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Aide à la classification des fractures du cotyle par segmentation des fragments osseux

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Background
The classification of acetabular fractures proposed by Letournel and Judet in 1961 is currently the most widely used system although its complexity and a wide variation in the interpretation. Development of CT scans with 2D then 3D reconstructions allow a better comprehension of fracture patterns. Questions purposes We thought that the exopelvic and endopelvic views of a 3D model reconstruction of acetabular fracture which separates each bone fragments by semi-automatic segmentation are sufficient to get a correct classification according to Letournel descriptions.

Methods
Six orthopedic surgery residents without specific knowledge in acetabular surgery had to classify 23 acetabular fractures using conventional 3D fixed reconstructions. Fractures were presented in an aleatory order for 2 minutes. Participants did not know whether their classification was correct or not. They were instructed that each of the 10 fracture patterns may be used more than once or not at all. They had to do the same 15 days later using our segmented exopelvic and endopelvic 3D reconstructions performed with the non-commercial software itksnap 3.0. This software allowed segmentation of each coxal bony fragment with a specific color. We then compared the number of correct responses from the two sessions and determined whether the use of the new 3D reconstructions exopelvic and endopelvic views influenced correct classification. Improvement in correct classification was assessed using the Mac Nemar test. Statistical analysis was performed using Statview 5.5 (SAS Institute, Cary, NC, USA). If the P-value was lower than the chosen alpha value of 0.05, the difference was considered significant.

Results
We found a significant improvement in classifying acetabular fractures with the new 3D reconstructions (81 ± 2% versus 52 ± 7%, $P < 0.001$). The improvement was better for simple patterns (100% versus 47%, $P < 0.0001$) than for associated patterns (75% versus 53%, $P < 0.001$) with our 3D specific reconstructions.

Conclusion
The use of computed tomography image segmentation which separates each bone fragments is an effective tool for orthopedic resident education and training in acetabular fracture classification. This study supports a wider use of such imaging technology in clinical practice.

Disclosure of interest
The authors declare that they have no conflicts of interest concerning this article.

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