

No. 4

## Navigation ACL Reconstruction Surgery

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Anterior cruciate ligament reconstruction with arthroscopy is getting common. Although this surgical operation is frequently performed, it needs good surgical technique to do it well. According to clinical publications, the failure rate of ACL reconstruction is between 8~25% despite the new technique making the whole surgical procedure safer. Patient selection, clinical experience, choice of graft, fixation and rehabilitation are critical to obtain a good outcome for ACL reconstruction. Also, there have well-consensuses standard point for the anatomical drill hole to ensure successful outcomes. Navigation system applying on ACL reconstruction is a new concept to improve the consistency of the drill holes and the assessment of the range of motion during the operation. Fluoroscopy images are used to identify the anatomic ACL insertions in order to facilitates a better control of the drill hole position and prevent the risk of impingement and isometric complications as well as blow-outs of posterior femoral wall.

BrainLAB navigation system - ACL software version 1.0 has been used to perform navigation ACL reconstruction surgery. During the planning stage with BraiLab system, the optimal femoral and tibia insertion points are identified by using the Bernard & Hertel Quadrant Method for the femur and the Staubli 43% Method for the tibia. They can also use the optional manual planning approach to plan both insertion points as well. With the pre-calibrated drill guides, the tunnel insertion points and trajectories can be accurately determined according to the preoperative planning. During the operation, the navigation system can assess the impingement control to verify and optimize the graft positioning before drilling the graft tunnels. The BrainLab ACL software version 1.0 system can provide accurate guide point for femoral and tibial tunnel drilling. However, this current system is not excellent enough and friendly to provide help for surgeon in everyday routines ACL reconstruction

procedures. There are some weak points that make this navigation system not very popular and attractive in arthroscopic surgeons. First, it can only provide guide in tibial and femoral tunnel creation by a quite time-consuming preoperative planning stage. It also need insert 2 pins each for administration in the femur and tibia that are not needed in ordinary arthroscopic ACL reconstruction. In the future, there must be some better improvements to provide more advantages by doing navigation ACL surgery.

At present, it is a time consuming procedure and still not a good tool that surgeons like to use in every arthroscopic operation today. We are expecting that the system and the techniques will improve, and that in the future this will be a major part of almost every ACL reconstruction procedure. In the next version, the following points should be considered to improve:

1. Integrate MRI image for administration instead of fluoroscopy to avoid X-ray exposure for surgeon
2. Discard insertion of pins in the femur and tibia during planning stage.
3. Provide kinematics and kinetic parameter measurements such as simulating KT-2000 Knee arthrometer tests to quantify anterior displacement preoperatively and postoperatively.
4. Study application navigation in navigation PCL reconstruction surgery system.
5. Study application navigation in navigation double-bundle ACL reconstruction.