The Tibial Tuberosity–Tibial Intercondylar Midpoint Distance: Letter to the Editor

Dear Editor:

I have read with great interest and, indeed, multiple times the article of Li et al[1] entitled "Reliability of Tibial Tubercle–Trochlear Groove Distance for Assessing Tibial Tubercle Lateralization: A Study Comparing Different Anatomic References," recently published in your esteemed journal. I commend the authors for researching the tibial tuberosity–tibial intercondylar midpoint (TT-TIM) distance. However, as the lead author of the original article,[2] I feel obligated to pinpoint a few issues that, if left unaddressed, may hurt the truth. I shall therefore refer solely to what the authors have written and do so to my earnest ability. Unfortunately, I have no financial or time resources to extend a possible discussion beyond this humble letter.

In their randomized axial computed tomography (CT) study, 2 blinded observers, both orthopaedic surgeons, at 2-week intervals measured 6 anatomic parameters, namely the TT–trochlear groove (TT-TG) distance, the TT–midepicondyle distance, the TT–Roman arch distance, the TT-TIM distance, the TT–mid inter-epicondyle trochlea intersection distance, and the TT lateralization (TTL) ratio, in 96 patients with recurrent patellar dislocations (RPDs) who underwent surgery (the study group) and 96 patients without RPDs (the age-matched control group). The measurements of these variables were averaged and compared between groups, as well as to the ratio of the distance between the vertical line passing through the midpoint of the TT and the vertical medial tangent of the tibia (d in the numerator) and the distance between the vertical medial and the vertical lateral tangent of the tibia (D in the denominator), the TTL ratio ($TTL = d/D$).

In their study, according to the inclusion criteria, they reported that the cases were the knees with "clinical patellar dislocations at least twice and a history of patellar dislocation surgery."[1] In our study, however, the cases were the knees with clinical patellar dislocations at least twice *without* a history of patellar dislocation surgery—in fact, without *any* kind of knee surgery. We did this because a previous surgical intervention would present a source of bias. A studied knee must have a pathological condition *without* an intervention. Therefore, our cases were *preoperative* TT-TIM distances without a history of prior knee surgery, as we reported.[2] If Li et al[1] wanted to know whether TT-TIM distance can differentiate the knees with and without RPDs, using knees with previous surgical intervention as cases would produce a biased and hence untrustworthy conclusion. On these terms, the authors would have made a *serious methodological error*.

The P values of the intergroup differences for all 6 anatomic parameters studied by Li et al[1] appear quite telling in the sense that they show a stark polarization along the spectrum of statistical significance: on the far right, toward 1, there is the TT-TIM distance ($P = .811$), whereas on the far left, toward 0, there is, well—everyone else ($P < .01$) (see Table 3). They are as far apart as night and day. Now, an isolated result such as TT-TIM distance is a maverick—it is either the only one wrong or the only one right. Given that only the TT-TIM distance was *similar* between the study and control groups (16.5 ± 3.2 vs 16.6 ± 4.0 mm, respectively; $P = .811$), the authors concluded it was the only one wrong. Since they defined the cases "selected from the electronic medical records system for patellar dislocation patients who were hospitalized from January 1, 2018 to May 31, 2021"[1] as "a total of 96 patients who had undergone surgery for patellar dislocation,"[1] I gather they measured *postoperative* TT-TIM distances of a previous, yet-unreported type of surgical intervention. Nonetheless, they repeatedly touch on TT osteotomy throughout their article. Therefore, I could reasonably speculate the surgical intervention performed was a distal realignment correction, that is, TT transfer. The goal of this type of correction, or any for that matter, is to *decrease* the distance, returning it to normal ("normal" typically having *lower* values). Hence, the values of the distance between the corrected and normal knees would be *similar*, provided the correction was successful. Given that only TT-TIM distance was *similar* between groups, it might have been the only one right, acknowledging a surgical correction! On these terms, the authors would have made a *serious interpretation error*.

If, by any chance unbeknownst to me, an attentive reader, the authors have *averaged* preoperative and postoperative measurements of the TT-TIM distance in a single measurement and then used it for the inferential statistics, they would have made a *serious statistical error*.

So, the question remains: What type of measurement (preoperative, postoperative, or averaged) of TT-TIM distance did the authors use to obtain the results in Table 3? It certainly looks like it was a *postoperative* measurement, in which case they should elaborate what type of surgical intervention was performed. I would be eager to hear if they agree that corrected and normal knees should have similar (ie, statistically nonsignificant) values of any distance, including TT-TIM distance. If my line of reasoning is correct, the authors have just proven that TT-TIM distance was the only one capable of acknowledging the

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outcome of surgical correction, which would be a very thought-provoking discovery.

In the frontal plane, TT lateralization is a lateral translation from the mechanical axis of the leg (MAL). The measurement is performed in the axial imaging plane, the initial imaging plane in radiology. Let us not forget, though, that a point in the frontal plane becomes a line in the axial plane. The aim is to measure the distance between the midpoint of the TT (ie, the insertion of the quadriceps muscle/mechanism) and the midpoint of the knee (ie, the theoretical MAL—never mind its deviation of negligible practical import). This is why the second line strives to reflect the midpoint of the knee one way or the other in all 5 distances. Therefore, there is no purpose in comparing the distances with the TTL ratio, which is, en passant, biased (eg, the larger the tibial diameter, *D*, the smaller the TTL ratio).

Interestingly, the mean TT-TIM distance in the control group (16.6 ± 4.0 mm) was *higher* than ours, which might imply an ethnic difference, more so because the standard deviations were similar (SD = 3 mm in our study[2]). Furthermore, the interobserver agreement in both studies was excellent (intraclass correlation coefficients: 0.847 for Li et al[1] vs 0.84).

The TT-TIM distance reflects the *translational* part of the patellar instability, and it would be clinically useful if proven (1) *independent* of a reasonable number of covariables (age, body side, bone rotations [eg, knee rotation, varus-valgus, and tibial torsion], femoral trochlear dysplasia, flexion-extension movements, height, imaging modality, pelvic diameters, sex, and weight, among others), (2) *different* in knees with RPDs and without knee surgery versus knees without RPDs, and (3) *decreased* in knees with isometric contraction versus knees with relaxation of the quadriceps muscle. Why so? Well, if a vast set of covariables, anatomic in particular, *does not control* the distance, it is controlled exclusively by the action of the quadriceps muscle/mechanism (hence, by controlling the action of the quadriceps muscle/mechanism, you control the distance). If the distance is *increased* in knees with RPDs and without knee surgery, it recognizes the patient (hence, you know whom to treat). If the distance is *decreased* with isometric contraction of the quadriceps muscle/mechanism, it reacts to nonsurgical medialization of the TT (hence, you can monitor a nonsurgical therapeutic outcome). Some of these points have been proven and others are yet unpublished (eg, we have a study undergoing peer review on CT vs magnetic resonance imaging, showing no disagreement of the TT-TIM distance values between these 2 imaging modalities as opposed to TT-TG distance). If TT-TIM distance could indicate whom you should treat, enabling you to control a nonsurgical as well as surgical therapeutic outcome exerted on the quadriceps muscle/mechanism, it would seem rather fit for clinical use.

The birth of TT-TIM distance was laborious, with captivating twists in the process. The idea is much older than the year 2020, when it was published, with roots going back to probably 2010. It was mentally completed just about time the TT–posterior cruciate ligament distance was brought out, yet for various reasons, lack of support, and my unpretentious nature, it rested in the shades of sweet obscurity. This letter is therefore not so much a critique of the authors' study (after all, they might have stumbled on something very interesting, albeit of different substance, and for that one must give them due credit), but a friendly call to all of the curious researchers out there, especially those of different ethnicities, to further investigate the TT-TIM distance.

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REFERENCES

1. Li K, Xu C, Dong Z, Ji G, Wang F. Reliability of tibial tubercle–trochlear groove distance for assessing tibial tubercle lateralization: a study comparing different anatomic references. *Orthop J Sports Med*. 2024;12(4):23259671241239965.
2. Nizić D, Šimunović M, Pavliša G, Jelić M. Tibial tuberosity–tibial intercondylar midpoint distance measured on computed tomography scanner is not biased during knee rotation and could be clinically more relevant than current measurement systems. *Int Orthop*. 2021;45(4):959-970.