

IN BRIEF

Can Isolated Tibial Component Revision Be an Alternative to Isolated Aseptic Loosening of the Tibial Component in Total Knee Arthroplasty?

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Received: 3 April 2023

Accepted: 12 November 2023

Abstract

This article reviews the information on isolated tibial component revision for isolated aseptic loosening of the tibial component in total knee arthroplasty (TKA). It summarizes the results of recent major studies published in PubMed since the beginning of the search engine until 28 March 2023. Sixty-five articles were found, of which only five were analyzed because they were directly related to the title of this article. At 5-year follow-up isolated tibial revision and both-component (femoral and tibial) revision for aseptic loosening did not differ with regard to failures of the implant, adverse events, and clinical outcomes.

Level of evidence: III

Keywords: Aseptic tibial loosening, Isolated tibial revision, Knee, Revision, Total knee arthroplasty

Introduction

This article reviews the information on isolated tibial component revision for isolated aseptic loosening of the tibial component in total knee arthroplasty (TKA). It summarizes the results of recent major studies published in PubMed since the beginning of the search engine until 28 March 2023. Sixty-five articles were found, of which only five were analyzed because they were directly related to the title of this article.¹⁻⁵

Recent publications

In 2020 Martin et al. stated that tibial component aseptic loosening was a common source of unsuccessful primary TKA. Treatment alternatives comprise the isolated revision of the tibial component or the revision of both prosthetic components (femoral and tibial). Both-component revision was commonly chosen by orthopedic surgeons unacquainted with the implanted prosthesis or who merely want to start from the beginning. This alternative implies more morbidity than the isolated revision of the tibial component. Although isolated revision of the tibial component is associated with lower morbidity, the procedure is more difficult due to problems with the surgical

approach and keeping the stability of the implant. Martin et al. compared these two reconstructive alternatives. The conclusion was that at 3.5 year follow-up on average isolated revision of the tibial component in cases of aseptic loosening of the tibial component gave similar outcomes than the revision of both components (femoral and tibial). Considerable osseous loss can happen when extracting a well-fixed femoral component requiring the implantation of a cone or sleeve. Revision of the femoral component for isolated aseptic loosening of the tibial component can commonly be averted, as long as we can achieve appropriate stability of the ligaments.¹

In a retrospective comparative study published in 2021, Lee et al. stated that isolated revision of the tibial component could be a management alternative for isolated loosening of the tibial component; nevertheless, not many publications have established its effectiveness. The conclusion was that the isolated revision of the tibial component for isolated aseptic loosening of the tibial component demonstrated equivalent results to the revision of both prosthetic components (femoral and tibial). The pros of the isolated revision of an aseptic tibial component were less surgical

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time and blood loss.²

In 2021 Tracey et al. affirmed that loosening of the tibial component is one of the most frequent failure manners in modern TKA. Insufficient literature was accessible on the results of isolated revision of the tibial component without the removal of the cruciate retaining (CR) femoral component. They analyzed the outcomes of isolated tibial revisions in CR TKA. The conclusion was that in individuals with isolated loosening of the tibial component and a well-fixed and well-positioned CR femoral component, isolated revision of the tibial component provided very good initial to mid-run prosthetic survival and clinical results with a reduced risk of tibial component instability leading to loosening of the tibial component.³

In 2023 Howard et al. stated that the revisions of aseptic TKAs might need revision of one or two prosthetic components (femoral and tibial). The outcomes of this study demonstrated that the isolated revision of a single component (femoral or tibial) is a reasonable alternative, with equivalent results, adverse events, and prosthetic

survival than the revision of both components (femoral and tibial). Therefore, revision of one of the components (femoral or tibial) should be contemplated where suitable.⁴

In a study with level 3 of evidence (cohort with control) published in 2023 by Apinyankul et al., they affirmed that both-component revision due to aseptic loosening had good results. In aseptic loosening, revision of only one component was associated to less surgical time and cost; nevertheless, implant survival and results of these different procedures were not clear. The conclusion was that one-component revision and two-component revision due to aseptic loosening were not different with regard to implant failures, adverse events, and outcomes at 5-year follow-up. Bad American Society of Anesthesiologists (ASA) situation, increased comorbidities, lack of stability, and a great osseous loss were associated with poor functional amelioration.⁵

Table 1 summarizes recent data on the role of partial-component rTKA for isolated aseptic tibial side loosening [Table 1].

Table 1. Recent data on the role of partial-component revision total knee arthroplasty (rTKA) for isolated aseptic tibial side loosening

AUTHORS [REFERENCE]	YEAR	LoE	MATERIALS AND METHODS	CONCLUSION
Martin et al (1)	2020	NA	Individuals experiencing rTKA for isolated aseptic tibial loosening between 2012 and 2017 were identified. Those with revision implants or revised for infection, instability, osteolysis, or femoral component loosening were excluded. A total of 164 individuals were included; 88 had an isolated tibial revision and 76 had revision of both components despite only having a loose tibial component. The demographics and clinical and radiological results were recorded. The patient demographics were statistically similar in the two groups. The median follow-up was 3.5 years. Supplementary femoral metaphyseal fixation was needed in five individuals in the full revision group. There was a higher prevalence of radiological tibial loosening in the full component revision group at the final follow-up [8 (10.5%) vs 5 (5.7%)]. Three individuals in the full component revision group developed instability while only one in the isolated tibial group did. Three individuals in the full revision group developed a flexion contracture greater than 5° while none in the isolated tibial group did.	Femoral component revision for isolated tibial loosening can commonly be avoided provided adequate ligamentous stability can be achieved.
Lee et al (2)	2021	NA	These authors compared the clinical and radiological results between isolated (tibial component) and total (femoral and tibial component) rTKA. Between January 2008 and February 2017, 31 patients experienced rTKA for isolated tibial side loosening; 14 experienced an isolated tibial component revision (isolated cohort) and 17 experienced total (both femoral and tibial components) revision surgery (total cohort). The postoperative ROM, Western WOMAC index, KSKS, KSFS, and MA were compared between the two cohorts. The intraoperative tourniquet time and amount of blood drainage were also compared. The mean follow-up durations in the isolated and total cohorts were 40.7 and 56.1 months, respectively. Both cohorts had similar postoperative ROM, WOMAC index, KSKS, KSFS, and MA; however, significantly shorter tourniquet time (105.2 vs. 154.6 minutes) and less blood drainage (417.2 vs. 968.1 mL) were noted in the isolated cohort than in the total cohort.	Isolated tibial component rTKA for tibial component loosening demonstrated comparable clinical and radiological results to those of total revision TKA.

Table 1. Continued

Tracey et al (3)	2021	NA	<p>These authors analyzed the outcomes of isolated tibial revisions in CR TKA. They identified 135 individuals who experienced an isolated tibial revision after a primary CR TKA from their institutional registry between January 2007 and January 2017. The mean time between the primary and revision was 2.9 years (range 0.1-15.4). Revision with a press-fit stem was carried out in 79 individuals and 56 individuals were revised with a fully cemented stem. Individuals were assessed at a minimum of two years using KSS, Knee Injury and Osteoarthritis Score for Joint Replacement, and radiography. Implant survivorship was determined using Kaplan-Meier survival analysis. At a mean follow-up of 5.1 years, there were six (4.4%) repeat revisions: three for periprosthetic joint infection (2.2%), two for instability (1.5%), and one for a fractured tibial stem (0.7%). The mean KSS and Knee Injury and Osteoarthritis Score for Joint Replacement increased from 51.6 and 56.1 preoperatively to 90.1 and 89.7 after surgery. Survivorship free of repeat revision for any cause was 93.3% at 5 years, and aseptic revision survivorship was 95.8% at 5 years. No implants were radiographically loose.</p>	<p>In individuals with isolated tibial loosening and a well-fixed and well-positioned CR femoral component, isolated tibial revision provided excellent early to midterm implant survivorship and clinical results with a low risk of instability and recurrent tibial loosening.</p>
Howard et al (4)	2023	NA	<p>They analyzed the clinical and functional results in 1- versus 2-component TKA revisions. They identified 92 1-component (tibial or femoral) revisions at a single center. The inclusion criteria were isolated revision of the tibial or femoral components with a minimum 2-year follow-up. The included cases were matched 1:2 with a control cohort of 2-component revisions (tibial and femoral) by age, BMI, ASA score, and indication for revision. They collected demographics, adverse events, operative times, any subsequent rerevisions, and functional outcome scores. The median follow-up time for the 1- and 2-component revision cohorts were 10 years (range, 3 to 17) and 8 years (range, 2 to 18), respectively. The most common adverse event after rerevision in both cohorts was stiffness at 9 of 92 (9.8%) and 9 of 170 (5.3%) in the 1- and 2-component cohorts, respectively. The overall complication incidence in the 1- and 2- component revision cohorts was similar 20 of 92 (22%) and 35 of 170 (21%), respectively. Subsequent rerevisions for any indication were found in 12 of 92 (13.0%) of the 1-component and 18 of 170 (11%) in the 2-component cohorts. There was no statistical difference in survivorship or functional outcomes scores between the cohorts.</p>	<p>The outcomes of this study demonstrated that isolated revision of a single TKA component is an acceptable alternative, with comparable functional results, adverse events, and survivorships when compared with both-component revision.</p>
Apinyankul et al (5)	2023	3	<p>Between January 2009 and December 2019, a consecutive group of rTKA was reviewed. Univariate and multivariable analyses were utilized to study correlations among factors and surgical related complications, time to prosthesis failure, and functional results (UCLA, Knee Society functional, knee osteoarthritis and outcome score for joint replacement, Veterans RAND 12 (VR-12) physical, and VR-12 mental). A total of 238 individuals experienced rTKA for aseptic loosening. The mean follow-up time was 61 months (range 25 to 152). Ten of the 105 individuals (9.5%) who experienced full revision (both femoral and tibial components) and 18 of the 133 (13.5%) who experienced isolated revision had subsequent prosthesis failure. The factor analysis of type of revision (full or isolated revision) did not show a significant difference between cohorts in terms of adverse events, implant failures, and times to failure. Metallosis was related to early time to failure and iliotibial band release was associated with more adverse events. Preoperative symptoms of instability were associated with the worst improvement in UCLA score. Higher ASA status and higher Charlson Comorbidity Index were related with worse VR-12 physical and knee osteoarthritis and outcome score for joint replacement scores, respectively.</p>	<p>Isolated and full component rTKA for aseptic loosening did not differ with respect to prosthesis failures, adverse events, and clinical results at 5 years.</p>

LoE, level of evidence; NA, not available; KSS, Knee Society score; ROM, range of motion; WOMAC, Western Ontario and McMaster Universities osteoarthritis index; KSKS, Knee Society knee score; KSFS, Knee Society function score; MA, mechanical axis; CR, cruciate retaining; BMI, body mass index; ASA, American Society of Anesthesiologists; UCLA, University of California Los Angeles

Conclusion

At 5-year follow-up, isolated revision of the tibial component and both-component (femoral and tibial) revision for aseptic loosening of the tibial component were not different with regard to implant failures, adverse events, and outcomes.

Acknowledgement

Not applicable

Conflict of interest: None

Funding: None

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