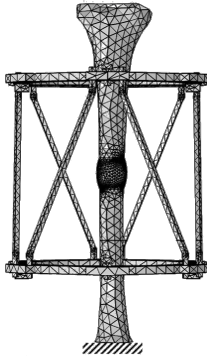


Bone fracture healing under Ilizarov fixator: Influence of fixator configuration, fracture geometry, and loading



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Talk focus
Numerical model

Bone fracture healing

Primary bone healing

- Every day process
- Requires absolute stability

- Plate fixation
- intramedullary nailing

Secondary bone healing

- Occurs with relative stability
- Involves callus formation - new bone

- External fixation



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Secondary bone healing

- Bone ends are not in direct contact
 - Relative motion between bone ends - Interfragmentary movement (IFM)
 - Bone healing is influenced (theories) by Interfragmentary strain (IFS)
-
- Found 10 different mechanoregulation measures in literature

Generally, 2–10 % engineering strain is desired



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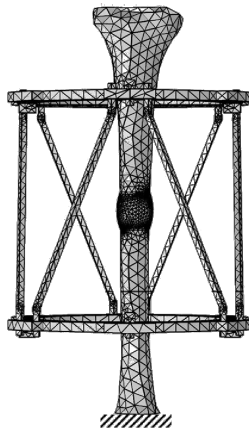
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- Circular rings
- Tensioned wires - k-wires - 1.5–1.8 mm
- Half pins - Schanz screws - 3–6 mm
- Threaded rods

Taylor Spatial Frame (TSF)



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Focus of the talk



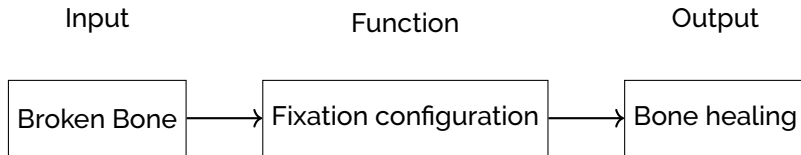
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General model setup

The same general model setup was used for all simulations and the experimental validation

- Perpendicular wires
- etc.



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Numerical model

Finite element model

- Second order tetrahedral elements - all parts
- $\approx 215\,000$ elements
- Convergence criteria:
 - 0.1 mm for displacement (Absolute)
- Mesh convergence study
 - $\leq 2\%$ difference between meshes considered converged



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