Comparison of Humeral Head Resurfacing Versus Stemless Humeral Components in Anatomic Total Shoulder Arthroplasty: a Multicenter Investigation with Minimum Two Year Follow Up

Joseph S Tramer[1], Pierre-Henri Flurin[2], Christopher Roche, Thomas W Wright[3], Joseph D Zuckerman[4], Robert M Titelman, Curtis R Noel, Ryan Wade Simovitch, Felix H Savoie[5], Tewfik T Benkalfate, Stephanie J Muh
[1]Henry Ford Hospital, [2]Bordeaux Merignac Sport Clinic, [3]UF Orthopaedics, [4]NYU Langone Medical Center, [5]Tulane University School of Medicine

INTRODUCTION: Humeral head resurfacing (HHR) and stemless humeral components offer an approach to anatomic total shoulder arthroplasty (aTSA) with the goal of replicating normal anatomy and conserving proximal humeral bone stock. The purpose of this investigation was to compare minimum two year outcomes of aTSA performed with HHR versus stemless implants.

METHODS:

A retrospective review of a large multicenter database was conducted. All patients who underwent aTSA with either HHR or stemless implants with minimum two year follow up were evaluated. Range of motion (ROM) including abduction, forward elevation, internal and external rotation were evaluated pre- and post-surgery. Patient reported outcomes (PROs) including Constant Score, Simple Shoulder test (SST), American Shoulder and Elbow score, University of California Los Angeles shoulder score, Shoulder Pain and Disability Index and Shoulder Arthroplasty Smart score were collected for all patients. Radiographic data was collected to determine the presence of radiolucent lines as well as evaluation of implant sizing.

RESULTS:

Overall 127 patients were included with 49 patients receiving HHR and 78 stemless aTSA. The patients in the HHR group were significantly older (69.3 ± 8.6 versus 64.3 ± 8.7, $P<0.01$), had a lower BMI (27.7 ± 4.3 versus 31.5 ± 7.2, $p<0.01$) and a higher percentage were females (87.8% versus 35.9%, $p<0.01$) compared to the stemless aTSA group. Postoperative follow up occurred at an average of 28.7 ± 7.7 months after surgery, with a minimum of two years. Both groups demonstrated significant improvements in all PROs and ROM from pre- to post-surgery ($p<0.05$). At final follow up the stemless aTSA group had significantly greater active abduction (148.5 ± 27.7 versus 115.6 ± 22.4, $p<0.01$), forward flexion (154.3 ± 20.6 versus 140.6 ± 15.3, $p<0.01$) and external rotation (52.14 ± 14.9 versus 34.4 ± 19.8, $p=0.01$) compared to the HHR group. The stemless aTSA group exhibited better scores on the SST (10.4 ± 2.0 versus 9.5 ± 1.9, $p=0.01$) but no other PROs demonstrated significant difference between groups (Table 1).

Radiographic evaluation of HHR implants demonstrated 8.7% of patients with evidence of overstuffing and 39.1% patients with oversizing of components by an average of 2.6 ± 0.7mm. Additionally, 13.0% of HHR patients showed lucent lines around the glenoid component. Radiographs of the stemless aTSA patients showed rates of radiolucent lines of 4.2% around the humeral component and 18.8% around the glenoid component. One patient in the stemless aTSA group required a revision surgery for aseptic glenoid loosening, otherwise no other major complications were reported.

DISCUSSION AND CONCLUSION: Anatomic TSA performed both with stemless implants and HHR resulted in significant improvements in ROM and multiple PROs at minimum two year follow up with a low complication rate. HHR arthroplasty was more likely to be performed in an older, female patients compared to stemless aTSA. Stemless aTSA resulted in better post-operative range of motion compared to HHR.

Motion	HHR	Stemless aTSA	p-value
Abduction	115.6 ± 22.4	148.5 ± 27.7	<0.01*
Forward Elevation	140.6 ± 15.3	154.3 ± 20.6	<0.01*
External Rotation	34.3 ± 17.0	49.9 ± 15.5	<0.01*
Internal Rotation	5.4 ± 1.8	4.8 ± 1.5	0.07
PROs			
VAS pain	0.9 ± 1.9	1.5 ± 2.2	0.09
SST	9.5 ± 1.9	10.4 ± 2.0	0.01*
Constant	72.5 ± 8.5	75.2 ± 11.8	0.26
ASES	84.4 ± 12.5	83.9 ± 18.1	0.86
UCLA	31.3 ± 2.7	30.7 ± 4.7	0.47
SPADI	17.4 ± 15.1	17.8 ± 19.7	0.91
SAS	78.1 ± 9.2	79.5 ± 9.2	0.49

Table 1: Postoperative evaluation at final follow up (28.7 ± 7.7 months after surgery)
Abbreviations: PROs = Patient reported outcomes ; HHR = humeral head resurfacing ; aTSA = anatomic total shoulder arthroplasty ; VAS = Visual Analog Scale ; SST = Simple Shoulder Test ; ASES = American Shoulder Elbow Surgeons Score ; UCLA = University of California Los Angeles shoulder score ; SPADI = Shoulder Pain and Disability Index ; SAS = Shoulder Arthroplasty Smart score