

THE REPAIR PROJECT

"Recommendation for Evidence-based Preoperative AI-controlled virtual Reduction and osteosynthesis of complex fractures"

Tuttle N, Hölzl S, Bejaoui A, Tzschätzsch H, Heyland M, Balzer F, Duda G, Toussaint M, Auer T, Tsitsilonis S, Back DA

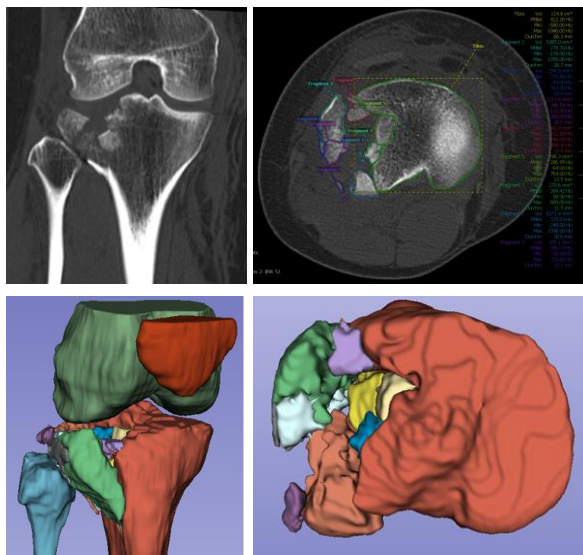
„Failing to plan is planning to fail“

Intraarticular fractures have a high risk of leading to post-traumatic osteoarthritis. This is due to the oftentimes multifragmentary situation of the fractures which makes a reduction and restoration of the pre-injury anatomy difficult. Evidence has shown that preoperative planning leads to better patient outcome^{1,2}. However current programs mainly rely in the input of the physician and are rarely automated.

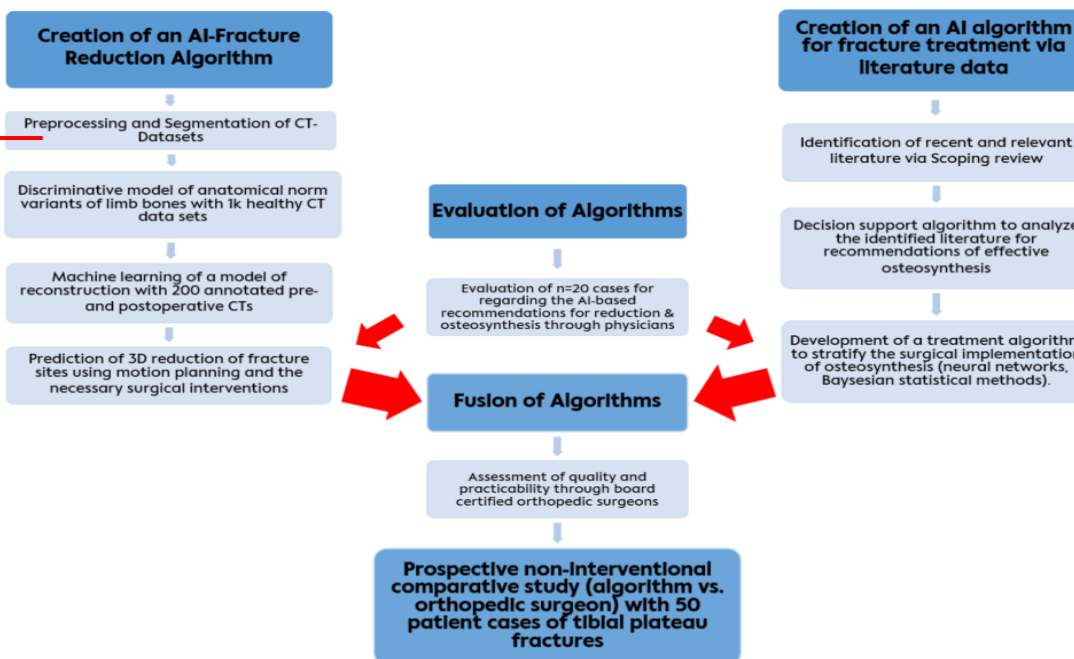
For the creation of our algorithm we chose to start by highlighting tibial plateau fractures because these are especially difficult to treat with rates of posttraumatic osteoarthritis ranging from 23% up to 36%³.

Segmentation

Segmentation and Export of an AO 41B3 Tibial Plateau Fracture into a 3D program using a NIFTI-type file format.



Flowchart of the REPAIR project



Aim of the project

REPAIR offers the potential to provide trauma surgeons with a reduction suggestion and literature-based recommendations for the osteosynthetic treatment of complex fractures using machine-learning and AI-based algorithms. In the course of the project, existing parts of the algorithm must be trained with higher case numbers in order to optimize its decision-making via machine-learning. Once the sub-algorithms have been created, the goal is to merge them into an user-friendly end-to-end software. In the further course, the algorithms will be gradually transferred to other fracture entities with the goal of lowering morbidity and achieving better patient outcomes.

References

- 1) Papotto G et al. Use of 3D printing and pre-contouring plate in the surgical planning of acetabular fractures: A systematic review. Orthop Traumatol Surg Res. 2022 Apr.
- 2) Wood L et al. Does using 3D printed models for pre-operative planning improve surgical outcomes of foot and ankle fracture fixation? A systematic review. Eur J Trauma Emerg Surg. 2022
- 3) Castano Betancourt MC et al. A review of Risk Factors for Post-traumatic hip and knee osteoarthritis following musculoskeletal injuries other than ACL rupture. Orthopedic Reviews. 2022

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