Cleveland Clinic Innovations

Model-Based Surgical Planning and Implant Placement

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PRODUCT

A surgical planning system for implant placement using simulation of relative motion of patient's pelvis and model of implant for hip arthroplasty.

INDICATIONS

Orthopedics, hip arthroplasty, hip replacement, implant placement, surgical planning.

VALUE PROPOSITION

- Patient specific planning for implant placement.
- Minimalizes dislocation risk by determining safe zone size.
- Creates a 3-D model for providing surgeon visual feedback for translational positioning and medialization (reaming).
- Better distribution of forces on implant surface area.

DEVELOPMENT STAGE

Proof-of-concept established

INTELLECTUAL PROPERTY

US Patent: 10,595,943

CONTACT INFORMATION

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PROBLEM/OPPORTUNITY

Arthroplasty is a surgical process that restores integrity and functionality of a joint. The purpose of this procedure is to increase the patient's quality of life by improving muscle strength, relieving pain, and by restoring range of motion. The process is very critical and for achieving the desired output precise placement of arthroplasty implant is essential to save costs and to reduce the risk of dislocation.

SOLUTION/PRODUCT

Model based surgical planning and implant placement can be used to increase patient's short term and long-term satisfaction with arthroplasty procedures such as hip replacement. This planning tool determines safe zone using pelvic tilt – measured as a position of a pelvis relative to the position of a spine of patient.
A model constructor is configured to construct a model of a pelvis of the patient according to the initial classification of the patient. A finite element modeling component is configured to simulate relative motion of the model of pelvis and a model of implant. A patient classifier is then configured to select at least one of a position and orientation of the implant according to data provided by simulated relative motion.

- Focusses on identifying a set of best possible positions and orientations specifically values for inclination and version for an acetabular cup of the implant having a low risk of dislocation and good wear characteristics.
- Personalized and more precise approach for acetabular cup based on size of patient's safe zone.