Orthopaedic external fixator

Country of origin | Germany

Health problem addressed
The use of an external fixator for fracture reduction as well as correction osteotomies of deformed long bones represents an established method in the area of orthopaedic and traumatologic surgery. The aim is the reconstruction of a physiologic bone geometry and a preferably fast, safe and painless bone healing.

Product description
The device is an external fixator design concept for bone fracture stabilization and gradual deformity correction based on a 3RPS spatial + 3RPR planar manipulator that can be locally produced in developing countries. The struts length can be adjusted to software that takes into account the biomechanical limitations of tissues. A hand-made laboratory sample was manufactured with a cost of the materials of 9€.

Product functionality
After fracture or correction osteotomy the external fixator is connected to the bone segments with pins and/or wires. In case of a correction of the bone geometry, the position and strut lengths of the fixator system are entered in the open source-software that computes the required movement of the bone segments via change of strut lengths with respect to biomechanical limitations.

Developer’s claims of product benefits
The developed system is much cheaper compared to external fixator systems with six degrees of freedom in industrial countries. The technical detail data and the computation program will be provided as open source, so the complete system can be locally produced and operated in developing countries.

Operating steps
Connect the wires and/or pins to the bone segments, connect the fixator parts to the wires/pins until the structure is complete, in case of a correction of deformity correction: measure the geometry of the fixator and the bone segments, enter the data in the software, software computes the strut lengths for the treatment, change strut lengths, remove fixator after the bone healing is completed.

Development stage
The concept was developed for the use in least developed countries (LDCs). A hand-made laboratory sample was manufactured with low tech materials. The price for the required material was about 9,- €. Software for the computations of the strut lengths was developed and experiments were performed to prove the capabilities of the design using an optical tracking system. The accuracy of the systems was satisfying.

Future work and challenges
In the study it could be shown that the positioning and mechanical properties of the fixator is satisfying. The next steps should include clinical trials to evaluate the biomechanical properties. After continuable clinical trials the applicant is willing to provide all required technical information as well as the computation program as an open source and the patent license for use in LDCs.

Use and maintenance
User: Patient, physician
Training: The positioning of the pins and wires requires the knowledge of an orthopedic physician.
Maintenance: patient, medical staff, technician

Environment of use
Requirements: Radiology device, orthopedic physician, sterile environment

Other features: Portable and reusable. Uses software, compatible with telemedicine.

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