Lower Trapezius Transfer (LTT) Performed at the Time of Reverse Shoulder Arthroplasty (RSA) with an Allograft-Prosthetic Composite (APC) Can Restore Active External Rotation in Shoulders with Posterosuperior Cuff Deficiency and Humeral Bone Loss

Christopher M. Hart MD, Tristan B. Weir MD, Nathan Graden MD, Musab Gulzar MD, Eric Wagner MD, Bassem ElHassan MD, Joaquin Sanchez-Sotelo MD PhD

Background. Transfer of the tendon of the lower trapezius has become the procedure of choice to restore active external rotation in patients with paralysis or irreparable posterosuperior cuff tears. Although transfer of the latissimus dorsi (with or without teres major) can help restore active external rotation in the setting of reverse shoulder arthroplasty (RSA), the latissimus dorsi and teres major are often compromised in the presence of severe proximal humerus bone loss. The purpose of this study was to describe a surgical technique that combines implantation of a reverse allograft prosthetic composite (APC) and a lower trapezius transfer (LTT) to the infraspinatus of the allograft prolonged with the inferior capsule, and to report the clinical outcomes, complications and reoperations of the procedure when performed in patients with severe proximal humerus bone loss below the attachment site of the teres major.

Methods. Between 2019 and 2022, three surgeons performed a total of 36 RSA APC with LTT. Indications for the procedure included failed shoulder arthroplasty with severe proximal humerus bone loss, the second stage of a two-stage reimplantation, or shoulder reconstruction at the time of oncologic resection. All proximal humerus allografts used included capsule and cuff allograft. The inferior and posterior allograft capsule was mobilized in continuity with the posterior allograft cuff to create a long tail of soft tissue attached to the graft that would allow LTT (**Figure 1**). Allograft prosthetic reconstruction was performed through a deltopectoral approach, whereas lower trapezius harvest was performed through a separate horizontal skin incision. Plate fixation was used in all cases. Once the APC reconstruction of the proximal humerus had been performed, the cuff-capsule allograft tissue was passed posterior to the glenoid and secured to the harvested lower trapezius. Shoulders were immobilized in external rotation for 6-8 weeks. All patients were followed for a minimum of one year.

Results. RSA APC with LTT resulted in reasonable motion in both active elevation (mean 75, range 0 to 130 degrees) and active external rotation (mean 22, range 0 to 60 degrees). The mean postoperative SSV and ASES scores were 28 (range, 5 to 75) and 36 (range, 18 to 25), respectively. Complications included dislocation (2), graft-host nonunion (2), superficial wound dehiscence or hematoma (2), deep infection (1), and glenosphere disassociation (1). Two patients developed transient radial nerve palsy. The overall complication rate was 27% (10/36) and the overall reoperation rate was 17% (6/36).

Conclusion. Transfer of the lower trapezius to the proximal humerus at the time of reverse shoulder arthroplasty using an allograft prosthetic composite has the potential to restore active external rotation in shoulders with combined substantial proximal humerus bone loss and posterosuperior cuff deficiency. However, restoration of active external rotation is not predictable, and dislocation, nonunion and infection may occur.

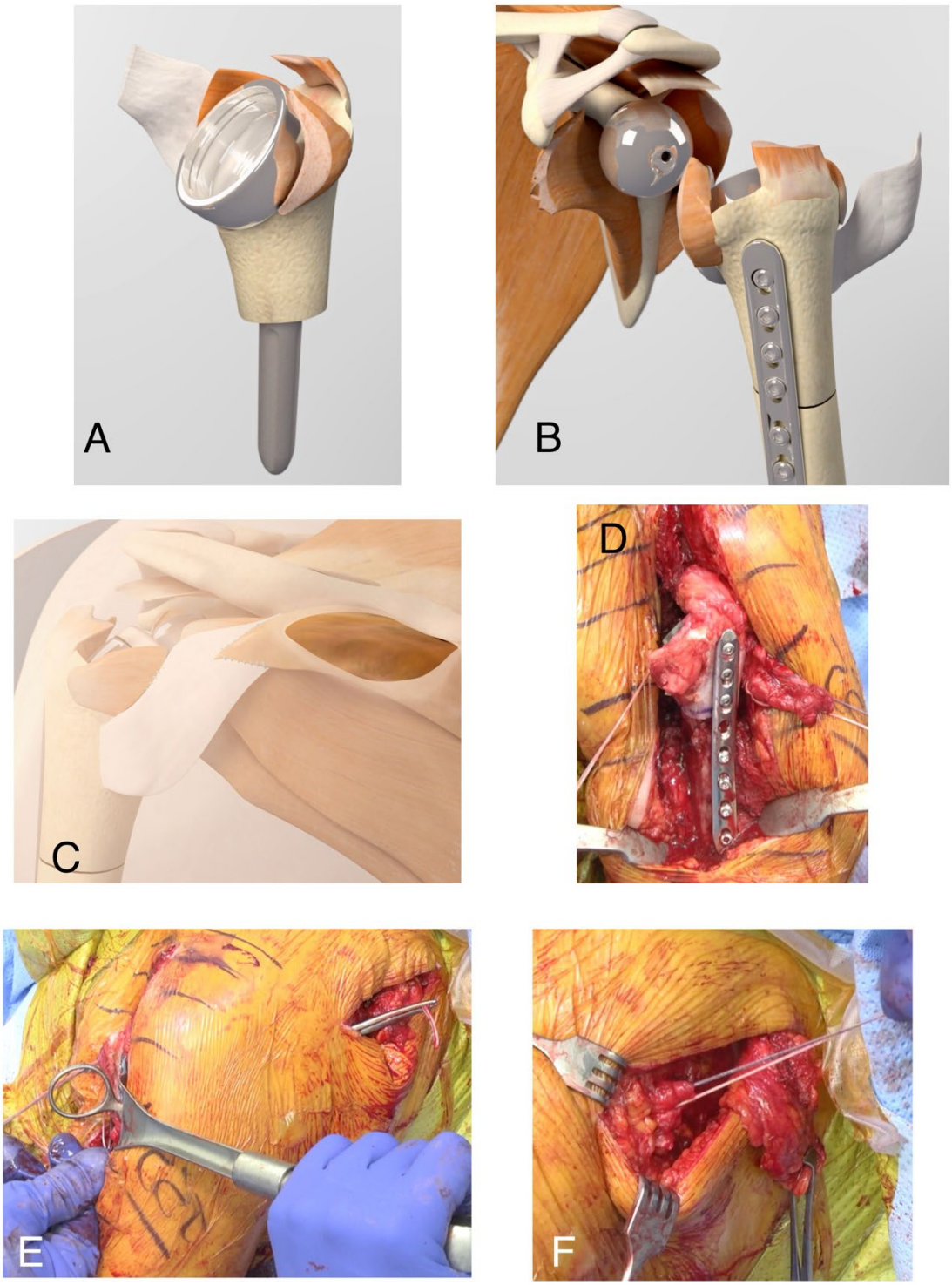

Figure 1. Schematic representation of the allograft composite preparation with a long tail of posterosuperior cuff and capsule (A & B) to transfer the tendon of the lower trapezius (C). Intraoperative photographs show APC reconstruction (D), passage of the posterosuperior cuff and capsule allograft to the donor site (E), and repair to the tendon of the lower trapezius (F).