scapula notching neither by incidence (21% vs 8%, P=0.08) nor by distribu-
tion. Conclusion This study found that at a two-year minimum follow up,
the position of humeral tray as either inlay or onlay did not influence the
clinical outcomes of function, range of motion, complications including
baseplate loosening and acromial stress fracture, and scapula notching.

Category: Shoulder - Arthroplasty

Periarticular Injection In Addition To Interscalene Nerve Block Can Decrease Opioid Consumption And Pain Following Total Shoulder Arthroplasty: A Prospective Comparison Cohort Study

Abstract ID #: 21744
All Authors:
Chaiyanaan Vijittrakarnrung MD THAILAND
Ryan Freshman MD UNITED STATES
Christopher Anigwe medical student UNITED STATES
Drew Lansdown MD UNITED STATES
Brian T. Feeley MD UNITED STATES
C. Benjamin Ma MD UNITED STATES

Summary: The addition of an intra-operative peri-articular cocktail injection appears to be a safe and effective method to reduce acute post-operative pain following TSA compared to an isolated interscalene nerve block.

Data: INTRODUCTION: Interscalene nerve block (INB) is as an effective technique to provide post-operative anesthesia for total shoulder arthroplasty (TSA). However, the analgesic effects of the block typically resolve between 8-and 24-hours following administration, which results in rebound pain and subsequent increased opioid utilization. With the aim of transitioning the shoulder arthroplasty procedure toward out-patient surgery, decreasing opioid consumption in the acute post-operative period is the main goal to achieve a shorter hospital stay. The objective of this study was to determine the effect that the combination of INB and intra-operative peri-articular injection (PAI) has on opioid consumption and acute post-operative pain scores in patients undergoing TSA. We hypothesized that the combination of INB + PAI will significantly reduce opioid consumption and pain scores for the first 24 hours following surgery as compared to INB alone. METHODS: We reviewed 130 consecutive patients who underwent elective primary TSA at a single tertiary institution. The first 65 patients were treated with INB alone, followed by 65 patients treated with INB + PAI. The PAI utilized was 50ml of a combination of Ropivacaine (123mg), Epinephrine (0.25mg), Clonidine (40mg), and Ketorolac (15mg). The PAI was injected using a standardized protocol; 10ml into the subcutaneous tissues prior to incision, 15ml into the supraspinatus fossa, 15ml at the base of the coracoid process, and 10ml into the deltoid and pectoralis muscles. A standardized post-operative oral pain medication protocol was utilized for all patients. The primary outcome measured was acute post-operative opioid consumption represented by morphine equivalent units (MEU), while the secondary outcome measured was Visual Analog Scale (VAS) pain scores over the first 24 hours after surgery, operative time, length of stay, and acute peri-operative complications.

RESULTS: There were no significant differences in patient demographics between the INB alone compared to patients with INB + PAI. Patients who received INB + PAI had a significantly lower 24-hour post-operative opioid consumption as compared to INB alone group (38.6±30.5 MEU versus 60.5±37.3 MEU, P=0.001). Moreover, the demand for rescue intravenous opioids from severe breakthrough pain was also decreased by 16.9% in INB + PAI group (20% versus 36.9%, P=0.033). Additionally, VAS pain scores for the first 24 hours following surgery in the INB + PAI group was significantly lower as compared to INB alone group (2.9±1.5 versus 4.3±1.6, P=0.001). There were no differences between both groups in the operative time, length of inpatient stay and acute peri-operative complications.

CONCLUSION: Patients undergoing TSA with INB + PAI demonstrated significantly decreased 24-hour post-operative total opioid consumption and 24-hour post-operative pain scores as compared to group treated with INB alone. There was no observed increase in acute peri-operative complications related to PAI. Thus, the addition of an intra-operative peri-articular cocktail injection appears to be a safe and effective method to reduce acute post-operative pain following TSA compared to an isolated interscalene nerve block.

Level of Evidence: Level II, Prospective Cohort Design; Treatment Study Keywords: Total shoulder arthroplasty, Interscalene nerve block, Peri-articular injection, Multimodal analgesia, Peri-operative analgesia, Opioid consumption

Category: Shoulder - Arthroplasty

Surgical Parameters are Associated With Kinematics, Contact Path, and Clinical Outcomes After Reverse Shoulder Arthroplasty During Hand to Head Motion

Abstract ID #: 22512
All Authors: Ajinkya Rai BS UNITED STATES

Summary: Retroversion, neckshaft angles and eccentricity are associated with kinematics, contact path, and clinical outcomes after reverse shoulder arthroplasty during hand to head motion.

Data:
INTRODUCTION: External rotation (ER) is a post-surgical assessment after reverse shoulder arthroplasty (RSA) because it is essential to activities of daily living, such as the hand-to-head motion. The aim of this study was to determine effects of surgical technique and prosthesis geometry on in vivo kinematics, contact path, and patient-reported outcomes (PROs) during the hand-to-head motion after RSA. We hypothesized that greater laterolization, greater retroversion, and lower humeral neck-shaft angles would associate with kinematics and contact paths during hand-to-head that are associated with improved PROs. METHODS: Patients who received RSA within the previous 1-5 years consented to participate in this IRB-approved study. RSA was performed using standard 135-degree or 145-degree humeral implants. Laterolization, gelenosphere size, and eccentricity were recorded from surgical notes. Humeral retroversion and glenoid tilt were measured on post-operative CT. Participants performed 3 trials of hand-to-head motions while synchronized biplane radiographs were collected at 50 images/s for 2 seconds. Digitally reconstructed radiographs from subject-specific segmented bone tissue of humerus and scapula with respective implants were matched to biplane radiographs with sub-millimeter accuracy to determine six degree-of-freedom kinematics. The contribution of each gelenohumeral (GH) and scapular rotation (GH abduction, plane of elevation and internal/external (I/E) rotation, as well as scapular upward rotation, protraction, and tilt) to overall shoulder motion was calculated. Average end position of all 6 rotations was found. The path of the center of contact between a 3D CAD model of the polyethylene and the gelenosphere was calculated. ASES, DASH, and CMS scores were collected at testing. Implant characteristics and surgical techniques that predicted kinematics (peak angles, ROM, contribution, end position) and contact path location were identified using multiple linear regression using forward selection with SPSS 29.0 software. Associations between kinematics and PROs were evaluated with Pearson correlations. Significance was set at p<0.05. RESULTS: This study includes 35 RSA patients (17M,18F,72.8±7.3 years) with average follow-up of 2.2±1.1 years. Greater retroversion angles correlated with less peak abduction and scapular protraction contribution (p=0.038 & p=0.005, respectively). Greater eccentricity was associated with more scapular upward rotation contribution (p=0.005). 145° neckshaft angles displayed more anterior contact path (p=0.006). CMS scores improved with more abduction (all p<0.05). ASES and DASH scores improved with more scapular upward rotation (all p<0.05). DASH and CMS scores improved with more superior contact paths (all p<0.05). DISCUSSION: During hand-to-head, favorable PROs are associated with more gelenohumeral abduction and higher upward scapular rotation. Those kinematic outcomes are associated with the surgical techniques of less retroversion, greater eccentricity, and more superior contact path. Contrary to our hypothesis, greater retroversion was not associated with kinematics that were associated with better PROs, and laterolization and neck-shaft angle did not have significant effect on this motion. Additional study is needed to identify the point at which less retroversion and more eccentricity begin to worsen outcomes. Control subject kinematics data are needed to evaluate RSA’s restoration of healthy kinematics. Satisfaction and function may improve by identifying techniques that affect kinematics associated with better outcomes after RSA. Study was funded by NIH Grant: R03AG064417

Category: Shoulder - Arthroplasty

Head Motion

INTRODUCTION: External rotation (ER) is a post-surgical assessment after reverse shoulder arthroplasty (RSA) because it is essential to activities of daily living, such as the hand-to-head motion. The aim of this study was to determine effects of surgical technique and prosthesis geometry on in vivo kinematics, contact path, and patient-reported outcomes (PROs) during the hand-to-head motion after RSA. We hypothesized that greater laterolization, greater retroversion, and lower humeral neck-shaft angles would associate with kinematics and contact paths during hand-to-head that are associated with improved PROs. METHODS: Patients who received RSA within the previous 1-5 years consented to participate in this IRB-approved study. RSA was performed using standard 135-degree or 145-degree humeral implants. Laterolization, gelenosphere size, and eccentricity were recorded from surgical notes. Humeral retroversion and glenoid tilt were measured on post-operative CT. Participants performed 3 trials of hand-to-head motions while synchronized biplane radiographs were collected at 50 images/s for 2 seconds. Digitally reconstructed radiographs from subject-specific segmented bone tissue of humerus and scapula with respective implants were matched to biplane radiographs with sub-millimeter accuracy to determine six degree-of-freedom kinematics. The contribution of each gelenohumeral (GH) and scapular rotation (GH abduction, plane of elevation and internal/external (I/E) rotation, as well as scapular upward rotation, protraction, and tilt) to overall shoulder motion was calculated. Average end position of all 6 rotations was found. The path of the center of contact between a 3D CAD model of the polyethylene and the gelenosphere was calculated. ASES, DASH, and CMS scores were collected at testing. Implant characteristics and surgical techniques that predicted kinematics (peak angles, ROM, contribution, end position) and contact path location were identified using multiple linear regression using forward selection with SPSS 29.0 software. Associations between kinematics and PROs were evaluated with Pearson correlations. Significance was set at p<0.05. RESULTS: This study includes 35 RSA patients (17M,18F,72.8±7.3 years) with average follow-up of 2.2±1.1 years. Greater retroversion angles correlated with less peak abduction and scapular protraction contribution (p=0.038 & p=0.005, respectively). Greater eccentricity was associated with more scapular upward rotation contribution (p=0.005). 145° neckshaft angles displayed more anterior contact path (p=0.006). CMS scores improved with more abduction (all p<0.05). ASES and DASH scores improved with more scapular upward rotation (all p<0.05). DASH and CMS scores improved with more superior contact paths (all p<0.05). DISCUSSION: During hand-to-head, favorable PROs are associated with more gelenohumeral abduction and higher upward scapular rotation. Those kinematic outcomes are associated with the surgical techniques of less retroversion, greater eccentricity, and more superior contact path. Contrary to our hypothesis, greater retroversion was not associated with kinematics that were associated with better PROs, and laterolization and neck-shaft angle did not have significant effect on this motion. Additional study is needed to identify the point at which less retroversion and more eccentricity begin to worsen outcomes. Control subject kinematics data are needed to evaluate RSA’s restoration of healthy kinematics. Satisfaction and function may improve by identifying techniques that affect kinematics associated with better outcomes after RSA. Study was funded by NIH Grant: R03AG064417