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Patient-Specific total knee arthroplasty for valgus osteoarthritis results in the use of minimal thickness polyethylene liners in low constraint implants

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Abstract

Background: Correction of valgus knee deformity during total knee arthroplasty (TKA) can present numerous challenges. This study assessed the ability of a patient-specific knee design to allow easier intraoperative balancing of valgus knees in primary TKA.

Materials and methods: This study utilized a database consisting of de-identified computed tomography (CT) scans, low constraint knee designs (CR or PS), tibial and femoral implant dimensions, and implanted polyethylene (PE) thickness for all patients who underwent primary TKA with a patient-specific knee design provided by Conformis Inc. (Boston, MA, US). Data were analyzed for knee design, coronal deformity, native posterior and distal femoral offset, and PE thickness.

Results: A total of 26,227 cases were included, of which 25% had valgus deformity. In the PS group, the thinnest available PE (6 mm) was used for 64% of varus cases and 68% of valgus cases (P = 0.004). There was no difference in the distribution of thin (≤ 8 mm) and thick (> 8 mm) PE between varus or valgus knees with 0-5 degrees or > 10 degrees of deformity. Knees with varus deformity of 5-10 degrees were more likely to receive a thick PE than knees with valgus deformity of 5-10 degrees. For the CR group, the thinnest available PE (6 mm) was used in 77% of varus cases and 76% of valgus cases (P = 0.12). There was no difference in the distribution of thin and thick PE between varus or valgus knees regardless of deformity. Over 99% of CR knees received PE with thicknesses 8 mm or less, regardless of degree of preoperative varus or valgus deformity.

Conclusions: These results indicate that patient-specific instrumentation in TKA can facilitate valgus deformity correction without requiring increased PE thickness to achieve balancing. Patient-specific knee designs may reduce the difficulty of valgus knee correction while allowing the use of minimal thickness PEs in low constraint TKA implants.

Keywords: Coronal deformity; Cruciate-retaining; Patient-specific total knee arthroplasty; Posterior-stabilized; Valgus; Varus.

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