#417 - Posters

Evaluation Of A Navigation System For Re-Orientation Rotational Acetabular Osteotomy (RAO)

Orthopaedics / Pelvis, Hip & Femur / Joint Preserving Surgery

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Background
As acetabular dysplasia results from abnormalities in acetabular coverage, including deficiencies in the acetabular wall and acetabular retroversion, appropriate re-orientation of the acetabulum is required. The authors undertook re-orientation RAO (R-RAO) with the aim of optimizing the acetabular orientation based on preoperative 3D computer simulations. The purpose of this study is to evaluate the usefulness of intra-operative navigation during R-RAO based on the preoperative simulation.
Objectives
We conducted a prospective study comparing 17 patients who underwent R-RAO with intraoperative navigation (Navigation group; average age 40y, 15 females and 2 males) and 7 patients with manual RAO（Control group; average age 38.7y, all female）. These patients included 2 pre OA, 18 stage I and 4 stage II hips, based on the Tonnis classification system.

Study Design & Methods
Preoperative 3D simulation was performed on a workstation using Mimics and 3matics software to achieve horizontalization of acetabular roof obliquity and acetabular anteversion at 25° on the functional pelvic plane.The acetabular orientation was expressed as the normal vector perpendicular to the acetabular version, based on the reference coordinates of the X-axis (transverse direction), Y axis (AP direction), and Z axis (vertical direction). Differences in post-operative acetabular orientation from the preoperative simulation, in which the roll, pitch, and yaw angles corresponded to each axis, were compared between the navigation group and the control group. The statistical analysis was performed using Student's t- test.

Results
Radiographic evaluation in navigation group revealed that the preoperative Sharp angle of 50 ± 3° was improved to 38 ± 4° postoperatively and the preoperative acetabular roof obliquity of 28 ± 6° was also improved to 0 ± 3° postoperatively. Cross-over and posterior wall signs disappeared after surgery.
The results for the post-operative normal vector, (X -0.54: Y -0.31: Z -0.73) in the navigation group, and (X -0.34: Y -0.45: Z -0.78) in the control group, revealed that the post-operative acetabular orientation was directed more antero-inferiorly in the control group. Although the error in the abduction angle around the Y axis was 5.3 ° in the

navigation group and 3.4° in the control group compared to preoperative simulation, the error in the anatomical anteversion angle around the Z axis was 10° in the navigation group and 14° in the control group, and there was no statistically significant differences.

Conclusions

Re-orientation of the acetabulum was achieved by R-RAO as shown by the abduction and anteversion angles being close to the preoperative 3D simulation in the navigation group. As there was still an error of 10° in the anteversion angle, further study is needed to improve the accuracy of the acetabular rotation.R-RAO afforded appropriate re-orientation of the acetabulum by intraoperative navigation based on preoperative 3D computer simulations.