REVIEW ARTICLE

Lattissimus Dorsi Tendon Transfer in Irreparable Postero-Superior Cuff Tears: Present and Future

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Abstract

Postero-superior cuff tears (PSCTs) are the most difficult hitch of all the cuff tears especially those which are vast and irretrievable. About 30% of the mended rotator cuff are constituted by vast PSCTs, while irretrievable PSCTs account for 7-10% of total surgically mended tears according to some authors. Pain in adults is commonly attributable to rotator cuff tears (RCTs) which often hampers routine activities. Tendon refutation to glenoid border along with evidence of stage 3 muscular atrophy on Magnetic Resonance Imaging (MRI) or stage ¾ invasion of fat into muscular tissue as evidenced by computed tomography serve as pre-operative evaluation findings of irreparable PSCTs. Contraindications for surgical treatment of PSCT include fatty degeneration of muscular tissue, colossal tendon deficit, abridged distance between humerus and acromion i.e. <5cm.In the current study we reviewed indications, contraindications, each etiology in depth.

***Keywords**: Postero-superior cuff tear, Lattissimus Dorsi Tendon, Cuff tears*

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Introduction

Postero-superior cuff tears (PSCTs) are the most difficult hitch of all the cuff tears especially those which are vast and irretrievable. About 30% of the mended rotator cuff are constituted by vast PSCTs,[1] while irretrievable PSCTs account for 7-10% of total surgically mended tears according to some authors.[2]Conventionally a vast tear is defined by its size i.e. >5cm or involvement of number of tendons i.e. ≥2 tendons.[3,4,5] Tendon refutation to glenoid border along with evidence of stage 3 muscular atrophy on Magnetic Resonance Imaging (MRI) or stage ¾ invasion of fat into muscular tissue as evidenced by computed tomography serve as pre-operative evaluation findings of irreparable PSCTs.[6,7,8] Pain in adults is commonly attributable to rotator cuff tears (RCTs) which often hampers routine activities. A plethora of surgical treatments have been tried historically for treatment of PSCTs which include:

1. Biceps tenotomy
2. Subacromial bursectomy [9]
3. Joint replacement [10]
4. Partial repair of cuff [11]
5. Latissimus dorsi tendon transfer (LDTT).[12]

Contraindications for surgical treatment of PSCT include fatty degeneration of muscular tissue, colossal tendon deficit, abridged distance between humerus and acromion i.e. <5cm.[13] For such cases LDTT was proposed a quarter century back, still it serves as sustainable treatment preference which has demonstrated reduction in pain and increase in range of activity.[2,5] It is majorly indicated in younger patients with no evidence of arthropathy of glenohumeral area.[5,14,15] Outcomes of this procedure is widely studied till date.[8,15,16,17] The major concern about this procedure was deltoid damage which was dramatically reduced by adapting arthroscopic assisted LDT, since it has been found in one study that once injured deltoid fails to recuperate its normal power.[14] Although only a handful of studies have evaluated outcomes of arthroscopic LDTT, findings of these studies are more than satisfying especially in terms of absence of occurrence of glenohumeral arthritis and absence of diminution of subacromial

space.[18,19] Eventually this leads to upwards drifting of head of humerus and finally cuff arthropathy ensues.[1] External rotation of shoulder is hampered in PSCTs when teres major is damaged, hence transfer of teres major tendon is occasionally done with LDTT in such cases.[20,21] In pursuit of attaining maximum reliability of tendon transfer some authors advocate confiscation of certain part of humerus to facilitate attachment of tendon to bone.[22,23]Preoperative dynamic scope of movement and sex are critical indicators of result in LDTT (females have more regrettable results).[24,25] Arthroscopic debridement is helpful as far as agony alleviation yet results may break down with time in youthful and dynamic patients.[26,27,28] LDTT alongside the teres major (TM) ligament exchange with a foremost approach for ligaments collecting was at first portrayed for sequelae of obstetrical brachial plexus paralysis with bear dynamic outer revolution shortfall.[29,30] It was later depicted that LD and TM ligament exchange for a similar can be done by posterior approach for LD and TM ligament collecting.[31] Latissimus dorsi exchange alone was first utilized as a part of this sign in 1982 is as yet utilized with achievement in this sign.[32,33]By conducting a thorough review of literature we aimed to study:

- Status of conventional knowledge of LDTT in present day practice
- Indications, factors playing important role in shaping outcomes of LDTT, contraindications.
- New advancements in the technique and their placement in management of PSCTs.

Current concepts

LD tendon (LDT) is embedded on the distal piece of the medial bicipital furrow among the extra teres major & pectoralis tendons.[34,35] The LD muscle while following up on humerus is taking part inside the inward turn, adduction of the humerus, along one of a kind muscle mass as teres predominant. Biomechanical and anatomical conditions for a proficient ligament exchange are as according to the subsequent: and capability time out of the exchanged ligament sufficiently essential to allow meeting of the ligament from its particular role to its final exchanged role.

- Course of pull of the transferred muscle have to be much like the course of the changed muscle.
- Traction on the neuro-vascular pedicle of the transferred muscle need to be low sufficient to permit switch without challenging vascularization and innervation of the transferred muscle.
- Transferred tendon must be attached at a tension as near as viable because the anxiety of the transferred muscle at its original duration as a way to permit the first-rate pre-anxiety at the muscle to offer the fine possible power after transfer.
- As much less dissection as viable on the encompassing tissues of the transferred tendon to decrease chance of postoperative adhesion.

LD tendon has a 33 cm potential excursion after detachment off its humeral insertion: this duration is enough to allow transfer at the humeral head if the LD muscle is free of its attachments on the encompassing smooth tissues, specifically teres major (TM) muscle, subcutaneous superficial tissues and extra not often distal tip of the scapula.[20,32,36] Relative tension of the LD muscle is plenty just like the relative anxiety of the supraspinatus muscle however decrease than the one of the infraspinatus muscle.[21,23] In step with those in vitro or finite element model research:

- Eliminating postero-advanced cuff induces a decrease of shoulder second-generating ability in flexion, abduction, and external rotation,[18,35,37] an growth of inner rotation and latero-advanced excursion of humeral head, and a decrease in gleno-humeral contact vicinity.[38]
- In finite detail model studies, moving the LD tendon to the supraspinatus insertion is much less favorable to repair biomechanical situations of the everyday shoulder than moving the LD tendon to the infraspinatus insertion.[35,39]
- In finite element version research, transferring TM on my own is extra green on restoring biomechanical situations of the regular shoulder than transferring the LD tendon or LD + TM collectively. In addition, for TM, switch to the supraspinatus insertion

is higher than transfer to the infraspinatus insertion.[35]

In a cadaveric observe, it became proven that the lower part of the trapezius had a better impact than the LD tendon or the TM tendon for restoring external rotation moment arm. Subsequently, the ones research are instead perplexing.[40] Apart from Oh et al[41] who studied impact of LD alone, all other research propose an exclusive transfer than LD (TM or decrease trapezius).[42,43] This is not the case for TM tendon which is bulkier and less able to excursion and TM and LD collectively are generally too thick to allow a clean excursion between posterior deltoid and triceps muscle.[3,44,45,46]Aoki et al in an animal take a look at showed that adding a Teflon felt to the LD tendon improved last tensile pressure compared with LD tendon.[47]

Warning signs, contraindications and factors affecting it

Extra than 52 research have been posted in the literature approximately LD tendon transfer in irreparable postero-superior cuff tears. Most of the research aren't without difficulty similar as they treated exceptional sufferers, used specific surgical techniques, and analyzed their outcomes with distinct final results measures. Moreover, a number of the successive posted series used the same patients extracted from the global enjoy of one center.[48,49,50]

Secondarily operated and primary operated sufferers: an evaluation

Some authors discovered no difference in the objective consequences assessed through the UCLA rating among sufferers who had an intact deltoid and those who had a nonfunctional deltoid.[51]For their 18 patients operated on in a revision technique Birmingham and Neviaser found outcomes equivalent to the effects of maximum of the series published where patients had been operated on in a number one method.[52]The evaluation of objective results have been primarily based on the yank shoulder and elbow society (ASES) score which isn't like the consistent and Murley rating used as measurement tools for most of the posted series.[53]One author operated on seven patients in a revision process and discovered modest development of feature.[54]Warner and Parsons had large decrease development of constant weighed rating, due especially to a much less significative ahead flexion development while lively external rotation and power have been not statistically unique among revision and primary sufferers.[55]

Gerber et al located significative lower results for revision patients with postoperative fifty nine % regular weighed rating in comparison with 79percentfor primary sufferers, however, they noticed that boom of subjective shoulder price become similar in revision and in primary patients, (respectively, +37 % and +36 %) which supposed that revision patients may benefit from the procedure with the same quantity of subjective shoulder fee increase than number one patients despite the fact that starting from a decrease price.[56] Sooner or later, some authors observed lower outcomes for revision sufferers but they protected of their number one instances patients who were already operated on with an remoted acromioplasty which is an extreme bias to compare revision and primary sufferers even though one may think that the ones sufferers being included in revision cases, primary instances may have obtained even better effects.[57]

As a conclusion a majority of authors discovered less favorable consequences for revision patients except detachment and/or atrophy of the anterior deltoid regarded to be a primary danger issue for postoperative decrease results while less competitive preoperative surgical treatment as arthroscopic debridement, acromioplasty or lengthy head of the biceps tenotomy is probably greater favorable. Age, gender very few authors analyzed the effect of age and gender on results of LD tendon transfer. Only Ianotti et al located a statistically significative impact of age and gender on outcomes: four out of 5 upset patients were women with a median age of 60.[24]

Work related condition

Only 1 author studied the influence of labor related conditions on results and that they determined that worker's repayment repute had no have an effect on outcomes.[53]

Preoperative mobility

Few authors excluded pseudoparalytic patients from the process, however no author described a unique cost of anteflexion under which a affected person would be considered as

pseudoparalytic.[58,59,60] To illustrate this trouble, in one of these research, although pseudoparalytic patients had been supposedly excluded, sufferers with preoperative mobility lower than 80° in anteflexion had better growth of anteflexion than sufferers with preoperative mobility higher than one hundred twenty°.[61]This factor of view changed into confirmed by one have a look at wherein five preoperatively pseudoparalytic sufferers recovered sufficient mobility to be considered as non-pseudoparalytic anymore. [57] Pearsall et al who done the LD tendon switch on seven sufferers with a mean preoperative anteflexion of 49°, which might be considered as pseudoparalytic sufferers, located a modest although nonstatistically significative improvement in shoulder anteflexion from 49° preoperatively to seventy six° postoperatively.[62]

Preoperative cuff tendons fatty degeneration

Most effective three research determined a terrible impact on of preoperative degree 3 and 4 fatty degeneration of torn cuff tendons on effects.[24,63,64]Double or single incision and function of LD tendon attachment: a few studies connected the LD tendon on infraspinatus insertion, most of the studies on the extra tuberosity with/or without attachment to the remaining stump of the cuff and to the subscapularis tendon.[46]

LD alone or LD + TM

Diverse authors compared two consecutive collection of patients LD tendon transfer on my own with blended LD and TM tendon transfer.[65,66]

LD tendon without reinforcement or reinforced with bone or artificial tissue

Moursy et al as compared, in consecutive series of sufferers, LD tendon switch on my own with LD tendon augmented with bone chips coming from its humeral insertion.[22] They located higher outcomes for bone augmented LD tendon. In different series, a few authors used vicryl mesh reinforcement,[48]PDS reinforcement,[51] or fascia lata augmentation of the LD tendon in their technique however they did now not evaluate their reinforced tendon technique organization with a manage institution with native LD tendons.[63]The usage of this LD tendon augmentation, they regarded to agree with Zafra et al who hypothesized that the truth that LD tendon turned into very thin is probably responsible for secondary failures.[67]

Evolution toward osteoarthritis and superior migrationof the humeral head

Osteoarthritis development numerous amongst studies between 29 % and 50 %, but development was typically restricted to 1 stage Samilson & Prieto classifications.[68] Proximal migration of humeral head turned into also not unusual within the research in which this particular problem become searched for.1 study confirmed statistically significative progression of osteoarthritis handiest with combined switch of LD and TM tendons however in 87.5 % of the instances development turned into confined to at least one level in Hamada type.[47]

Complications

Some complications of the procedures have been describe:[2,15,25,43,54,69,70]

- Hematoma.
- Infection.
- Deltoid secondary detachment
- LD tendon secondary rupture.
- Subscapularis secondary rupture.
- Transient nerve palsy

Recent advances

Technical improvement

Arthroscopic fixation, tendon tubularization some technical or anatomical notes have defined arthroscopic assistance in latissimus dorsi switch.[71,72]

Only 1 author described a small series of eight sufferers but with short observe-up and few postoperative records and not using an assessment rankings.[73] This technique regarded to bring about a higher mechanical resistance to traction than other already published techniques.[74]The sole negative issue for postoperative consistent score turned into preoperative surgical treatment with postoperative consistent rating being significantly one of a kind between sufferers operated on in a number one manner (imply postoperative constant rating: 70) and patients operated on in a revision system (suggest postoperative steady rating: 60).

Extension of indication: LD transfer with reverse shoulder arthroplasty to restore lively outside rotation. A few authors have prolonged

indication of LD tendon transfer to patients operated on for cuff tear arthropathy with opposite overall shoulder prosthesis and tormented by energetic external rotation deficit. This energetic outside rotation deficit might also supply a few disappointing consequences if no longer handled during reverse shoulder arthroplasty surgery. They might boom active external rotation and reap an extra balanced manage of the hand.[67]

Conclusion

A thorough exam of the literature on LD tendon transfer for irreparable postero-superior tears and our own clinical revel in showed that in this indication this surgical treatment offers good sized development of ache, energetic anteflexion, active outside rotation, and characteristic of the shoulder. Power is usually improved but not usually in a statistically significant manner. Patients' satisfaction is high with typically round eighty % of the patients glad with the manner. Revision surgery, complete and irreparable subscapularis related tear, and to a lesser extent teres minor atrophy are factors of horrific diagnosis. There's a consensus among authors to exclude pseudoparalytic sufferers or with irreparable subscapularis tear from this surgical treatment. LD tendon transfer does now not seem to prevent osteoarthritis progression or advanced humeral head migration even though the ones troubles have had no influence on postoperative subjective and objective results of the manner to date.

Conflict of Interest: *None declared*
Source of Support: *Nil*

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