Biomechanical study of the elastic fixation of the posterolateral fracture of the tibial plateau: Arrow technique.

ISAKOS CONGRESS 2023 Boston Massachusetts June 18–June 21

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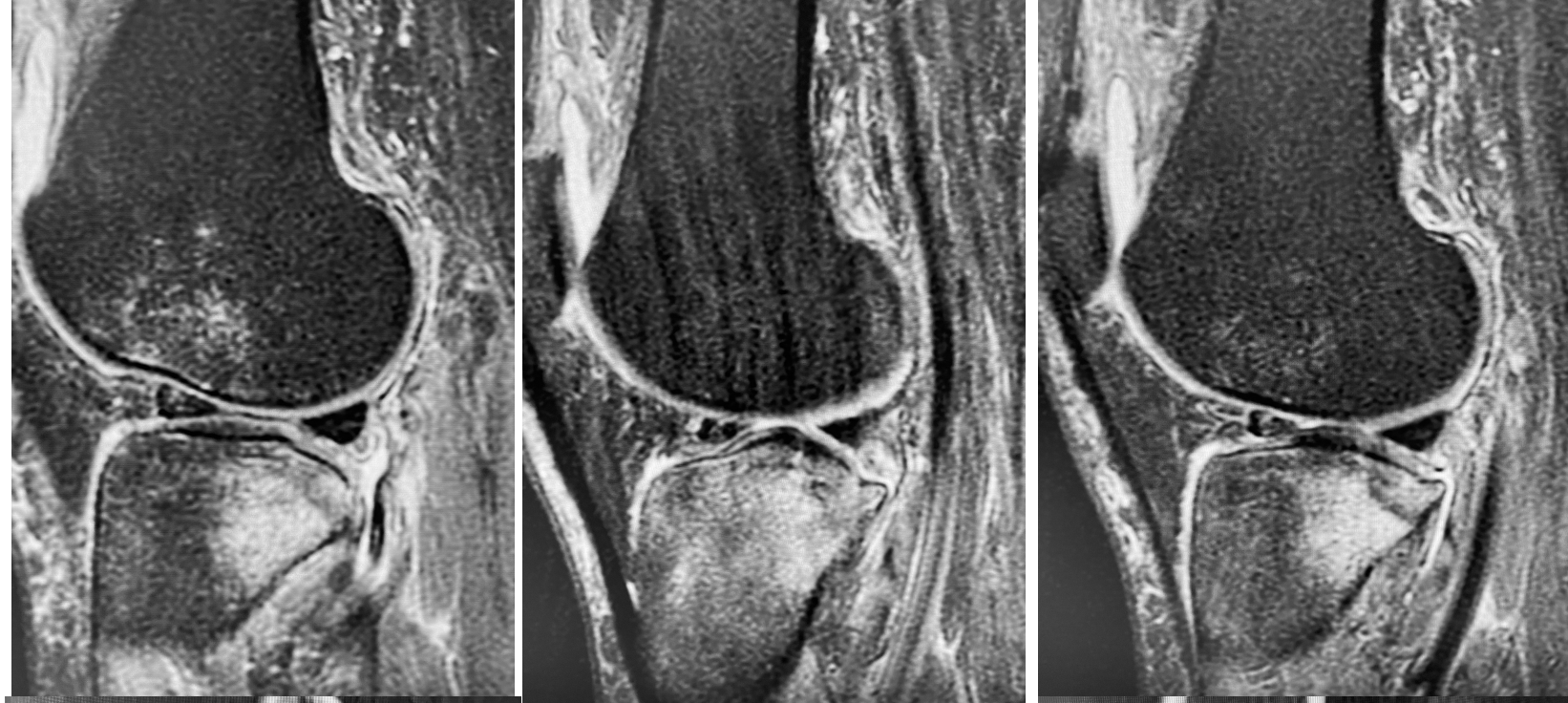
Financial Disclosure Statement

• Oscar Ares	• No Conflict of Interest
• David Gutierrez Medina	• No Conflict of Interest
• Salvador Madariaga	• No Conflict of Interest
• Carlos Morales	• No Conflict of Interest
• Manel Llusa	• No Conflict of Interest

The posterior-lateral tibial plateau shear fracture associated with anterior cruciate ligament (ACL) injury or isolated is a rare entity.



There are two main classifications of this type of fracture:

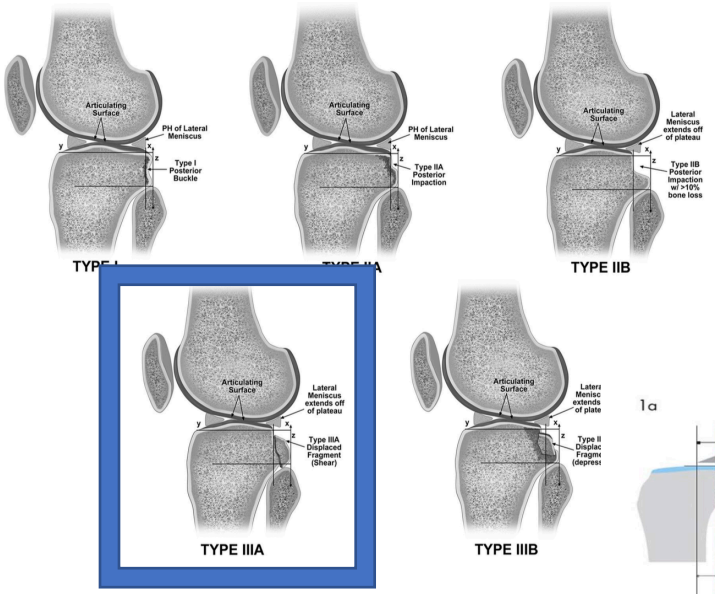
- **Bernholt** classification
- **Menzdorf** classification.

Pre-study biomechanical situation

Morphologic Variants of Posterolateral Tibia Plateau Impaction Fractures in the Setting of Primary Anterior Crucite Ligament Tear.

David L. Bernholt,MD, et al.

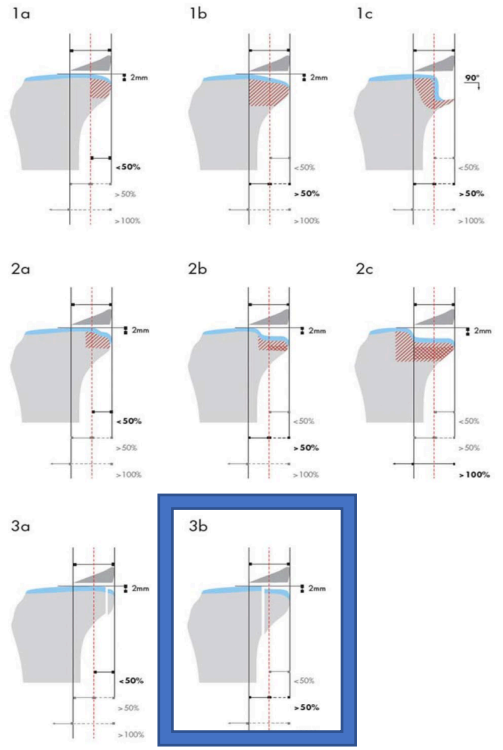
Study performed according to type 3A fracture according to Bernholt's classification.



Clinical results after surgical treatment of posterolateral tibial plateau fractures (“apple bite fracture”) in combination with ACL injuries

Leif Menzdorf, et al.

Study performed according to type 3B fracture according to Menzdorf's classification.



Model Design

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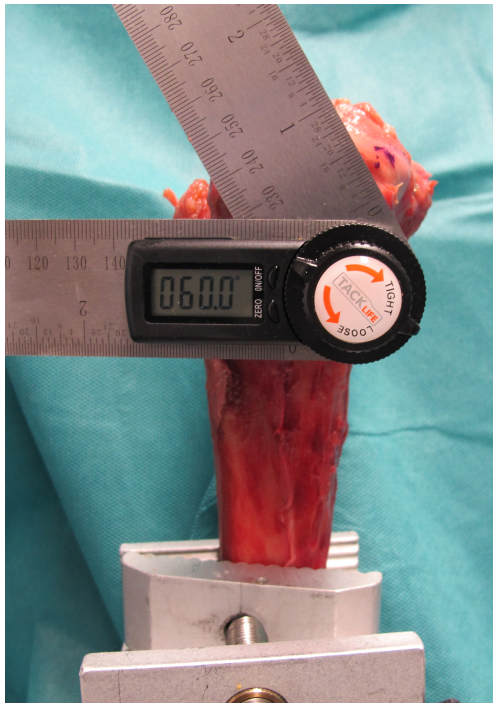
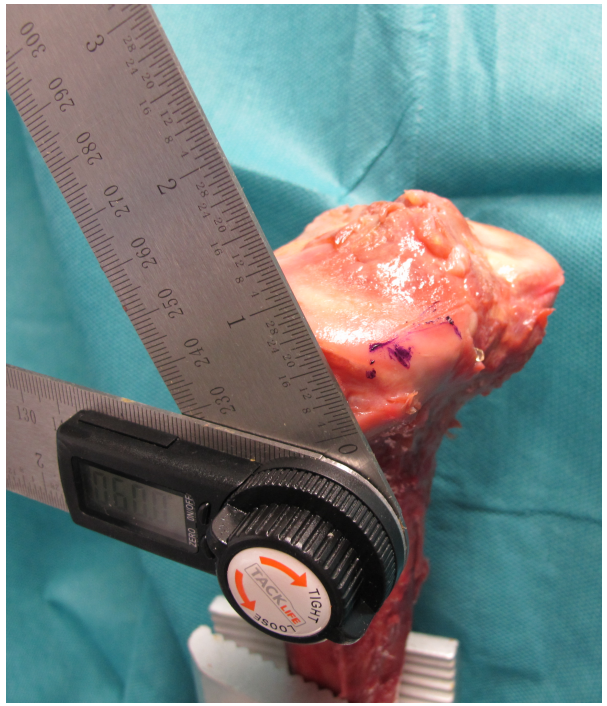
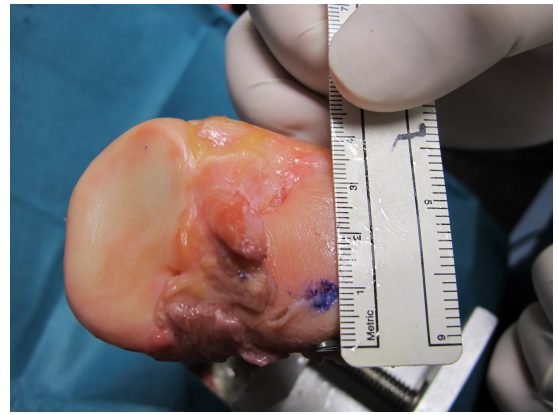




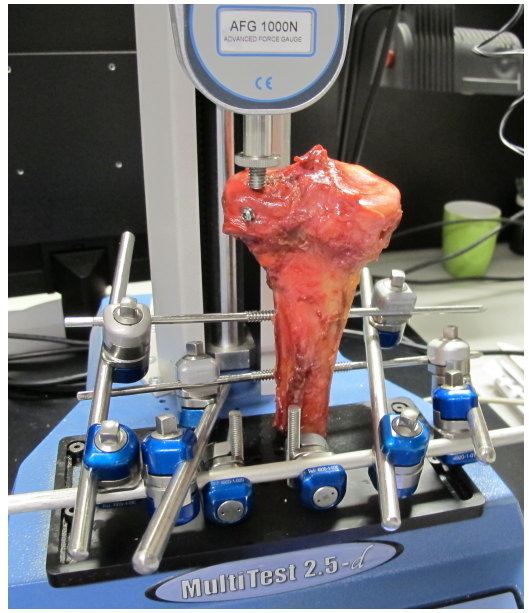
A cranio-caudal cut is done with a 60-degree inclination.

18 specimens were randomized into two groups.



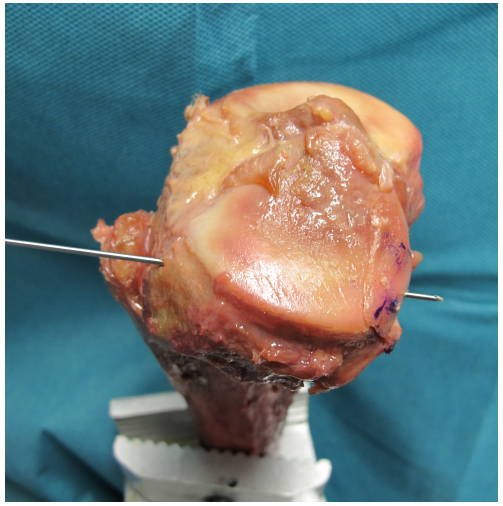
The rule simulates the saw cut

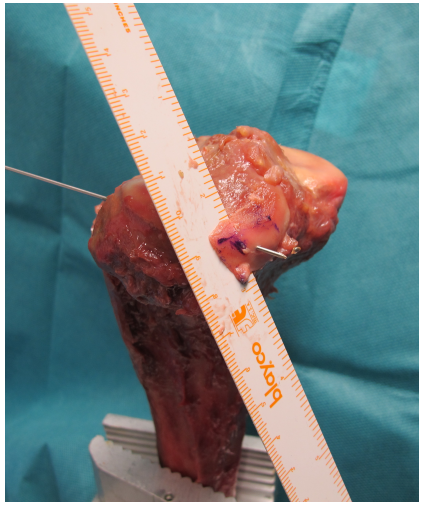
The specimen is placed in the compression machine



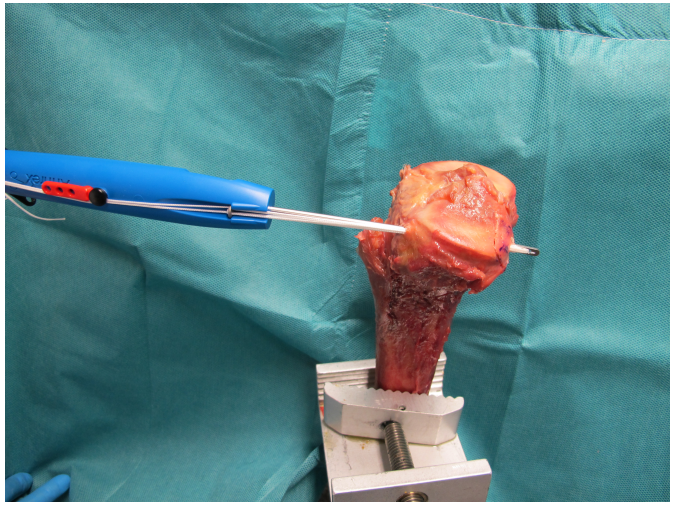
Biomechanical study of the elastic fixation of the posterolateral fracture of the tibial plateau: Arrow technique.

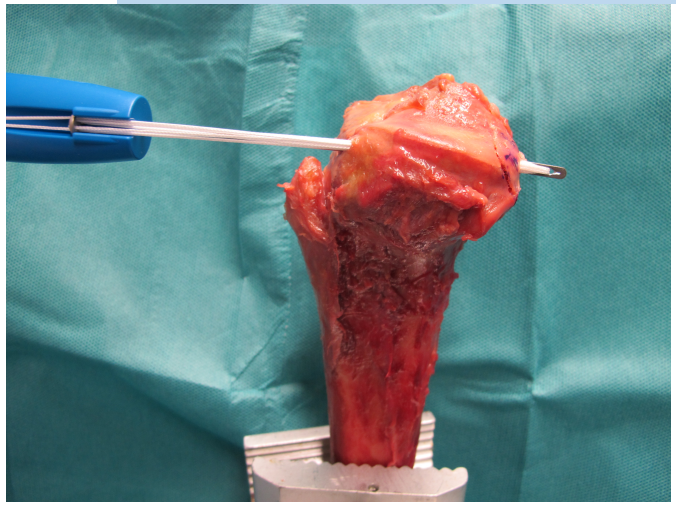
Group A: Tightrope syndesmosis XP





K-wire is placed.

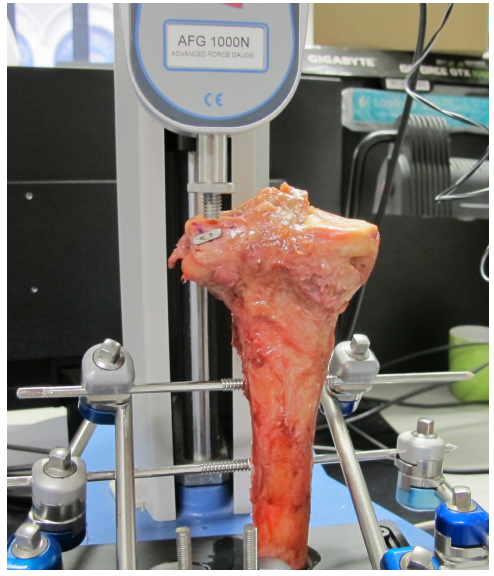




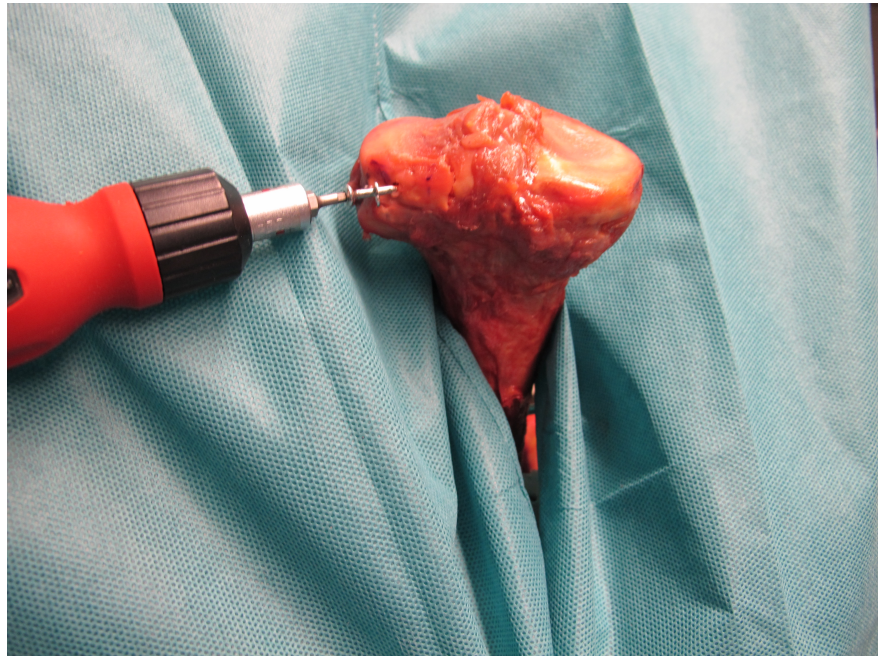
Tightrope XP is passed through the drill bit tunnel over the k-wire.

Final result.

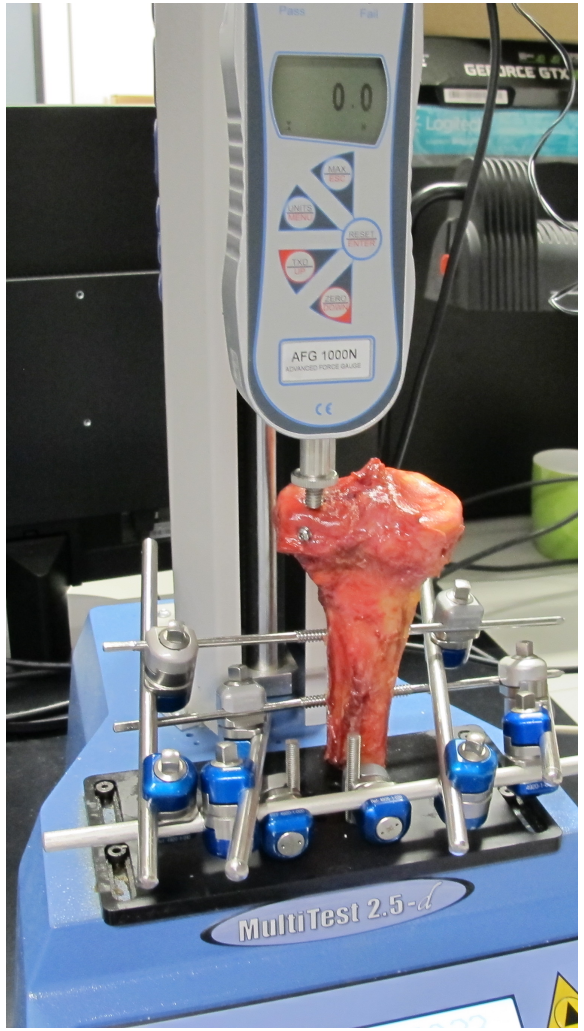
The specimen is placed in the compression machine



Group B: Screw



Screw with washer is placed from posterolateral part of the tibial plateau.



The specimen is placed in the compression machine

Method: Biomechanical Test

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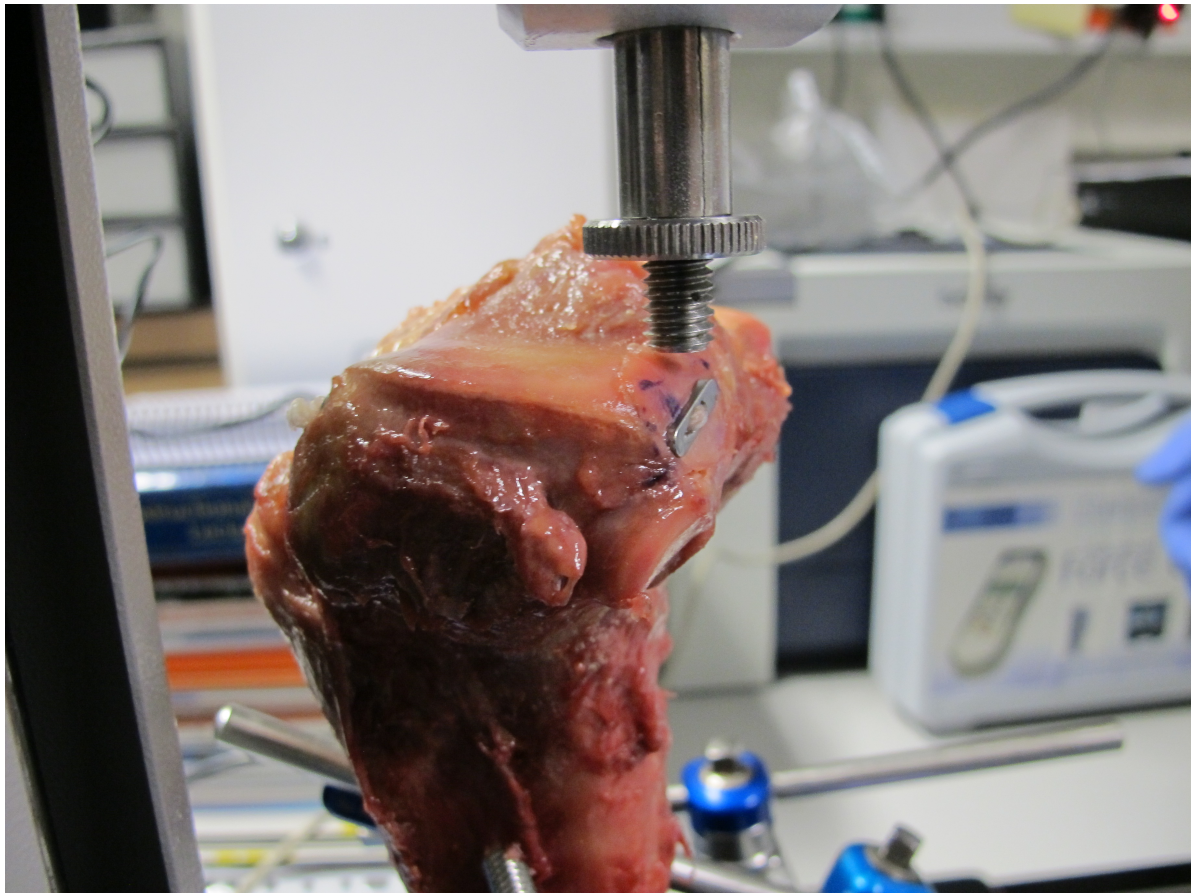
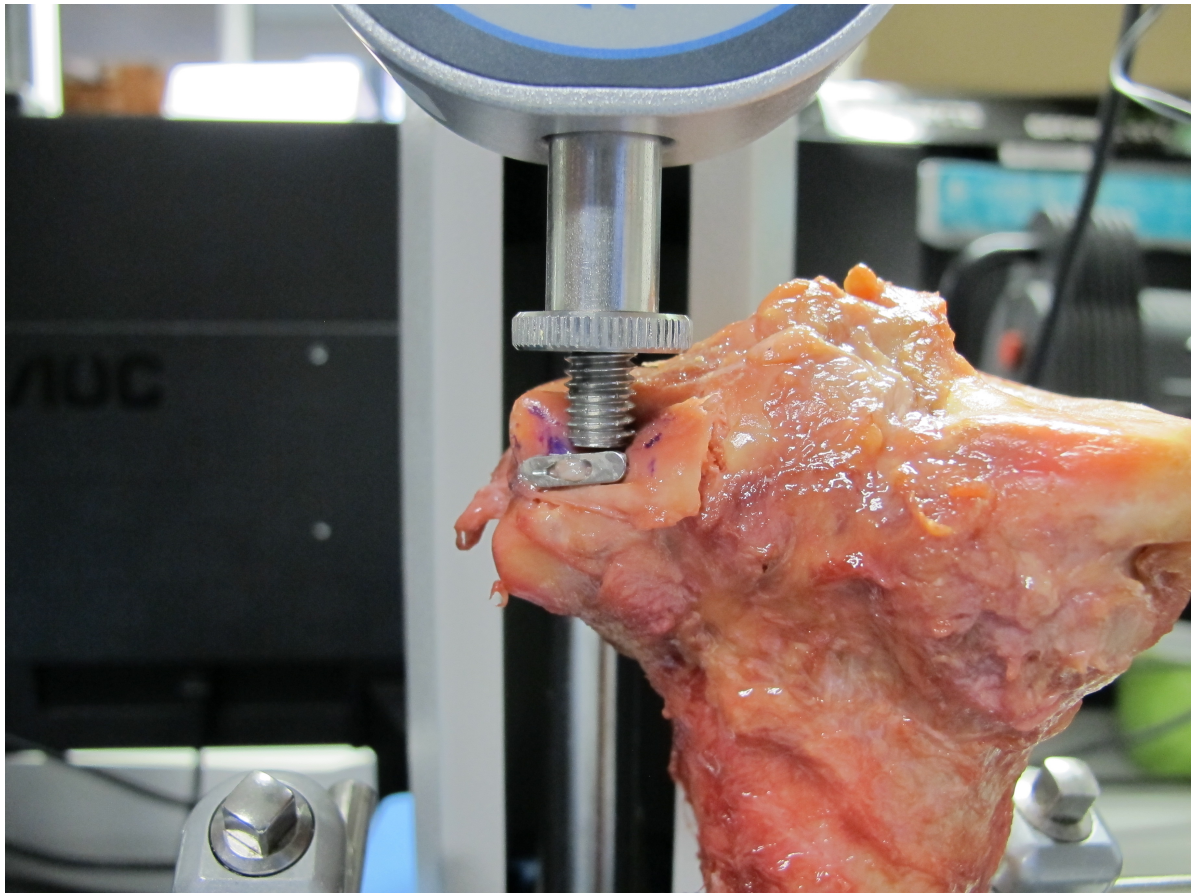
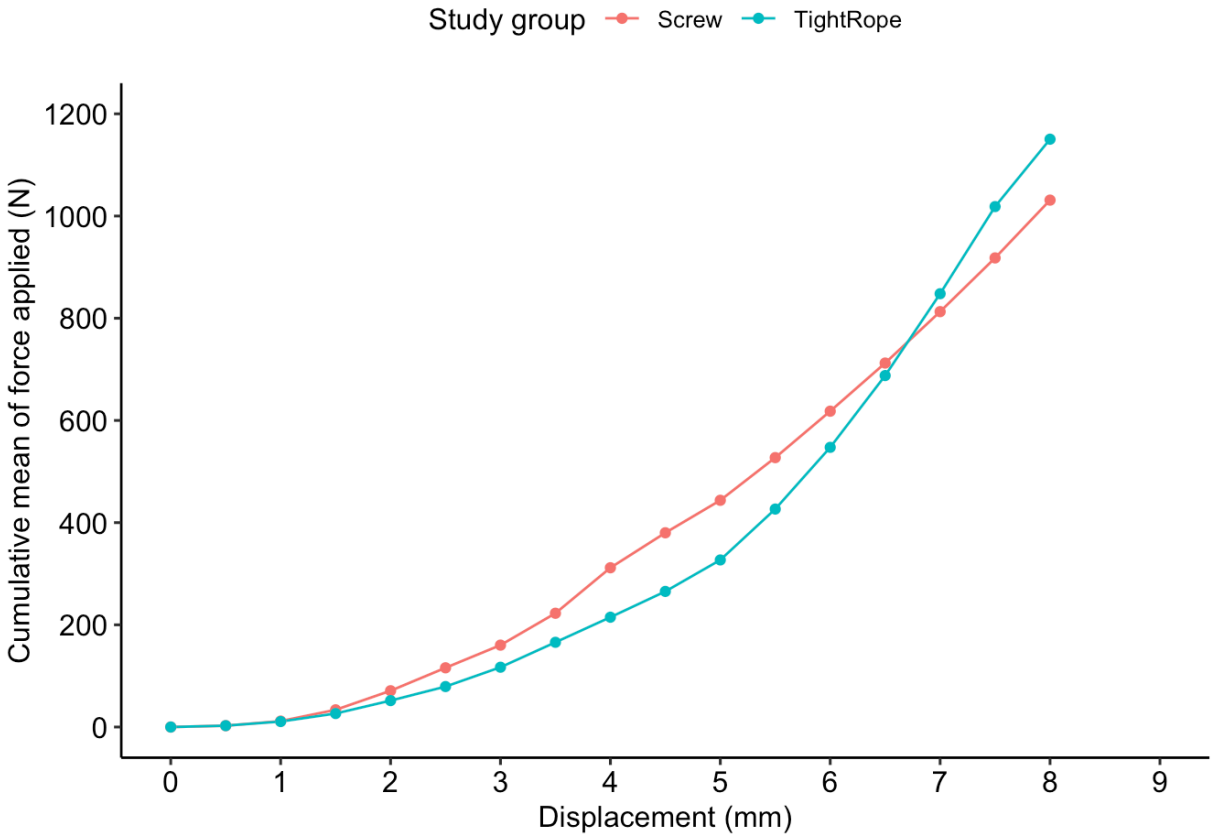
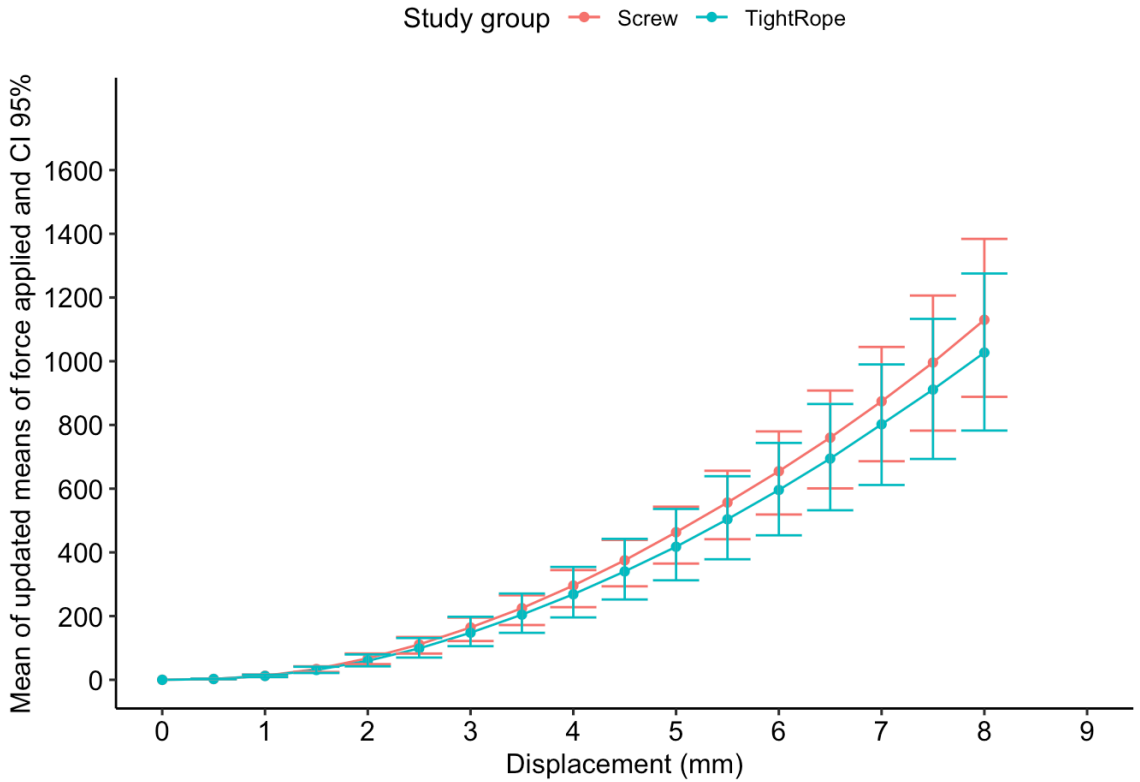




Specimens are placed in the compression machine (**Mecmesin MultiTest 2.5**) until 1000N. Study: load to failure

Results





The green line shows the bone displacement on tightrope model when force is applied. The red line shows the bone displacement on screw model when force is applied.

Results

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Results described by median and (95%CI)

Displacement (mm)	Screw	TightRope	p-value
0.5	2.65 N (1.45 - 4.25)	2.7 N (1.25 - 3.6)	0.86
1.0	11.6 N (7.7 - 19.4)	10.75 N (7.1 - 19.85)	0.80
1.5	33.65 N (21.65 - 51.15)	26.45 N (20.16 - 51.93)	0.55
2.0	71.01 N (47.7 - 97.11)	51.72 N (36.06 - 105.3)	0.49
2.5	115.91 N (87.91 - 146.76)	79.17 N (57.06 - 170.8)	0.44
3.0	160.26 N (141.61 - 200.51)	117.01 N (86.01 - 240.71)	0.34
3.5	222.66 N (207.26 - 288.62)	165.82 N (124.52 - 312.26)	0.39
4.0	311.66 N (265.87 - 393.57)	214.92 N (178.82 - 388.8)	0.49
4.5	380.12 N (323.97 - 494.56)	265.37 N (221.41 - 478.81)	0.55
5.0	443.72 N (378.57 - 596.96)	326.97 N (256.76 - 574.96)	0.55
5.5	527.21 N (435.02 - 717.41)	426.57 N (294.11 - 684.61)	0.44
6.0	618.12 N (491.32 - 857.72)	547.32 N (334.91 - 862.41)	0.60
6.5	712.27 N (548.58 - 1015.82)	687.82 N (378.46 - 1021.56)	0.67
7.0	812.93 N (617.43 - 1190.66)	847.98 N (425.31 - 1095.86)	0.60
7.5	918.03 N (695.48 - 1386.34)	1018.48 N (481.22 - 1171.62)	0.60
8.0	1031.11 N (774.58 - 1603.67)	1150.38 N (545.46 - 1294.08)	0.60

No stadistical diferencences between two groups.

Both groups have similar displacement at the same force applied.

Discussion

- There are diferents techniques to fix this fracture.
- Posterior part of the knee has a complex anatomy.
- **The new technique is biomechanical equal to the classic screw technique.**
- Both groups have similar displacement at the same force applied.
- This new technique is more easy & safe because you don’t have to make a new posterior approach to fix the fracture.

Limitations

- Compression to failure study.
- Unpaired samples.
- No bone density test performed prior to the surgery

Conclusions

- This new technique is more easy & safe because you don't have to make a new posterior approach to fix the fracture.

- More clinical studies are needed.

Clínic Barcelona | Universitat de Barcelona | Hospital El Pilar Grupo quirónsalud

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