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Is There Evidence Supporting the Use of All-Polyethylene Tibial Components in Primary Total Knee Arthroplasty?

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Question: Is There Evidence Supporting the use of All-Polyethylene Tibial Components in Primary Total Knee Arthroplasty?

Response/Recommendation: Excellent performance across various patient demographics, including age, body mass index (BMI), and activity level.

More than two years' follow-up studies indicate that all-polyethylene tibial (APT) components offer major cost savings with excellent performance across various patient demographics, including age, body mass index (BMI), and activity level.

Level of evidences: Moderate.

Expert vote: Agree: 81.2%. Disagree: 12.6%. Abstain: 6.3%.

The survival and revision rates, complications, and functional scores of APT components are comparable to those of metal-backed tibial (MBT) components.

Level of Evidence: Moderate.

Expert vote: Agree: 61.5%. Disagree: 24%. Abstain: 14.5%.

Rationale

Basic Science

Early designs of total knee arthroplasty (TKA) primarily utilized all-polyethylene tibial (APT) components, with studies from that era reporting survival rates exceeding 90% at more than 10 years of follow-up for both cruciate-retaining and posterior-stabilized designs with APT components [1–7]. Early aseptic loosening, often due to poor surgical techniques or design flaws [8–13], led to the introduction of mobile-bearing tibial (MBT) components in the 1970s, providing theoretical advantages such as modularity, which allows for intraoperative flexibility, and isolated polyethylene liner exchanges without disturbing tibial fixation [14,15]. However, designs, components, and surgical techniques when utilizing APT have improved dramatically over the years, leading to better clinical outcomes and increased use among orthopaedic surgeons. To evaluate the outcomes of APT components, studies with more than

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two years of follow-up, including meta-analyses, randomized controlled trials, and retrospective and prospective cohort studies published in peer-reviewed journals, were analyzed.

The APT components demonstrate good to excellent survival with revision rates comparable to MBT components [15–46]. These results were consistent across different age groups [24,32,37,39–41,47–51], with reports from the Total Joint Replacement Registry and other large-scale studies confirming satisfactory outcomes and a low risk of revision in patients below 65 years [37,40]. The APT technique also demonstrated satisfactory outcomes among active patients [26,37,39–41,51]. Most studies evaluating the effect of BMI on outcomes reported that both APT and MBT components performed similarly [37,43,52–55]. Notably, some studies indicated that APT components had better results in morbidly obese patients (BMI > 40) [24,29]. The APT components also exhibit favorable functional scores [22,23,25,27–29,31,33,34,36,39,41,42,45,46,50,51]. Their use in TKA can reduce hospital charges and save costs [8,27,32,34,36,40,45,46,56–62]. The complication rates associated with APT components in primary TKA, such as infections, osteolysis, periprosthetic fractures, component migration, and wound complications, are acceptable and comparable to MBT [20,21,24,25,27,29–31,33,35,37,39,40,42–46,63]. The clinical performance of APT components in TKA has demonstrated consistent benefits, particularly with respect to more than 10 years implant survival and patient satisfaction, but their success is closely linked to both their design and surgical technique [2–6,8,9,12,13,20,23,30,37,42,49,60,61,63–98]. Many randomized controlled trials also confirm these results [26,33,60,66,75]. Nevertheless, patient-specific factors and other potential limitations must be carefully considered when selecting APT components. Notable limitations include the inability to fine-tune knee balancing postimplantation, the lack of stemmed options, and the challenges of undertaking debridement, antibiotics and implant retention in early infections [20,99,100]. However, these concerns are mitigated by the lower infection rates reported with APT constructs [20,21,24,25,27,29–31,33,35,37,39,40,42–46,60,63,65,66].

CRediT authorship contribution statement

Hamidreza Yazdi: Supervision, Conceptualization. **Mohammadamin Haghbin:** Methodology, Investigation. **Mohammadmahdi Omidian:** Methodology, Investigation. **Aidin Eslam Pour:** Methodology, Conceptualization. **Victor H. Hernandez:** Conceptualization. **Fouad Zamel Sadek:** Conceptualization. **Masood Umer:** Conceptualization. **Antonio Fraguas Castany:** Conceptualization.

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