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Paper #1

COMPUTER NAVIGATION DURING ARTHROSCOPIC OSTEOCHONDROPLASTY IN PATIENTS WITH CAM FEMOROACETABULAR IMPINGEMENT

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Summary: The paper introduces an efficiency of computer aided navigation of shaver blades during arthroscopic osteochondroplasty in patients with CAM deformity.

Introduction: The most common reason for failure after arthroscopic treatment of femoroacetabular impingement (FAI) is an inaccurate resection. Compared to the open resection of CAM deformity, arthroscopic osteochondroplasty has a tendency to under-correct the femoral head sphericity. Many authors suggested planning the resection of CAM deformity from CT-3D reconstruction. Computer navigation of instruments was mentioned as a potential solution to improve accuracy of resection and end clinical results after arthroscopic osteochondroplasty. According to our knowledge, no one has succeeded to apply this idea in praxis.

Patients and Methods: 20 male patients with isolated CAM type FAI have been treated with arthroscopic osteochondroplasty upgraded by computer aided navigation of arthroscopic shaver blades. Prior the surgery, 3D reconstruction of the hip was done from a low dose CT scan of the pelvis using EBS® software. This software uses both (1) an anatomic plan using alpha and gamma angles as parameters of femoral head sphericity and (2) a kinematic plan to define zones of impingement and then to predict improvement in ROM after a virtual resection. The model with pre-planned volume of bone to be resected was transferred to the GUIDING STAR® surgical navigation system which is based on the electromagnetic tracking. After arthroscopic osteochondroplasty assisted by computer aided navigation

of surgical instruments a control low dose CT scan was obtained to check the mismatch of the preplanned shape of the femoral head and the one obtained with a surgery. Alpha and gamma angles were measured from AP and Dunn view postoperative radiographs of the hip.

Results: In all 20 cases we were able to complete the procedure without any major technical difficulties. No fluoroscopy was needed during osteochondroplasty to check the position of the instruments and the amount of the resected bone in any of cases. The shape of the proximal femur almost perfectly matched to the preplanned one, with up to only 4% of bone being under or over resected to the maximum depth of 1 mm. Alpha and gamma angles were corrected to physiological values (mean 66 degrees preoperatively and mean 38 degrees postoperatively).

Conclusion: Computer navigation of arthroscopic tools is available and offers several significant advantages. It eliminates the need of fluoroscopic control during the procedure and allows the sphericity of the femoral head to be obtained close to perfection. It seems to shorten the operative time but further studies should be conducted to prove this. In the future, clinical studies involving the control group without navigation are planned to claim positive effect of the navigation on the postoperative clinical outcome. The software and the navigation system used in our study need some technical improvement to become more user friendly.