

“Outliers” in Osteoarthritic Knees Concerning Distal Femoral Valgus Angle and Femoral Rotation Angle



To the Editor:

We read with interest the article in press at your journal entitled “Variability in distal femoral anatomy in patients undergoing total knee arthroplasty: measurements on 13,546 computed tomography scans” written by Meric et al [1]. We congratulate them for their inspiring work.

The authors analyzed 13,546 computed tomographic (CT) scans of arthritic patients undergoing total knee arthroplasty (TKA) and measured distal femoral valgus angle (DFVA) between the anatomic and mechanical axis, and femoral rotation angle (FRA) relative to posterior condylar line. However, the study itself has some methodological drawbacks:

1. Although the purpose of the study was to better understand average femoral anatomy and the incidence of outliers in their arthritic population, they disregarded severity of varus deformity at the knee and the relationship of this deformity with femoral bowing concerning the DFVA. Negative correlation is reported in literature between the severity of varus deformity and the femoral condylar-mechanical axis angle [2–5]. A lesser femoral condylar-mechanical axis angle in patients with severe varus deformities along with an increased distal femoral axis-mechanical axis angle supports the finding of increased varus femoral bowing in these patients [2–5]. Therefore, it is not surprising to find out the patients with varus deformities and femoral bowing are outliers with DFVA angle of more than 9°. In addition, valgus arthritic knees constituted the other side of outliers with <2° DFVA (Fig. 4 in the original article). If the patients with varus deformity and femoral bowing, and those with valgus arthritic knees had been assessed in separate groups, the average anatomy and outliers in arthritic population would have been evaluated accordingly to get better understanding of the results in clinical setting. Furthermore, to our knowledge, there are no such studies reporting the incidence and severity of femoral bowing in this large consecutive series of patients undergoing TKA for gonarthrosis.
2. There are conflicting results in the literature concerning the correlation between FRA and DFVA but the number of cases in most of these series is limited [6,7]. Grouping the patients regarding the distal femoral morphology would also be helpful to define correlation between FRA and DFVA.
3. Since the authors analyzed CT scans of patients, it should be kept in mind that FRA measurements may differ with or without cartilage and it was reported in the literature that condylar twist angle in the absence of cartilage is greater than the angle with cartilage [8]. There is also intra-individual difference in distal femoral anatomy that can range from 1° to 5° in bilateral measurements [6].

Actually, the data in these large series of patients with osteoarthritic knees contain much more information than the authors gave us. Careful planning of methodology by the researchers could have improved our understanding of the deformity in this patient group.

Harun R. Gungor, MD
Nusret Ok, MD
Kadir Agladioglu, MD

Orthopedics and Traumatology Department, Medical Faculty, Pamukkale University, Kinikli, Denizli, Turkey

Reprint requests: Harun R. Gungor, MD, Orthopedics and Traumatology Department, Medical Faculty, Pamukkale University 20070, Kinikli, Denizli, Turkey

<http://dx.doi.org/10.1016/j.arth.2015.07.003>

No author associated with this paper has disclosed any potential or pertinent conflicts which may be perceived to have impending conflict with this work. For full disclosure statements refer to <http://dx.doi.org/10.1016/j.arth.2015.07.003>.

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In Reply



We have read with the comments of the “Outliers in Osteoarthritic Knees Concerning Distal Femoral Valgus Angle and Femoral Rotation Angle” and we would like to appreciate and thank the authors of the letter and for their interest in our study.

The authors have made some interesting comments with regard to our publication and they clearly have a high level of understanding of the anatomy of the lower extremity. We designed our study as an anatomic study of arthritic knees undergoing total knee arthroplasty (TKA), with the purpose of understanding the variability of distal femoral anatomy. In the literature, many anatomic studies have been performed with non-arthritic knees. We agree that femoral bowing may be an important anatomic variable, but the main goal of our study was to measure the distal femoral valgus angle (DFA) and distal femoral rotation angle (DFRA), which are key anatomic relationships that are used to achieve proper mechanic alignment in arthritic knees undergoing TKA. We found that the distal femoral anatomy is highly variable in patients undergoing TKA. While it is true that our computed tomographic (CT) data contain a wealth of anatomic information, we chose to present the most relevant data for arthroplasty surgeons performing TKA. Although potentially interesting, our purpose was not to investigate the relationship of varus or valgus deformity to femoral bowing. The authors were right that grouping the patients regarding the distal femoral morphology would also be helpful to define correlation between FRA and DFVA. As is true for so many scientific endeavors, seeking the answer to one question usually leads to as many new questions as answers.

We agree that cartilage erosion of the posterior femoral condyle can affect the measurement of the FRA [1]. During TKA surgery surgeons use posterior femoral condyle based guides, whose position may be affected by asymmetric cartilage wear as well as overall condylar anatomy. We used 3D-CT scan data to evaluate patients' anatomic variables of the distal femur, which allows for direct measurement of bony landmarks independent of cartilage thickness. CT is an excellent imaging modality for identifying bony landmarks and determining 3D geometry [2].

One or more of the authors of this paper have disclosed potential or pertinent conflicts of interest, which may include receipt of payment, either direct or indirect, institutional support, or association with an entity in the biomedical field which may be perceived to have potential conflict of interest with this work. For full disclosure statements refer to <http://dx.doi.org/10.1016/j.arth.2015.07.005>.