

Anterolateral Mini-open Fixation with a Patch Augmentation for Latissimus Dorsi Tendon Transfer in Irreparable Rotator Cuff Tears: Technical Note

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Latissimus dorsi tendon transfer is a well-established method for treatment of irreparable posterosuperior rotator cuff tears. We report on an anterolateral mini-open technique with a porcine dermal patch augmentation for latissimus dorsi tendon transfer. Use of this technique would result in avoidance of deltoid damage by anterolateral mini-open approach and reduction of failure rate by patch augmentation.

(Clin Shoulder Elbow 2015;18(4):269-271)

Key Words: Latissimus dorsi; Irreparable rotator cuff tear; Tendon transfer; Mini-open; Patch

Introduction

Irreparable massive rotator cuff tears present severe functional impairment and disabling pain. They are also a complex and difficult challenge for the orthopedic surgeon. Latissimus dorsi tendon transfer described by Gerber et al.¹⁾ in 1988 is a reasonable treatment option for irreparable posterosuperior rotator cuff tears. This procedure provides further improvement of motion and pain relief by anterior and posterior soft tissue balanced fulcrum and effective deltoid action. It has been supported by biomechanical studies and clinical reports showing significant improvement in clinical outcomes.²⁻⁷⁾

However, latissimus dorsi tendon transfer is a technically challenging procedure. Classic technique requires violation of the deltoid for attachment of the transferred tendon.⁵⁾ Recently, in an effort to avoid deltoid damage, less invasive procedures including single-incision or arthroscopic technique have been described.^{3,5,6)} In patients with a short and small body type, harvested latissimus dorsi tendon may be too thin and short for transfer to the greater tuberosity. In these cases, several augmen-

tation techniques using allograft or tensor fascia lata have been proposed.⁷⁾

We report on an anterolateral mini-open technique with a porcine dermal patch augmentation that avoids deltoid damage and increases initial fixation strength for latissimus dorsi tendon transfer for irreparable posterosuperior rotator cuff tears.

Technique

Under general anesthesia, the patient is placed in the lateral decubitus position with an articulated hydraulic arm holder. Placing the arm into flexion, abduction, and internal rotation, an L-shaped 10 cm skin incision is made along the anterior belly of the latissimus dorsi muscle and then along the posterior axillary crease. Latissimus dorsi is dissected from its attachments to the anterior chest wall, and then the interval between the latissimus dorsi and teres major is identified. Its humeral insertion is identified and tenotomized with maximal internal rotation of the arm to obtain maximal tendon length (Fig. 1).

The tendinous portion of latissimus dorsi was tagged by trac-

Received October 4, 2015. **Revised** November 24, 2015. **Accepted** December 9, 2015.

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Financial support: None. **Conflict of interests:** None.

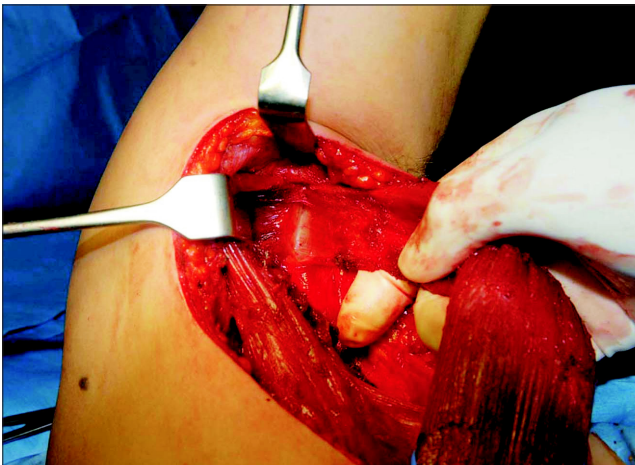


Fig. 1. The latissimus dorsi tendon is dissected to the humeral insertion.

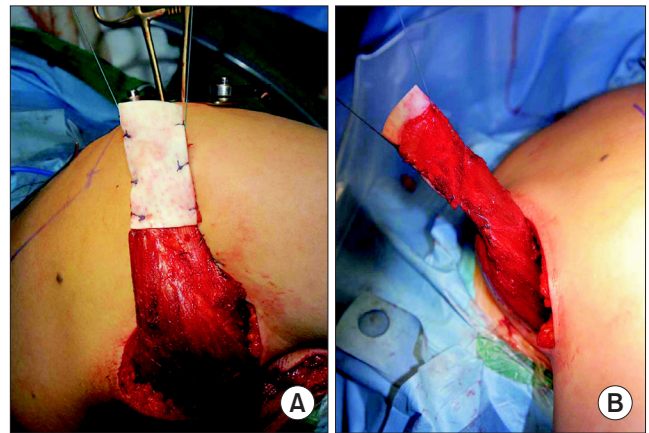


Fig. 2. The harvested latissimus dorsi tendon is augmented by a porcine dermal patch. (A) Superior view. (B) Inferior view.

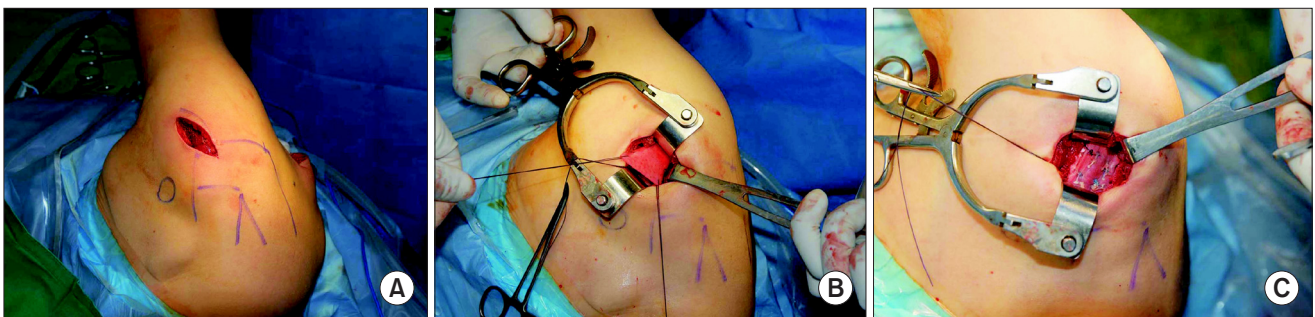


Fig. 3. (A) A 4 cm skin incision is made distally from the anterolateral edge of the acromion. (B) The augmented latissimus dorsi tendon is passed to the greater tuberosity through the subdeltoid tunnel. (C) The transferred tendon is fixed at the footprint using suture anchors.

tion suture, facilitating dissection of proximal muscle belly. The dissection is performed in order not to injure the underlying thoracodorsal artery and nerve, then the muscle-tendon unit is mobilized to reach the top of the acromion, avoiding excessive tension on the pedicle. If harvested tendon is too thin and short for transfer to the greater tuberosity, tendon augmentation is performed using a porcine dermal patch. A Permacol (Covidien, Mansfield, MA, USA) is created of an appropriate size and configuration. After placement of the designed patch on the harvested tendon, the overlapped patch and tendon is fixed by 3 simple sutures using 2-0 Vicryl (Ethicon, Somerville, NJ, USA) on each side (Fig. 2).

To fix the transferred tendon to the greater tuberosity, we use a mini-open technique using an anterolateral approach. A 4 cm skin incision is made distally from the anterolateral edge of the acromion, and dissection was made to the raphe between the anterior and middle deltoid. A stay suture was placed distally to prevent propagation of the deltoid split and potential injury to the axillary nerve. The footprint area on the greater tuberosity is debrided to enhance bone-to-tendon healing. A tunnel is created deep to the deltoid and superficial to the teres minor. A

curved clamp is passed inferiorly through the tunnel. Then the latissimus dorsi tendon is placed on the greater tuberosity. Four 6.0-mm Duet suture anchors (ConMed, Largo, FL, USA) are inserted at each corner of the footprint. The transferred tendon is securely fixed by mattress suture method (Fig. 3).

After immobilization with an abduction and external rotation brace for 6 weeks after surgery, the patient is allowed to begin passive and active range-of-motion exercises. A biofeedback program is initiated at 3 months after surgery.

Discussion

Latissimus dorsi tendon transfer is regarded as a procedure for treatment of irreparable massive rotator cuff tears involving the supraspinatus and infraspinatus tendons in the absence of glenohumeral arthritis.¹⁻⁵⁾

Classic technique of latissimus dorsi tendon transfer requires violation of the deltoid for attachment of the transferred tendon.^{1,5)} Deltoid detachment is a disadvantageous step in the classic technique in that it can produce an inferior clinical outcome by deltoid morbidity. Recently, in an efforts to avoid deltoid

damage, less invasive procedures using arthroscopic technique have been described.^{3,5,6)} However, arthroscopically assisted latissimus dorsi tendon transfer is a technically demanding procedure. Cho et al.⁸⁾ introduced an anterolateral mini-open rotator cuff repair technique that represents a smaller deltoid-sparing version of the standard open repair, preserving the deltoid origin by splitting the anterolateral raphe of the deltoid muscle and still allowing adequate exposure for massive rotator cuff tears. In the current study, we used mini-open a technique with an anterolateral approach. This technique is good enough to fix transferred tendon at the footprint of the greater tuberosity. We believe that use of this technique can lead to satisfactory clinical outcomes without deltoid detachment.

In patients with a short and small body type such as Asian harvested latissimus dorsi tendon may be too thin and short for transfer to the greater tuberosity. Augmentation or reinforcement techniques using allograft or tensor fascia lata for latissimus dorsi tendon transfer have been used to restore length of harvested tendon and increase initial fixation strength.^{5,7)} Villacis et al.⁵⁾ introduced an augmentation technique with allograft tissue for latissimus dorsi transfer. If the tendon was very thin and diminutive in nature, they used either a strip of achilles or double-looped semitendinosus allograft. In the current study, tendon augmentation was performed using a porcine dermal patch. Porcine dermal patch has been widely used for reinforcement of human body tissues.⁹⁾ Badhe et al.⁹⁾ reported clinical and radiologic results after porcine dermal patch augmentation in the repair of extensive rotator cuff. We propose that porcine dermal patch augmentation is one option to decrease healing failure of transferred tendon by restoring tendon length and increasing initial fixation strength.

In conclusion, anterolateral mini-open fixation with a patch augmentation for latissimus dorsi tendon transfer can be a useful technique for prevention of deltoid morbidity and failure rate.

References

1. Gerber C, Vinh TS, Hertel R, Hess CW. Latissimus dorsi transfer for the treatment of massive tears of the rotator cuff. A preliminary report. *Clin Orthop Relat Res.* 1988;(232):51-61.
2. Tauber M, Moursy M, Forstner R, Koller H, Resch H. Latissimus dorsi tendon transfer for irreparable rotator cuff tears: a modified technique to improve tendon transfer integrity: surgical technique. *J Bone Joint Surg Am.* 2010;92 Suppl 1:226-39.
3. Habermeyer P, Magosch P, Rudolph T, Lichtenberg S, Liem D. Transfer of the tendon of latissimus dorsi for the treatment of massive tears of the rotator cuff: a new single-incision technique. *J Bone Joint Surg Br.* 2006;88(2):208-12.
4. Qadir R, Romine L, Yao DC, Duncan SF. Latissimus dorsi tendon transfer for massive, irreparable posterosuperior rotator cuff tears: surgical technique. *Tech Hand Up Extrem Surg.* 2014;18(3):125-30.
5. Villacis D, Merriman J, Wong K, Rick Hatch GF 3rd. Latissimus dorsi tendon transfer for irreparable rotator cuff tears: a modified technique using arthroscopy. *Arthrosc Tech.* 2013;2(1):e27-30.
6. Goldstein Y, Grimberg J, Valenti P, Chechik O, Drexler M, Kany J. Arthroscopic fixation with a minimally invasive axillary approach for latissimus dorsi transfer using an endobutton in massive and irreparable postero-superior cuff tears. *Int J Shoulder Surg.* 2013;7(2):79-82.
7. Grimberg J, Kany J. Latissimus dorsi tendon transfer for irreparable postero-superior cuff tears: current concepts, indications, and recent advances. *Curr Rev Musculoskelet Med.* 2014;7(1):22-32.
8. Cho CH, Yeo KK, Lee SY, Jung GH. Mini-open rotator cuff repair using anterolateral approach. *J Korean Shoulder Elbow Soc.* 2010;13:86-91.
9. Badhe SP, Lawrence TM, Smith FD, Lunn PG. An assessment of porcine dermal xenograft as an augmentation graft in the treatment of extensive rotator cuff tears. *J Shoulder Elbow Surg.* 2008;17(1 Suppl):35S-9S.