VALUE OF 3D-CT RECONSTRUCTION IN THE TREATMENT OF POSTERIOR TIBIAL PLATEAU FRACTURES

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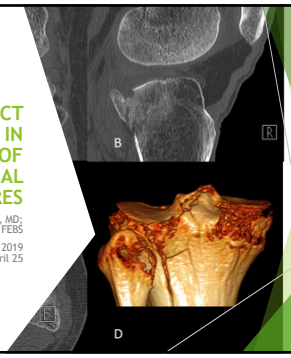
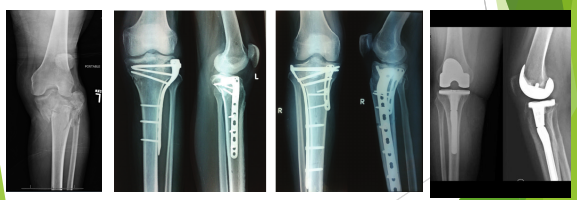


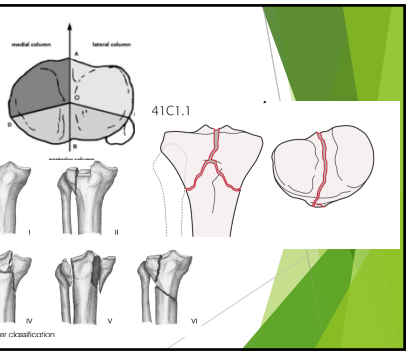
Introduction

- Uncertain outcome of TPF



Introduction

- Uncertain outcome of TPF
- Flaw in classification systems?
  - Schatzker
  - AO
  - 3 column
  - Revised 3-column ?



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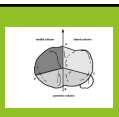
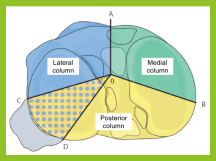
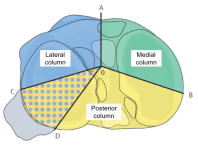
Schatzker classification

Introduction



- Posterior column fractures are an important prognostic factor
- In contrast to the classical classification approaches (Schatzker, AO / OTA), posterior tibia plateau fractures are depicted best according to the 3-column concept
- Revised 3-column concept:
  - Fractures of multiple columns?



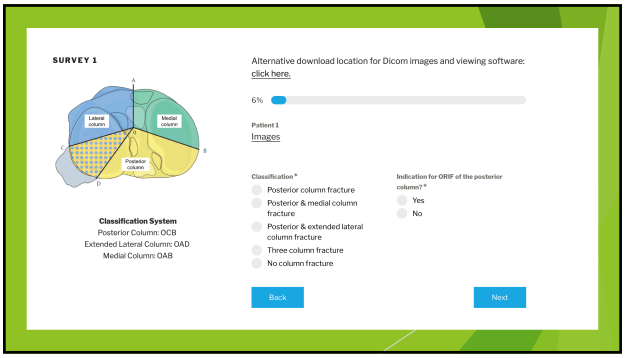


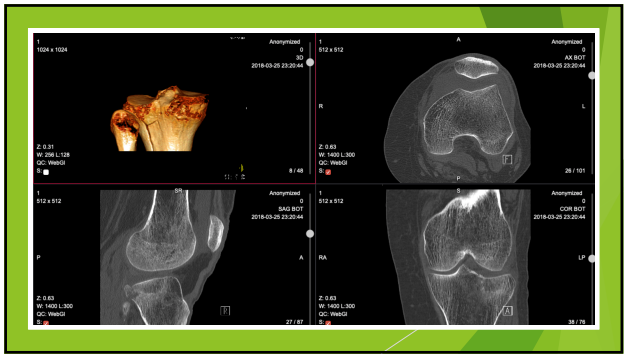
Introduction

- The goal of the present study was to determine the value of 3D reconstruction in classification and treatment of tibial plateau fractures with posterior involvement.
- Objective:
  - assess the inter-and intraobserver variability of 2D and 3D classification
  - The influence of 3D images in clinical practice

Patients and methods

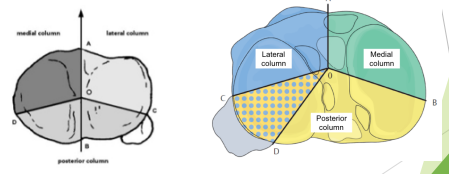
- 34 patients with a TPF involving the posterior column treated between July 24, 2014 and May 29, 2018
- Anonymized and digitally presented to a panel of five international observers
- Evaluation:
  - T1: 2D CT images
  - T2: 3D reconstruction images
- Outcome:
  - rTCC classification
  - Operative strategy
  - Inter/intra-reliabilty





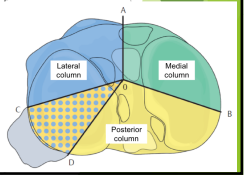
Patients and Methods

- *The 3-column concept and rTCC*



Patients and Methods

- *rTCC*
  - *Lateral column fracture extending in OCD: "extended lateral column fracture" OAD*
  - *Posterolateral fracture extending medially of the fibular head: "posterolateral column fracture" (OCB): posterior column fracture*
  - *Posterior column: posteromedial and posterolateral part*
- *Statistics*
  - *Kappa value: intraobserver and interobserver reliability*
  - *Logistic regression analysis: decision to operate*



Results

- *34 CT-scans, 5 international observers, 7,5 week average interval*

Results

- Table 1: Intraobserver agreement and reliability between 2D and 3D classification

	Agreement 2D-3D classification	Kappa (intraobserver)
Observer 1	23 (68%)	0.52
Observer 2	31 (91%)	0.85
Observer 3	27 (79%)	0.65
Observer 4	23 (68%)	0.46
Observer 5	19 (56%)	0.17

Average 0.53 ("moderate") Range (0.17 - 0.85)

Results

- Table 2: Analysis of decision to operate based on 3D vs 2D images

	2D operate, N (%)	3D operate, N (%)	Difference (95% CI)
Observer 1	20 (59%)	22 (65%)	6 (-13, 24)
Observer 2	19 (56%)	21 (62%)	6 (-7, 18)
Observer 3	19 (56%)	20 (59%)	3 (-5, 11)
Observer 4	16 (47%)	21 (62%)	15 (-1, 29)
Observer 5	25 (74%)	29 (85%)	12 (-3, 27)

OR of image condition was 2.01 (95% CI, 1.11 to 3.67), p=0.022

Results

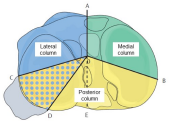
- Table 3: Interobserver agreement and reliability when using 2D or 3D images

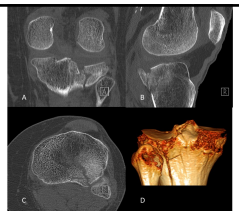
	Observer 1	Observer 2	Observer 3	Observer 4
Observer 1				
Observer 2	28 (82%) / 21(62%)			
Observer 3	27 (79%) / 26 (76%)	29 (85%) / 28 (82%)		
Observer 4	25 (74%) / 21 (62%)	29 (85%) / 26 (76%)	24 (71%) / 24 (71%)	
Observer 5	15 (44%) / 17 (50%)	19 (56%) / 20 (59%)	14 (41%) / 23 (68%)	22 (65%) / 22 (65%)

- Average pairwise agreement
  - 2D images: 68%, kappa 0,48
  - 3D images: 67%, kappa 0,43

Results

- 13 cases with an increase of operative indication
  - 1 case: posteromedial fracture
  - 12 case: posterior and lateral column fracture
    - 10 cases: exclusively posterolateral column "ODE"





Illustrative case

The opinion of the panel changed to posterior operative indication

Conclusions

- Increase in favor of posterior column fixation when assessing 3D images
  - Contrast, other studies report overestimation of comminution in 2D images, and therefore less need for surgery in 3D images
- Research regarding patient outcome is necessary, but the relevance of the posterolateral column in TPF outcome has been demonstrated
- Weakness: small international panel