

Analysis of bone fragments displacement during the treatment of Tibial Nonunion with a hexapod fixator with the use of computer navigation

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Abstract

Statement of the Problem: The purpose of this study was an experimental assessment of changes in bone fragment position in patients with nonunion of the tibia treated with a hexapod fixator. We hypothesized that the use of hexapod fixators leads to differences between the planned and actual position of bone fragments. **Methodology & Theoretical Orientation:** The study was conducted in physical models of the hexapod fixator–bone fragment system. Bone fragment displacement was measured using the Optotrak Certus Motion Capture System. We assessed differences between the planned and actual position of bone fragments.

Findings: Assessment of bone fragment compression demonstrated a difference between the target and actual correction ranging from 1.5% to 13.2% (depending on the force applied to bone fragments) for configuration 1, from 17% to 21.3% for configuration 2, and from 13.2% to 17.9% for configuration 3. The achieved Varus deformity correction constituted 93.7–98.4% of the target correction for configuration 2 and 98.3–98.9% of the target correction for configuration 3. Torsional deformity correction showed considerable discrepancies between the target and achieved correction, ranging from 65.6% to 83%.

Conclusion & Significance: The value of the applied compression force had no marked effect on the differences between the target and achieved correction or on the magnitude of unintended rotational and transverse displacement of bone fragments. The use of hexapod fixators helped achieve complete correction of the simulated varus deformity; however, complete correction of torsional deformities was not achieved. Deformity correction with the use of a hexapod fixator yielded instances of unintended rotational and transverse bone-fragment displacement. The use of hexapod fixators leads to differences between the planned and actual position of bone fragments.

Biography

Piotr Morasiewicz is Head of the Department of Orthopedic and Traumatologic Surgery in Opole University. Author of several dozen publications, author of several dozen conference reports. He conducts research in the field of Pediatric Orthopedics, Ilizarov methods and biomechanics of the musculoskeletal system.



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