Birmingham Hip Resurfacing: Clinical and Radiographic Outcomes with Minimum 2 Years Follow Up and Sub-Analysis of Navigation vs Non-Navigation

R. Quesada-Jimenez, MD, [1] A. Kahana-Rojkind, M.D.,[1] E. Walsh, B.S.,[1]
T. McCarroll, M.D.,[1] M. Schinsky, M.D.,[1,2] B. Domb, M.D.[1,2]
1. American Hip Institute Research Foundation, Des Plaines,IL 2. American Hip Institute, Des Plaines, IL

Background

Hip resurfacing (HR) is a promising option for active individuals with hip osteoarthritis (OA). The integration of navigation technology offers real-time assessment of component placement and limb alignment during surgery, which could potentially enhance precision and improve clinical outcomes.

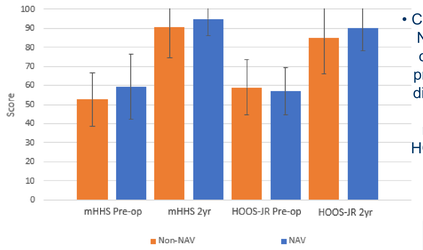
Objectives

To report on the short-term clinical outcomes of hip resurfacing (HR) with navigation and the impact on accuracy of acetabular implant placement in both the frontal and sagittal planes.

Methods

- 2010- 2021: Data was collected retrospectively on all patients who underwent hip resurfacing (HR).
- **Inclusion Criteria:** Patients who underwent primary HR to treat idiopathic hip osteoarthritis, had post-operative x-rays, and completed a minimum 2-year follow-up questionnaire
- **Exclusion Criteria:** Patients who had a workers' compensation claim or were unwilling to participate in the registry.
- Patients who met the criteria were divided into two groups based on whether navigation was utilized during their HR. Navigation started to be used at our institution beginning in January 2020. All patients with a date of surgery at this time point or later were included in the NAV study group. Patients with a date of surgery earlier than this were put into the non-NAV study group. The NAV group was propensity-matched in a 1:1 ratio to the non-NAV group based on age at surgery and BMI.
- An a priori power analysis was run prospectively to determine the sample size needed to achieve 80% power, with an alpha value of 0,05. A standard deviation of 12 was used. An a priori power analysis found a sample size of 37 subjects per group were needed to achieve 80% power.
- **Statistical Analysis:**A two-tailed Wilcoxon Signed-Rank Test was utilized to compare PROs of non-NAV and NAV groups. A two-tailed paired T-test was also utilized to compare acetabular inclination and anteversion, obtained from two year follow up x-rays, of non-NAV and NAV groups. The percentage of hips that met the Minimal Clinically Important Difference (MCID) for mHHS and VAS was also noted.
- **Radiographic Evaluation:** The radiographic evaluation was conducted based on the 4-month post-operative x-rays. Acetabular inclination and anteversion were obtained using measurement tools in TraumaCad™. 20–22 Cup size and femoral head size were collected from the operative report. Component placement analysis was conducted based on the safes zone defined by Lewinnek, Callanan, and Relative Acetabular Inclination Limit (RAIL).

Results

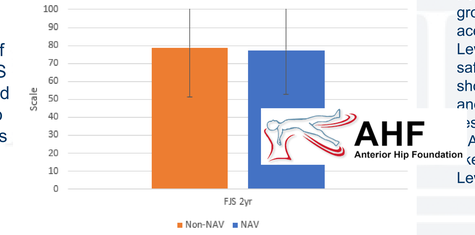


- Clinical data analysis of Non-NAV v. NAV for mHHS, pre-op and 2yr, and HOOS-JR, pre-op and 2yr. No statistical difference was noted for pre-op mHHS (p= 0.216), 2yr mHHS (p = 0.336), pre-op HOOS-JR (p=0.762), and 2yr HOOS-JR (p = 0.264).

- A total of 76 hips matched, 38 per group. The mean age at
- surgery in the non-NAV group was 49.1 ± 7.3 and 49.1 ± 8.7 for the NAV group (P > 0.9). The mean BMI in the non-Nav group was 30.1 ± 5.4 and 29.8 ± 5.1 for the NAV group (P = 0.7). All patients in the study were men.

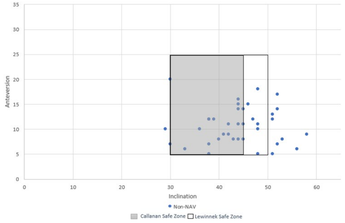
Table 1:
Demographics of the Matched Study Group

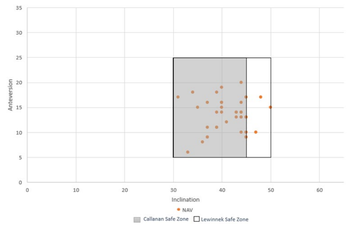
Clinical Variables	Non-NAV	NAV Average	P-value
Age at Surgery (years)	49.05 ± 7,3 (27,3 – 64,7)	49,11 ± 8.7 (25,3 – 68,5)	0,970
Weight (lbs)	213.41 ± 39.5 (161 – 300)	209,44 ± 28.8 (150 – 265)	0,658
Body Mass Index (kg/m²)	30.1 ± 5.4 (23.7 – 45.7)	29.8 ± 5.1 (22.2 – 48.8)	0,739
	Non-NAV Number	**NAV Number**	
Sex (N= 76)			
Male	38 (100%)	38 (100%)	>0,999
Approach			
Posterior	32 (84,2%)	14 (36,8%)	<0,001
Anterior	6 (15,8%)	24 (63,2%)	<0,001

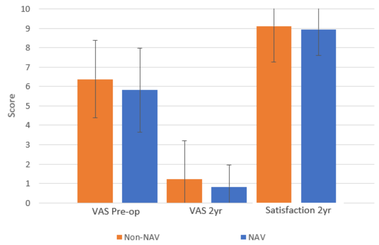


- Clinical data analysis of non-NAV v. NAV for FJS 2yr was evaluated based on a 0 to 100 scale. No statistical difference was noted (p = 0.591).

- For acetabular inclination, the non-NAV group had 10 hips (26%) outside the acetabular inclination safe zone defined by Lewinnek and 14 hips (36%) outside the safe zone described by Callanan, as shown in Figure 4(A). In the NAV group, 0 and 3 (7,8%) hips were outside respectively, as shown in Figure 4(B). The AV group was 28,8 and 6,8 times more kely to be within the Callanan and Lewinnek safe zones, respectively.

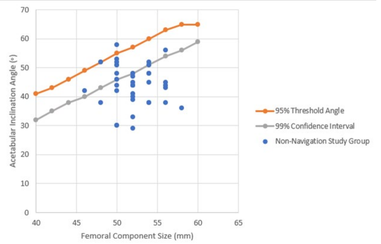


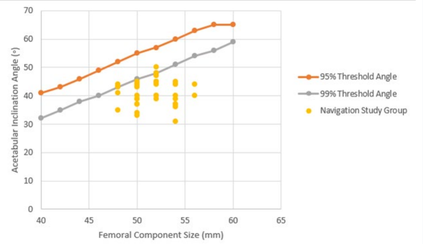




- Clinical data analysis of non-NAV v. NAV for VAS, pre-op and 2yr, and Satisfaction, 2yr, was evaluated based on a 0 to 10 scale. No statistical difference was noted for pre-op VAS (p = 0.257), 2yr VAS (p = 0.556), and 2yr Satisfaction (p = 0.408).

- RAIL safe acetabular inclination angle ranges related to femoral component sizes with 95% and 99% confidence interval for metal ion level < 10 ug/L trend lines in relation to (A) Non-Navigation study group and (B) Navigation study group. The NAV group was 3.1 and 6.4 times more likely to be within the 95 and 99% confidence interval safe zones, respectively.





Conclusions

HR is an effective treatment for physically active individuals with OA. Comparable improvements in PROs were observed in both groups over a minimum 2-year follow-up. Navigation-assisted surgery enhances the accuracy of acetabular component positioning, with a higher likelihood of cup placement within the safe zones.

References

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Contact Information

Dr. Benjamin Domb
Email: DrDomb@americanhipinstitute.org
Phone: +1 630-455-7130
Fax: +1 630-323-5625