

# Comparison of different innovative plating systems in treatment of C3 distal radius fractures

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## Comparison of different innovative plating systems in treatment of C3 distal radius fractures

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**Aims:** Highly complex fractures require surgical interventions, which mandate specific experience and proficiency. Surgeons who deal with distal radius fractures should consider both soft tissue envelope and mechanical stability. Wide ranges of implants are available today on the market dealing with distal radius fractures. Choosing the best hardware is a difficult decision. The groundwork of a mechanical model of the bones and plates using Finite Element Analysis (FEA) before surgery is feasible to promote optimal surgical solution.

**Methods:** Six different systems were compared in a mechanical point of view. Two columns dorsal plates, juxta-articular plate, volar columnar plate, variable angle distal radius plate and different Vortex variable angle plates were compared. Data acquisitions were taken from real patient C3 injured distal radius CT scans and exported to surgical planning software. The system builds up from different modules with special tasks. The first module segments the bone from the gray scale CT scans. Then the 3D structure is constructed from the segmented volume model. A mesh simplification algorithm is developed to eliminate the complexity of the surface. Surgical planning tool is created in the fourth module, where distinct procedures can be tested. The 3D editing functions like slicing, drilling and implant insertion are visualized. Then the surgeon is able to apply the direction and the amount

of forces to the model and exports the data to the FEA system. The finite element method analyses the possible results of our surgical plan and creates animations with colour maps for better understanding. Mechanical results, visual animation and clinical data were compared. Clinical evaluation will be also presented.

**Results:** Finite element analysis showed that angular stable volar plating has mechanical advantages in C3 fracture fixation. Two column-plates, two row-plates have further mechanical advantages.

**Conclusion:** Preoperative planning supplemented with FEA could avoid several complications, while more scrupulous and prompt assessment capabilities could be provided for surgeons. Under the basis of these results further clinical benefits of novel plates will be discussed. This method offers new possibilities that complement current visual analytic methods and gives great perspective in the postgraduate education, preoperative planning and optimal implant design.

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# Comparison of different advanced intramedullar nailing systems in treatment of proximal femoral fractures

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## Comparison of different advanced intramedullar nailing systems in treatment of proximal femoral fractures

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**Aims:** Highly complex fractures require surgical interventions which mandate specific experience and proficiency. Surgeons who deal with proximal femoral fractures should think about both soft tissue envelope and mechanical stability. Wide ranges of fancy implants are available on the market dealing with proximal femoral fractures. To choose the doubtless best solution is a difficult decision. The groundwork of a mechanical model of the bones and plates using Finite Element Analysis (FEA) before surgery is feasible to support optimal surgical solution.

**Methods:** Three different systems were compared with mechanical point of view. Gamma3 nail, PFNA nail and Spectrum Trochanter nails were compared, all of them in 31 A3 fracture. Data acquisitions were taken from real patient 31A3 injured femur CT scans and exported to surgical planning software. The system builds up from different modules with special odd jobs. The first module segments the bone from the gray scale CT scans. Then the 3D structure is constructed from the segmented volume model. A mesh simplification algorithm is developed to eliminate the complexity of the surface. Surgical planning tool is created in the fourth module, where distinct procedures can be tested. The 3D editing functions like slicing, drilling and implant insertion are visualized. Then the surgeon is able to apply the direction and the amount of forces to the model and exports the data to the FEA system. Mechanical results, visual animation and clinical data were compared. The mechanical data are discussed with aid of video animation. Clinical evaluation will be also presented. Long versions of these nails need image control

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during locking procedure.

**Results: Finite element analysis showed that all the tested intramedullar devices were able to provide enough stability in the otherwise unstable fracture. Spectrum Trochanter Long Nail has clinical advantage with handy locking trick, which needs less image control during locking.**

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**Conclusion:** All implants mentioned above are stable enough to resist physiological forces following fixation 31A3 fracture. Tricky distal locking can be advantageous using Spectrum Trochanter Long Nail.

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