Novel Handheld, Wireless Robotic-Assisted Total Knee Arthroplasty

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Introduction:

While robotics in total knee arthroplasty have gained popularity in recent years, adoption has been hindered by closedimplant systembusiness models, form factor in the operating room, and overall efficiency. This videocase report presents the use of a handheld, wireless robotic-assisted inresponse to the patient's request for a robotic procedure. Video Case Report:

A 66 year old female presented with right knee end-stageosteoarthritis after a previous manually-instrumented left knee replacement atanother institution. The patient requested robotic technology for her jointreplacement. A 3D preoperative plan, based off of CT imaging, was created by the robot manufacturer for the surgeon to review and approve. The planidentifies implant system, size, and clinical parameters such as bony resectiondepths and alignment angles. Once the plan is approved, it istransferred to the robotic system for operation.

Any standard TKA approach issuitable for the system. In the video case report a mini-medial parapatellar approachwas used. Active tracking arrays were placed using extra- and intra-incisional bonepins in the tibia and femur, respectively. The robotic system digitizer registers femur and tibia with a rough registration initially based on anatomical landmarks, and then with a fine registration on the subchondral bone for accurateregistration to the CT plan.

The handheld, wireless robotic system places auniversal cut block for the distal femoral resection by only actuating while inthe plan-defined plane. Two pins are placed in the femur, the universal cutblock is affixed, and then the distal femoral resection is done through the cutblock with a standard saw. To perform the remaining femoral preparation, amanufacturer-specific cutting guide, included with the robotic system, is placedusing the robotic system on the distal cut surface to position the 4-in-1cutting guide. The 4-in-1 cutting guide is then secured to the distal cut surfaceand manual instrumentation completes the resections. The proximal tibia is thenprepared with the same robotic system, universal cut block, and traditional sawas the distal femur. The robotic system arrays are then removed and the procedure completed with trial and final implants.

Conclusion

The patient at 2-weeks is ambulating well with minor cane supportand only using over-the-counter NSAIDs for pain relief. Her knee range of motion is 0-125 and she states the recovery has exceeded her expectations. The 2-week x-rays show the implants were placed accurately according to the pre-operative plan.