

**Table 1**

The kappa and weighted kappa values for assessing agreement between 2 observers having more than 2 categories.

	grade	Observer 1			Sum
		1	2	3	
Observer 2	1	60	20	1	81
	2	2	12	4	18
	3	3	11	11	25
Sum		65	43	16	124
Kappa		0.43 (Moderate)			
Weighted kappa		0.63 (Good)			

interobserver reliability ranged from 0.10 to 0.52, while those for intraobserver reliability ranged from 0.29 to 0.66 [1].

We congratulate authors for their valuable work, but we would like to explain some issues about this study. To assess agreement of a qualitative variable, using kappa value is not always an appropriate estimate. First, Kappa is sensitive to marginal distribution and extremely depends on the prevalence. Second, the kappa value is sensitive to the number of categories [2–6]. We should mention that when a variable with more than two categories or an ordinal scale is used (with 3 or more ordered categories), then the weighted kappa would be a good choice to investigate inter and intraobserver reliability [2–6]. Table 1 shows the agreement by applying kappa (0.43 as moderate) and weighted kappa (0.63 as good) which has different values and consequently different interpretations. In this table, the marginal distribution in first category (grade1) is different from the other categories and also, the number of categories is more than two.

Authors concluded that overall interobserver reliability of the FFP classification system was moderate, while intraobserver reliability was substantial. Also, classification of FFP subtypes involving a complete nondisplaced or displaced sacral fracture showed relatively poor reliability. Such conclusion may be a misleading message due to applying an inappropriate estimate to assess reliability.

In this letter, we discussed two important limitations of the kappa value to assess reliability [2–6]. Any conclusion in reliability analyses needs to be supported by the methodological and statistical issues mentioned above.

#### Source(s) of support

None.

#### Conflicts of interest

No.

#### References

- [1] Krappinger D, Kaser V, Kammerlander C, Neuberger C, Merkel A, Lindtner RA. Inter- and intraobserver reliability and critical analysis of the FFP classification of osteoporotic pelvic ring injuries. *Injury* 2019;50:337–43.
- [2] Szklo M, Nieto FJ. *Epidemiology beyond the basics*. 3rd ed. Manhattan, New York: Jones and Bartlett Publisher; 2014.
- [3] Sabour S. Reliability of automatic vibratory equipment for ultrasonic strain measurement of the median nerve: common mistake. *Ultrasound Med Biol* 2015;41:1119–20.
- [4] Naderi M, Sabour S. Reproducibility of diagnostic criteria associated with atypical breast cytology: a methodological issue. *Cytopathology* 2018;29:396.
- [5] Naderi M, Sabour S. Reproducibility of cytological smears stained with modified ultrafast Papanicolaou stain: methodological issue. *Diagn Cytopathol* 2019;47:255–6.
- [6] Sabour S, Dastjerdi EV. Reliability of four different computerized cephalometric analysis programs: a methodological error. *Eur J Orthod* 2013;35:848.

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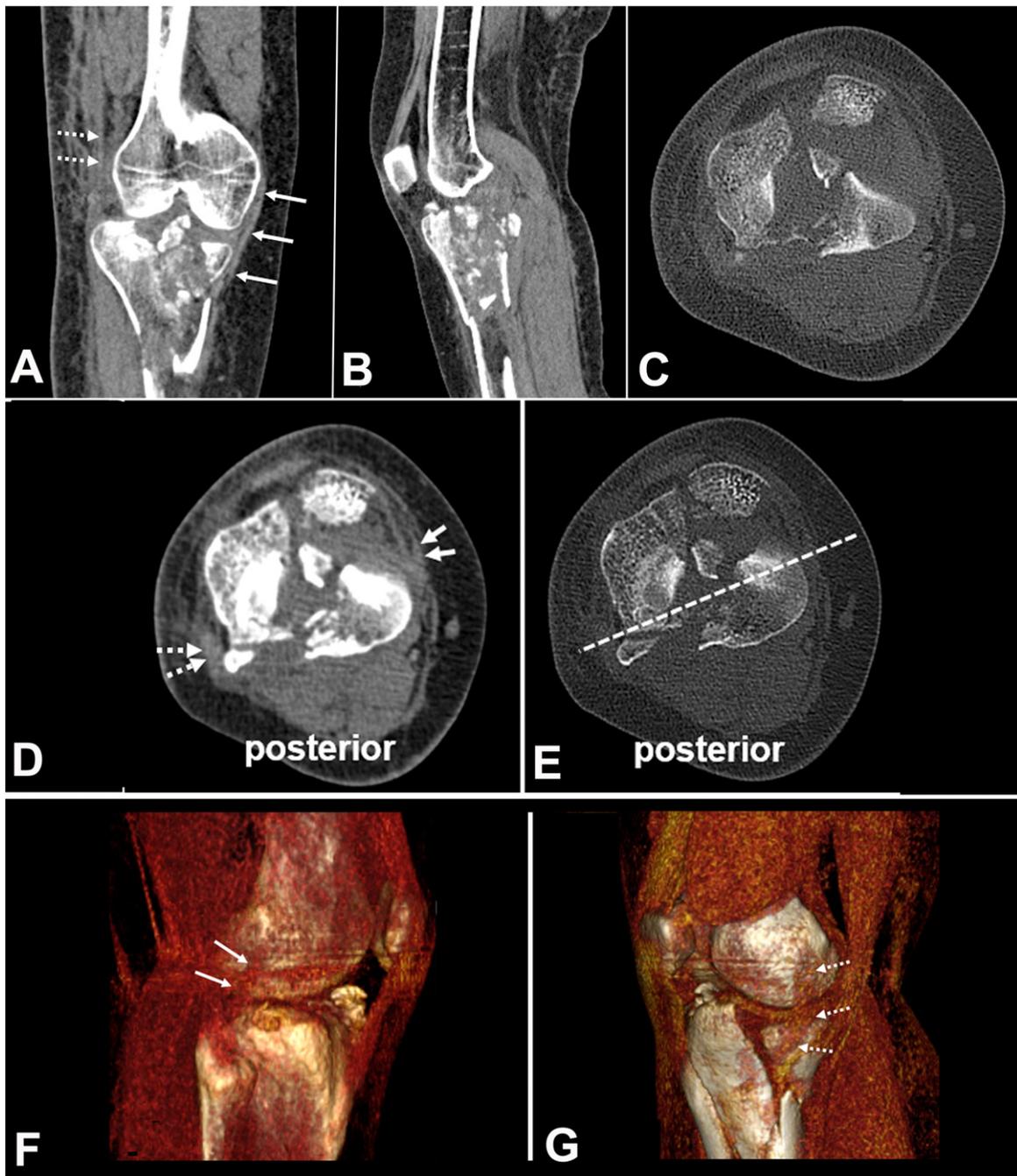
**Response to A. Kumar, et al., Letter to the Editor concerning “Revisiting the Schatzker classification of tibial plateau fractures” by Kfuri M, Schatzker J. *Injury*. 2018 49 December (12):2252–2263, *Injury* (2019) <https://doi.org/10.1016/j.injury.2019.01.020>**



We would like to thank the authors of the letter to the editor for their interesting and challenging remarks. In response to their request, we are highlighting some important aspects of our original manuscript [1]. In our publication, we have emphasized three essential new concepts: the virtual equator, the main fracture plane, and the importance of restoring stability of the joint by restoring the containment of the rim injury. In order to address more expertly some of the specific anatomical questions about the identification of our proposed landmarks for the virtual equator when using computed tomography, we have added a musculo-skeletal radiologist as a co-author of our response.

#### The virtual equator

Our aim in “revisiting the Schatzker classification” was to find a way to localize the lesions responsible for joint instability in three dimensions. In order to do this, we had to establish new anatomical landmarks. The proximal tibial epiphysis has two condyles, each covered by a cartilage surface and a meniscus. Anatomists have accurately described the origin and insertion of the collateral ligaments of the knee; namely, the fibular collateral ligament and the medial collateral ligament [2,3]. The virtual equator uses as landmarks the collateral ligaments of the knee and their specific bony attachments. We agree that high energy tibial plateau fractures are frequently associated with ligament injuries [4]. It is also true that computed tomography does not compare with MRI when it comes to the assessment of soft tissues injuries around the knee. However, the fibular collateral ligament and the medial collateral ligament are easily identifiable in the axial cuts of computed tomography even in cases of comminuted bicondylar tibial plateau fractures. (Fig. 1) The interpretation of the anatomy of the knee when one is using computed tomography may be done on any given computer by scrolling images of each of the three planes. Furthermore, the comparison of the fractured knee with the contralateral side, by superimposition of the images, allows for a double check of the described bony anatomical landmarks, in case any questions arise. Computed tomography makes it possible to track the peripheral knee ligaments. On the medial side, it is possible to track the



**Fig. 1.** Computed tomography imaging of a tibial plateau fracture. **A:** Coronal plane view illustrating a bicondylar tibial plateau fracture and depicting the medial collateral ligament (white arrows) and the lateral collateral ligament (dashed arrows); **B and C:** Sagittal and axial views of the tibial plateau illustrating a high energy bicondylar fracture; **D:** Axial view of the tibial plateau highlighting the medial collateral ligament (white arrows), and the lateral collateral ligament (dashed arrows); **E:** Axial view illustrating the virtual equator which is determined by anatomical landmarks attached to the fibular head and to the posterior edge of the tibial crest; **F:** Three dimensional reconstruction of the knee illustrating the lateral collateral ligament (white arrows); **G:** Three dimensional reconstruction of the knee highlighting the medial collateral ligament of the knee (dashed arrows).

posterior tibial crest from below the fracture level and up. On the lateral side, even in cases of posterolateral corner disruption, the fibular head remains an identifiable landmark, which is posterior to the mediolateral axis of the tibial head.

#### The comminution

We appreciate the author's comments regarding the addition of an extra modifier in order to describe the degree of comminution and

thereby provide the ability to localize it within a specific quadrant or quadrants. In order to reconstruct any tibial plateau fracture, one must first establish the principle fracture plane(s), which is/are necessary to establish the exact position of the necessary buttress plating. Experience has shown that the restoration of the continuity and stability of the rim takes precedence over the anatomical reduction of the articular surface. This concept comes from the observation that restoring the tibial plateau rim provides stability to the joint, which is critical for the preservation of joint function. In

reviewing the outcomes of plateau fractures, residual articular incongruities appear to be relatively well tolerated, but only when joint stability is restored. The restoration of the coronal plane alignment and the retention and repair of the meniscus if necessary are more critical in determining outcome than articular step-off alone [5]. There is no doubt that the anatomical reduction of the articular surface should be pursued. To achieve this, we have noticed that it is best to follow the main fracture plane through the split component of the fracture. In the majority of the cases, this technical maneuver dramatically facilitates access to the areas of comminution. If the joint depression is of the rim itself - a rim impaction and depression - this is also a split wedge. The horizontal portion of the depressed rim represents the length along the rim of the split wedge, and its point of exit (x) is where the normal cortex is encountered distally. The vertical height of the wedge is given by the extent of the crushed cortex between the height of the rim and the point (x). The three-dimensional extension of the original classification allows accurate spatial localization of this area. This ability will guide the surgeon in planning the final reduction and fixation which will restore joint stability. To enhance the reproducibility of this new three-dimensional classification we tried to keep it as logical and straightforward as possible. The six principle types described by Schatzker continue to be the basis of this new classification and are incredibly relevant in differentiating the low-velocity fracture types (I to III) from the high energy ones (IV to VI). The modifiers A (anterior) and P (posterior) indicate the three-dimensional location of the rim lesion(s) responsible for joint instability. We acknowledge that our new template may not suffice in the rare instance to describe an incredibly complex joint fragmentation, but such an exceptional injury would defy accurate description while using any existing classification. We do not deny that joint comminution may be so extensive as to challenge any attempt at anatomical reconstruction. Failure to restore joint congruity may indeed interfere with joint motion, but more important is the restoration of joint stability because instability inhibits the return of normal joint function from the start. We are grateful to have had this opportunity to clarify important aspects of our manuscript and hope that the additional information will enhance the understanding of our concepts.

#### Author's conflict of interest disclosure

None of the authors received payments or services, either directly or indirectly (i.e., via his or her institution), from a third party in support of any aspect of this work. None of the authors, or their institution(s), have had any financial relationship, in the thirty-six months prior to submission of this work, with any entity in the biomedical arena that could be perceived to influence or have the potential to influence what is written in this work. Also, no author has had any other relationships, or has engaged in any other activities, that could be perceived to influence or have the potential to influence what is written in this work.

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#### References

- [1] Kfuri M, Schatzker J. Revisiting the Schatzker classification of tibial plateau fractures. *Injury* 2018;49(December (12)):2252–63, doi:<http://dx.doi.org/10.1016/j.injury.2018.11.010>.

- [2] Takahashi H, Tajima G, Kikuchi S, Yan J, Kamei Y, Maruyama M, et al. Morphology of the fibular insertion of the posterolateral corner and biceps femoris tendon. *Knee Surg Sports Traumatol Arthrosc* 2017;25(January (1)):184–91.
- [3] LaPrade RF, Engebretsen AH, Ly TV, Johansen S, Wentorf FA, Engebretsen L. The anatomy of the medial part of the knee. *J Bone Joint Surg Am* 2007;89(September (9)):2000–10.
- [4] Stannard JP, Lopez R, Volgas D. Soft tissue injury of the knee after tibial plateau fractures. *J Knee Surg* 2010;23(December (4)):187–92.
- [5] Giannoudis PV, Tzioupi C, Papatheanassopoulos A, Obakponovwe O, Roberts C. Articular step-off and risk of post-traumatic osteoarthritis. *Evidence Today Inj* 2010;41(October (10)):986–95, doi:<http://dx.doi.org/10.1016/j.injury.2010.08.003>.

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## Letter to the Editor

### Enforcing standards for systematic reviews



Re: Comparison of arthroscopic reduction and percutaneous fixation and open reduction and internal fixation for tibial plateau fractures (*Injury* 2018;49:1208–1214).

I note this recent systematic review includes data from 7 RCTs, and details the quality domains of these 7 RCTs such as allocation concealment and blinding, including a Risk of Bias table. Noting the low risk of bias in nearly all domains for all studies (unusual for surgical trials, particularly without the use of placebo) I attempted to look up the included trials. The first paper was a retrospective file review of cases presenting to one institution. The second paper did not appear to be an RCT (no mention in the abstract and unequal distribution of case numbers). The remaining papers are in Chinese only and not accessible to me.

The paper appears to contain fabricated and false data. Without investigating further, it is possible that none of the papers are RCTs, let alone RCTs at low risk of bias. Ioannidis has recently published on “The Mass Production of Redundant, Misleading, and Conflicted Systematic Reviews and Meta-analyses” [1]. To allow such an obviously flawed paper to be published reflects poorly on the safeguards and procedures for peer review at the journal.

### Conflict of interest

None.

### References

- [1] Ioannidis JP. The mass production of redundant, misleading, and conflicted systematic reviews and meta-analyses. *Milbank Q* 2016;94(3):485–514.