Time to Power Up, Beyond Motion After Reverse Total Shoulder Arthroplasty: Tailored Muscle Tensioning for Functional Internal Rotation

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Introduction/Background

Reverse total shoulder arthroplasty (rTSA) effectively treats irreparable massive rotator cuff tear (mRCT) and cuff tear arthropathy (CTA), yet reliable restoration of internal rotation (IR) is elusive when the subscapularis is irreparable. Despite advancements in prosthetic design and surgical implantation techniques, significant challenges remain in achieving satisfactory IR active range of motion and strength. Biomechanical studies advocate adjunct latissimus dorsi–teres major (LDTM) or pectoralis major (PM) transfers, but clinical data and direct comparisons are scarce. This video demonstrates how LDTM and PM transfers are performed concomitantly with a lateralized rTSA (Exactech Equinoxe) via a single deltopectoral approach, and presents the first head-to-head clinical comparison of their outcomes in patients with irreparable mRCT with subscapularis insufficiency. Sixty shoulders with mRCT/CTA and irreparable subscapularis deficiency were retrospectively reviewed (37 LDTM, 23 PM).

Key Findings

Significant improvement in pain, ASES, Constant, UCLA, SANE and global ROM in both cohorts ($p<0.001$)
Internal Rotation ROM (arm behind back level): LDTM group achieved higher behind-the-back reach (mean 6.4 vs 4.6 vertebral levels; $p<0.001$).
Internal Rotation Strength: PM transfer generated greater IR strength at the side (28.8 N vs 24.7 N; $p<0.001$).
Activities of Daily Living: Toileting was significantly easier in the LDTM group (67.5% vs 26.0% reporting it "easy"; $p<0.001$).
Complications: Minimal issues occurred – one transient axillary nerve palsy and one acromial fracture in the LDTM group, and one dislocation in the PM group all resolved nonoperatively.

Indications

(1) mRCT or CTA with combined loss of active elevation and IR (CLEIR) but preserved external rotation (negative drop-arm and ER-lag sign).
(2) Irreparable subscapularis confirmed by MRI (Lafosse ≥ III, Goutallier ≥ III) and intraoperatively
(3) Teres minor fatty infiltration ≤ Grade 2 on MRI.
(4) Intact deltoid muscle function and bone stock for rTSA

Contraindications

(1) Combined loss of elevation and external rotation (CLEER).
(2) Intact/repairable subscapularis.
(3) Severe teres minor atrophy (> Grade 2) or cervical palsy.
(4) Active infection or uncontrolled neuromuscular disorder.

Advantages

Improved Internal Rotation Function: Both LDTM and PM transfers combined with RSA significantly enhance internal rotation capability, addressing a key post-rTSA deficit and improving patient independence in daily activities.
LDTM Transfer Benefits: Better arm-behind-back mobility, facilitating personal hygiene tasks (toileting, dressing). Suited for patients prioritizing movements requiring reach behind the back.
PM Transfer Benefits: Greater IR strength in neutral, aiding tasks like pulling doors or lifting objects toward the body. Beneficial for patients who need front-of-body strength in work or daily activities.
Single-Approach Procedure: Both transfers are performed at the time of RSA through a single deltopectoral incision (facilitated by a lateralized implant), avoiding the need for separate incisions or staged procedures.

Disadvantages/Cautions

Technically Demanding: Tendon transfers with RSA require advanced surgical skill. Proper mobilization and tensioning of the transferred tendon are critical to avoid over- or under-tightening.
Rehabilitation: Postoperative rehab must protect the tendon transfer. Patients require guided therapy to avoid stressing the repair too early; rehabilitation protocols are more involved than for standard RSA alone.
Selection & Biomechanics: Each transfer's benefit is posture-specific (LDTM for behind-back reach, PM for strength in front). An improper choice or suboptimal tensioning can lead to persistent deficits or slight loss of the opposite motion (e.g. reduced external rotation).

Potential Complications: While uncommon, risks include nerve stretch injury, acromial or humeral fractures due to altered force vectors, or instability if the transfer is overly tight. These complications were rare in our series (<3% incidence) but warrant caution.

Conclusion

Both LDTM and PM transfers combined with RTSA significantly improve clinical scores and aROM postoperatively in mRCT and CTA who had a loss of active IR. The LDTM transfer is superior in enhancing IR aROM with the arm behind the back, aiding in daily activities such as personal hygiene. The PM transfer more effectively improves IR strength with the arm in a neutral position and 0° adduction, benefiting patients who require strength for front-of-body movements. Therefore, preoperative counseling could address the patient's specific functional needs to guide the selection of the appropriate tendon transfer.

References

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