An Image Guided Navigation System for Accurate Alignment in Total Hip Replacement Surgery

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Abstract

Dislocation following total hip replacement surgery (THR) remains a significant clinical problem. Malposition of the acetabular component increases the occurrence of impingement, reduces the ?safe? range of motion and increases the risk of dislocation. Not fully understanding the interaction between pelvic orientation and final acetabular cup alignment may be one of the main contributing factors in the continued significant incidence of dislocations following total hip replacement.
There has been little clinical research to examine the effects of patient positioning and pelvic motion on the alignment of the acetabular implant during total hip replacement surgery. Until now, no tools were capable of accurately measuring these variables during the actual procedure. As part of a broader program in medical robotics and computer assisted surgery, we have developed several enabling technologies that provide surgeons with a new class of image guided measurement tools and assist devices. These surgical navigation tools provide position and alignment information never before available intraoperatively. Our Hip Navigation system (HipNav) continuously and precisely measures and tracks pelvic location and relative implant alignment. HipNav technology is used to gauge current clinical practice and provide intraoperative feedback to surgeons in order to improve the precision and accuracy of acetabular alignment during THR. These tools were successfully introduced into the clinical practice of surgery with results showing that: a) there exist unpredictable and large variations of the initial position of patients? pelvii on the OR table as well as significant pelvic movement during surgery and during intraoperative range of motion testing; b) current mechanical acetabular alignment guides do not account for these variations, and result in variable and in some cases unacceptable acetabular alignment; and c) press fitting oversized acetabular components influences the final cup orientation.

Notes

- **Associated Center(s) / Consortia:** Medical Robotics Technology Center
- **Associated Lab(s) / Group(s):** Medical Robotics and Computer Assisted Surgery
- **Associated Project(s):** Hip Navigation System

Text Reference

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