

ANTHEM[◊] Total Knee System (TKS) offers the potential to improve anatomic implant fit by reducing implant overhang, compared to standard fit implants, which could increase patient satisfaction

+ Plus points

Patients with no femoral overhang are associated with improved clinical outcomes, compared to those with overhang¹⁻³

Patients of different ethnicities are associated with different knee size and shape^{4,5}

Narrower femoral implants, such as ANTHEM TKS, may result in a better fit for patients by reducing implant overhang⁵

Introduction

- The number of total knee arthroplasties (TKAs) performed globally is expected to surge over the coming years due to the increasing prevalence of obesity and increased life expectancies⁶
- With growing global demand, it is important to identify differences in knee shape and size across varying ethnicities and design knee implants which correctly fit patients of differing anatomies

- ANTHEM TKS is designed to promote improved anatomic implant fit for a diverse patient population⁷
- ANTHEM TKS has evolved from the GENESIS[◊] II system, which has over 20 years of clinical use demonstrating it safe and effective with a high survivorship rate⁸



ANTHEM TKS (posterior stabilised [left] and cruciate retaining [right])

Compromised TKA fit is associated with decreased patient satisfaction

Up to one in five patients are left feeling unsatisfied following their TKA procedure.⁹ The primary determinant of patient satisfaction is the fulfilment of patient expectations, of which pain relief and improved knee function are the most common.¹⁰

Several studies have shown that femoral overhang (where the component is wider than the distal part of the femur) is associated with reduced functional and patient-reported outcomes compared to those without overhang.¹⁻³

In a study of 114 consecutive TKAs, mediolateral (ML) overhang was shown in at least one area in over 60% of femurs and tibiae.¹ Pain score and Knee Injury and Osteoarthritis Outcomes Score (KOOS) showed that oversizing was associated with worse clinical outcomes, when compared to TKAs without oversizing (Figure 1).¹ KOOS is a patient-reported outcomes measure recording the patient's assessment of their knee replacement and any associated problems.¹¹

In addition, Chung BJ, et al., reported **significantly reduced flexion with an overhang of ≥4mm compared to no overhang** (121 vs 133°; p<0.001) in a study of 1,025 TKAs in Korean patients.³

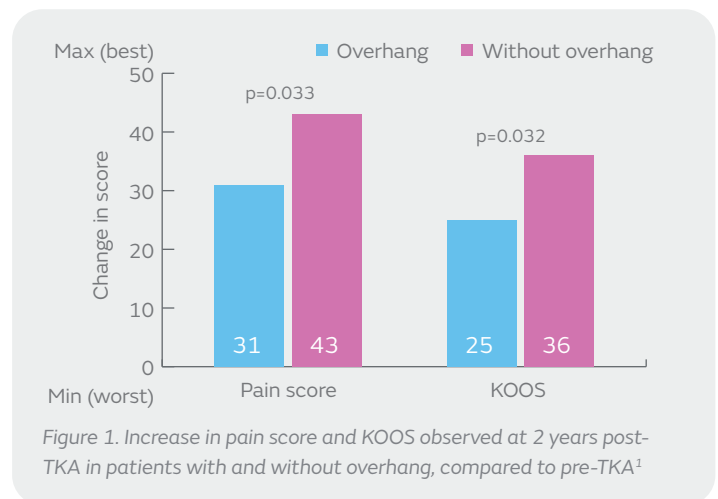


Figure 1. Increase in pain score and KOOS observed at 2 years post-TKA in patients with and without overhang, compared to pre-TKA¹

"This study confirms that oversizing may lead to worse clinical results in TKA."¹

These results are corroborated by Mahoney OM, et al.² In a study of 437 TKAs, 68% of women and 40% of men had an overhang of ≥3mm in at least one zone. The authors showed that overhang was associated with an almost **two-fold increase in risk of knee pain more severe than occasional or mild at 2 years post-TKA** (Figure 2).²



Figure 2. Increase in knee pain risk with more severe than occasional or mild at 2 years post-TKA overhang²

Differences in size and shape of knees among different ethnicities

Nearly all TKA implants are designed based on male, western, primarily Caucasian patients. Kim TK, et al., conducted a systematic literature review to help understand how the femur and tibia differ among ethnic populations.⁴ The authors identified 30 eligible studies which met the study criteria, and included the assessment of four ethnic populations (Figure 3).

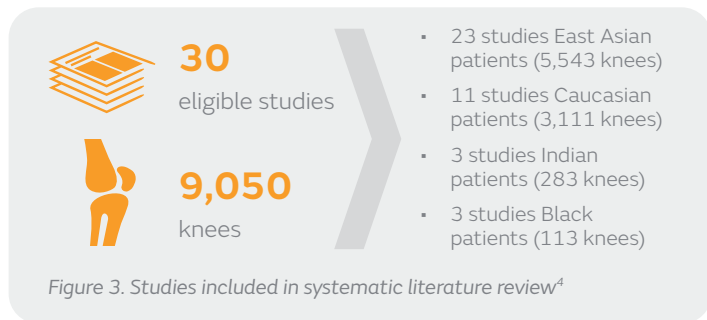


Figure 3. Studies included in systematic literature review⁴

Anteroposterior (AP) height and ML width were assessed for both the femur and the tibia to determine the size of the knee. Aspect ratios, which were calculated by dividing the ML width by the lateral AP for both the femur and tibia, were used to assess the shape of the knee.⁴

Whilst the study was limited by the underrepresentation of Black and Indian populations in the published literature, **patterns in the differences in both size and shape were observed between knees from different ethnicities.**

“Matching the size of TKA components to the size of the resected bony surface may help to minimize complication and prolong survival.”⁴

Improving TKA component fit by introducing ANTHEM^o TKS

The anatomical variations in knee dimensions identified between different ethnicities⁴ may present a problem in optimal component fit with standard implant sizes. Sharma G, et al., assessed whether the addition of a femoral component with a reduced ML dimension for the same AP dimension (ANTHEM TKS) could improve fit across various ethnicities.⁵

The authors analysed the femoral dimensions of 967 TKAs with the GENESIS^o II implant from 119 Australian Caucasian patients and 212 patients from each of four Asian ethnic groups (Chinese,

Indian, Japanese and Korean). Differences in size and shape were identified between the groups, which influenced the rate of overhang.⁵ In female patients, overhang was more frequent at the trochlear than at the condylar level across most ethnicities.⁵

When an additional narrow femoral component (ANTHEM TKS), with an optimised trochlear and mediolateral dimension,⁷ was available, the improved-fit rate increased significantly for Caucasian, Indian and Korean women, compared to when only the standard implant was available (Figure 4), with slight improvements in Caucasian, Chinese and Indian males.⁵

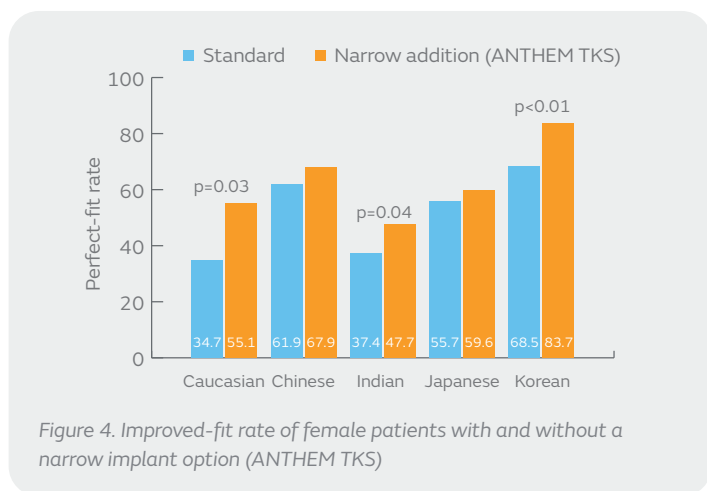
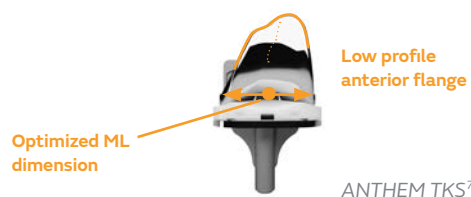


Figure 4. Improved-fit rate of female patients with and without a narrow implant option (ANTHEM TKS)

“The additional availability of a femoral component with a reduced mediolateral dimension for the same anteroposterior size [ANTHEM TKS] has the potential to reduce overhang and improve component fit across ethnicities.”⁵



Conclusion

The availability of a narrower femoral component with an optimised trochlear and mediolateral dimension,⁶ such as ANTHEM TKS, has been shown to improve component fit in some ethnic populations.⁵ By providing improved fit, it may be possible to reduce femoral overhang, which in turn may improve patient satisfaction following TKA.¹⁻³

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