knee arthroplasty OR knee replacement OR unicompartmental knee arthroplasty OR unicompartmental knee replacement OR total knee arthroplasty OR total knee replacement OR TKA OR UKA OR TKR OR UKR)". Following removal of duplicates, two authors (JPL and DLS) independently scanned all studies by title and abstract for eligibility for this study. These selected studies were then scanned for full text on the inclusion and exclusion criteria. In addition, references of eligible articles were scanned for additional studies and registries were searched for outcomes of cementless knee arthroplasty. In case of any disagreement, a third author (ADP) was consulted and consensus was reached on inclusion and exclusion of all studies.

2.2. Selection criteria

Inclusion criteria for the search consisted of studies that (I) reported survivorship, revision rates or functional outcomes of primary cementless UKA or TKA, (II) were published between 2005 and 2016, (III) were minimum level IV studies according to adjusted Oxford Centre for Evidence-Based Medicine [18,19]. Exclusion criteria consisted of (I) main indication of surgery was not OA, (II) revision cases, (III) specific patient groups (e.g., only <55 years of age or only obese patients), (IV) hybrid fixation, (V) long stem fixation, (VI) not clearly reporting fixation methods, (VII) not reporting mean follow-up, (VIII) studies using the same database of patients or (IX) study designs of meta-analysis, reviews or case reports.

2.3. Methodological quality of studies

Level of Evidence of the studies was determined using the adjusted Oxford Centre for Evidence-based Medicine [18,19]. To assess methodological quality of studies, two different tools were used. For level I randomized clinical trials (RCT), the PEDro tool was used [20]. This tool assesses methodological quality of RCTs using 11 questions on blinding, randomizing method and study quality. For non-randomized studies, the Methodological Index for Non-randomized Studies (MINORS) instrument was used [21]. This tool assesses methodological quality of comparative and non-comparative non-randomized studies using 12 and eight questions, respectively. Mean scores and percentage of the maximum score were reported.

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