Title: Reverse Total Shoulder Arthroplasty with Lower Trapezius Transfer for Combined Loss of Elevation and External Rotation

Authors: John P Scanaliato, MD; Tyler Williams, BS; Sydney Garelick, BS; Niraj V Lawande, BS; Stanley Liu, MA; William E Harkin, MD; Gregory P Nicholson, MD; Grant E Garrigues, MD

Insititution: Rush University Medical Center Department of Orthopaedics, Chicago, IL, USA

Introduction: Reverse total shoulder arthroplasty (RTSA) is a well-accepted treatment for cuff tear arthropathy and consistently restores active forward elevation. However, when there is loss of the posterior rotator cuff (infraspinatus and teres minor), patients can exhibit a "Hornblower's sign". This loss of active external rotation (ER) in abduction can be functionally disabling and RTSA alone may not reliably restore active ER ability in this clinical scenario. We present a series of RTSA with lower trapezius transfer (LTT) (utilizing tibialis anterior allograft) as the primary surgery for patients with a combined loss of active elevation and external rotation (CLEER).

Materials & Methods: Ten patients (9 male, 1 female) underwent RTSA with LTT (9 with tibialis anterior, 1 achilles tendon allograft). The average patient age was 68.6 years (52.4-82.8) and the average follow-up was 25.1 months (12-44 months). All had a loss of active ER with the average active ER at the side being -6° (-30 to 45). The average pre-operative active elevation was 66.0° (30-160). Pre-operative patient-reported outcome scores were: ASES: 43.0 (±19.36), SANE: 32.4 (±20.68), and VAS for Pain: 5.6 (±2.56). Preoperatively, all exhibited the "Hornblower's sign" with the forearm falling into internal rotation with elevation. Magnetic resonance imaging (MRI) revealed irreparable cuff tears involving the supraspinatus and infraspinatus. In all cases, the infraspinatus and teres minor had significant atrophy and/or fatty infiltration.

Results: All patients could actively elevate and keep the forearm pointed to the ceiling in the scapular plane following surgery, thus eliminating the "Hornblower's sign." The average postoperative active FE and active ER at the side were 144.5° (120-170, $p<0.0001$) and 38.5° (30-70, $p=0.0002$), respectively. Postoperative outcome scores averaged: ASES: 82.7 (±10.4, $p=0.0004$), SANE: 74.0 (±24.9, $p=0.002$), VAS for pain: 1.0 (±1.6, $p=0.0009$).

Discussion: RTSA with latissimus dorsi transfer has been utilized to address CLEER. LTT has been described for rotator cuff deficient shoulders without arthritis to restore ER ability without a prosthetic implant. This series, with early-term follow-up, reports the results of RTSA with LTT to restore ER ability in severely dysfunctional shoulders. Consistent functional results and high patient satisfaction were obtained with RTSA and LTT with a tibialis anterior tendon allograft in patients with CLEER. The Hornblower's sign was eliminated in all patients.

Table 1. Pre- and Postoperative Patient Reported Outcomes

	Preoperative	Postoperative	Change	P-Value
ASES, mean (SD)	43.03 (25 – 51.67)	85.42 (63.33 – 91.67	42.39	<0.001
ASES Pain, mean (SD)	21.88 (10 – 50)	46.25 (30 – 50)	24.37	0.001
SANE, mean (SD)	32.25 (10 – 75)	74.25 (25 – 99)	42.00	0.005

Table 2. Pre- and Postoperative Range of Motion

	Preoperative	Postoperative	Change	P-Value
Active Forward Elevation, mean (range), degrees	66.00 (30 – 160)	144.50 (100 – 170)	78.50	<0.001
Active External Rotation with the Arm at the Side, mean (range), degrees	-6.00 (-30 – 45)	38.50 (25 – 70)	44.50	<0.001
Active External Rotation Strength, mean (range), degrees	2.86 (2 – 5)	4.71 (4 – 5)	1.85	0.002