Bone Healing Potential of Fascia Lata Autograft to Humeral Head Footprint in Rotator Cuff Reconstruction

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Background: We performed a cellular fresh fascia lata autograft (FLA) patch procedure for large to massive rotator cuff tears. During follow-up periods, we found a unique pattern of retear of the FLA remaining in the greater tuberosity of most shoulders. We performed a second-look arthroscopy after the FLA patch procedure in one shoulder, and harvested the FLA remaining on the greater tuberosity at the time of reverse shoulder arthroplasty after the patch procedure as revision surgery to macroscopically and histologically analyze the FLA in another two shoulders. We aimed to evaluate the bone-healing potential of facia lata autograft (FLA) by magnetic resonance imaging (MRI) and histological analysis.

Methods: Subjects included 70 patients after an FLA patch procedure by MRI. Three of the 70 patients underwent a revision procedure after the primary FLA procedure: one underwent a second-look arthroscopy and two underwent reverse shoulder arthroplasties (RSAs). In the two RSA patients, we histologically evaluated greater tuberosities (GTs) with the repaired graft. Moreover, as a control, we harvested the GT with the cuff tendon at the time of RSA for failed open reduction of internal fixation for 4-part proximal humeral fracture. Based on MRI, retear cases were divided into type 1 (the graft did not remain in the GT) and type 2 (the graft remained in the GT). Histological sections were inspected under a microscope, assessing the histological appearances for the fascia (or rotator cuff)-bone interface, midsubstance of fascia lata graft (or rotator cuff), and tear portion site. Moreover, we evaluated the sites semi-quantitatively, using the modified tendon maturing score.

Results: There were 35 intact repairs: seven type 1 and 28 type 2 shoulders (type 1 vs 2, P < 0.001). Of the 70 patients, the repaired fascia lata remained on the greater tuberosity in 63 shoulders (90.0%). Second-look arthroscopic finding confirmed that the graft was securely attached to the GT. Histological analysis of GTs in RSA patients showed solid continuity of the graft to the bone with tidemarks and cells with nuclei in the collagen matrix oriented in parallel. The FLA to bone junction consisted of the FLA, fibrocartilage, and bone, which is almost similar to the normal cuff tendon to bone junction. There was some safranin-O-stained layer representing fibrocartilage layer (Figure 1). The maturing score for both RSA patients exceeded 75% of the control’s score. In contrast, the scores of two cases for the midsubstance sites were <75% of the control score, and the scores of the tear sites were <60% of the control score.

Conclusions: This present study noted three findings. The first was that 63 postoperative MRIs (90.0%) showed that the FLA remained on the greater tuberosity among 70 MRIs in 70 patients who underwent FLA patch procedures. The second was
that the graft remained on the greater tuberosity in the patient who underwent a second-look arthroscopy. The third was that histological findings revealed that the fascia–bone insertion comprises four zones, the fascia (like tendon), nonmineralized fibrocartilage, mineralized fibrocartilage, and bone, which is similar to the normal cuff tendon–bone junction, and the modified tendon maturing scores of the fascia–bone interface exceeded 75% of the control score at the tendon–bone interface. Based on these radiographic and histological results, a fresh cellular FLA has a good to excellent bone healing-potential as a valuable graft.