A New External Fixator Design for Femoral Fracture Reduction

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Objective: To design an external fixator for femoral fracture reduction with improved angulation and adjustability, reduced bulk, and comparative stiffness. Background: The use of external fixator for femoral shaft fixators in children has been a device of choice. The use though satisfactory, the occurrences of wire/pin tract infections has been widely reported. Moreover, The use of Ilizarov external fixator in adults has been limited due to its bulk. Hence there is a need for improvement on the current external fixators for femoral fractures. Methods: The finite element models of four-ring Ilizarov and hybrid two-ring fixators were developed. These designs were improved upon by incorporating a "modular sliding joint design," and by reducing the bulk by reducing the number of rings and adding guide plates. Wire length optimization feature was also added in the design. Axial stiffness of the new design was compared with the hybrid design using finite element analysis (FEA). Results and Discussion: The new design has reduced bulk at the proximal region allowing its application in adults. The axial stiffness of the proposed design was found to be comparable with the two-ring hybrid design, as determined from FEA. Sliding joint design allows reduced inventory, quick assembly, and improved angulation over current designs. Wire length optimization may reduce the occurrences of wire tract infections.