MAYO CLINIC

# Rehabilitation Following Tendon Transfer

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Chicago Sports Medicine Symposium
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## Objectives

1. Define postoperative expectations
2. Examine primary rehabilitation goals in phase I-IV
3. Demonstrate therapeutic interventions



## Introduction

## Tendon Transfer Procedure

Aim: restore joint mechanics by restoring the force couple across the joint

Elhassan, 2016
https://www.shoulderdoc.co.uk/article/1463

## Tendon Transfer Procedure

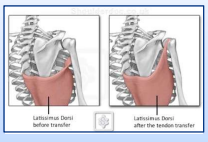
Indications:

- Younger patients
- Without glenohumeral arthritis
- Irreparable rotator cuff tear
- Functional deficits

Namdari, 2012

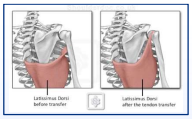
## Tendon Transfer Procedure

| Location of Tear | Tendon Transferred |
|---|---|
| Posterosuperior | Latissimus dorsi<br>Lower trapezius |
| | |
| | |




Elhassan, 2016
https://www.shoulderdoc.co.uk/article/1381
https://www.shoulderdoc.co.uk/article/1382
Crowe, 2016

## Tendon Transfer Procedure



| Location of Tear | Tendon Transferred |
|---|---|
| Posterosuperior | Latissimus dorsi<br>Lower trapezius |
| Anterosuperior | Pectoralis Major<br>Latissimus dorsi |
| | |

Elhassan, 2016
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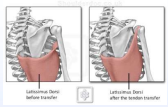
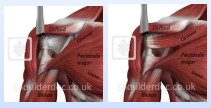
Crowe, 2016

## Tendon Transfer Procedure



| Location of Tear | Tendon Transferred |
|---|---|
| Posterosuperior | Latissimus dorsi<br>Lower trapezius |
| Anterosuperior | Pectoralis Major<br>Latissimus dorsi |
| Infraspinatus | Lower trapezius |



Elhassan, 2016
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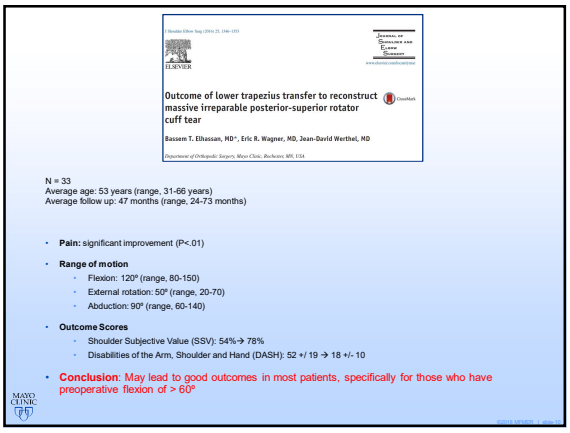
Crowe, 2016

## Outcomes



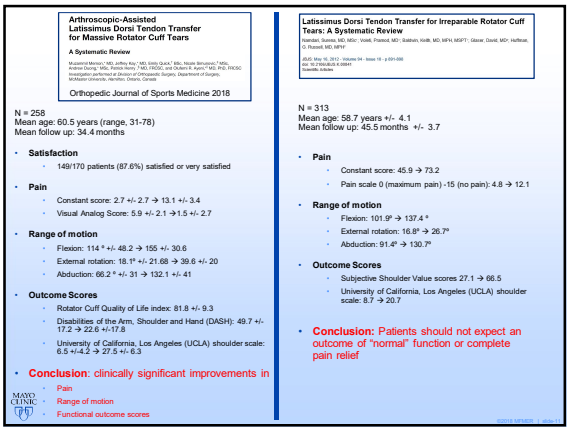
Outcome of lower trapezius transfer to reconstruct massive irreparable posterior-superior rotator cuff tear

Bassem T. Elhassan, MD*, Eric R. Wagner, MD, Jean-David Werthel, MD

Department of Orthopedic Surgery, Mayo Clinic, Rochester, MN, USA

N = 33
Average age: 53 years (range, 31-66 years)
Average follow up: 47 months (range, 24-73 months)

- **Pain:** significant improvement (P<.01)
- **Range of motion**
  - Flexion: 120º (range, 80-150)
  - External rotation: 50º (range, 20-70)
  - Abduction: 90º (range, 60-140)
- **Outcome Scores**
  - Shoulder Subjective Value (SSV): 54%→ 78%
  - Disabilities of the Arm, Shoulder and Hand (DASH): 52 +/ 19 → 18 +/- 10
- **Conclusion**: May lead to good outcomes in most patients, specifically for those who have preoperative flexion of > 60º



Arthroscopic-Assisted Latissimus Dorsi Tendon Transfer for Massive Rotator Cuff Tears

A Systematic Review

Orthopedic Journal of Sports Medicine 2018

N = 258
Mean age: 60.5 years (range, 31-78)
Mean follow up: 34.4 months

- **Satisfaction**
  - 149/170 patients (87.6%) satisfied or very satisfied
- **Pain**
  - Constant score: 2.7 +/- 2.7 → 13.1 +/- 3.4
  - Visual Analog Score: 5.9 +/- 2.1 →1.5 +/- 2.7
- **Range of motion**
  - Flexion: 114 º +/- 48.2 → 155 +/- 30.6
  - External rotation: 18.1º +/- 21.68 → 39.6 +/- 20
  - Abduction: 66.2 º +/- 31 → 132.1 +/- 41
- **Outcome Scores**
  - Rotator Cuff Quality of Life index: 81.8 +/- 9.3
  - Disabilities of the Arm, Shoulder and Hand (DASH): 49.7 +/- 17.2 → 22.6 +/-17.8
  - University of California, Los Angeles (UCLA) shoulder scale: 6.5 +/-4.2 → 27.5 +/- 6.3
- **Conclusion**: clinically significant improvements in
  - Pain
  - Range of motion
  - Functional outcome scores



Latissimus Dorsi Tendon Transfer for Irreparable Rotator Cuff Tears: A Systematic Review

N = 313
Mean age: 58.7 years +/- 4.1
Mean follow up: 45.5 months +/- 3.7

- **Pain**
  - Constant score: 45.9 → 73.2
  - Pain scale 0 (maximum pain) -15 (no pain): 4.8 → 12.1
- **Range of motion**
  - Flexion: 101.9º → 137.4 º
  - External rotation: 16.8º → 26.7º
  - Abduction: 91.4º → 130.7º
- **Outcome Scores**
  - Subjective Shoulder Value scores 27.1 → 66.5
  - University of California, Los Angeles (UCLA) shoulder scale: 8.7 → 20.7
- **Conclusion:** Patients should not expect an outcome of "normal" function or complete pain relief

## Expectations

- Goals: improve pain and function
- Strength: 75-80% of uninvolved
- Functional improvement: 50–70% improvement at 1 year
- Optimal recovery: >1 year

https://www.shoulderdoc.co.uk/article/1381
https://www.shoulderdoc.co.uk/article/1382
https://www.shoulderdoc.co.uk/article/1380
Namdari, 2012

## Postoperative Protocol

## Treatment Principles

- Respect the procedure
- Optimize joint stability
- Learn new muscle activation and movement patterns
- Improve (vs. restore) range of motion and strength

## Unique Considerations

- Tissue(s) involved
- Pre-operative status
- Function of other rotator cuff muscles
- Patient specific goals

| Postoperative Week | Phase |
|---|---|
| 0-6 | Maximal Protection |
| 6-12 | Active range of motion (AROM) |
| 12-24 | Strengthening |
| 24+ | Advanced Strengthening/Return to Activity |

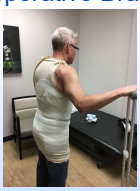
| Postoperative Week | Phase | Range of Motion | Strength | Goals | Criteria for Progression |
|---|---|---|---|---|---|
| 0-6 | Maximal Protection | | | | |
| 6-12 | Active range of motion (AROM) | | | | |
| 12-24 | Strengthening | | | | |
| 24+ | Advanced Strengthening/ Return to Activity | | | | |

## Phase I: Maximal Protection Week 0-6

| Range of Motion | Strength | Goals | Criteria for Progression |
|---|---|---|---|
|  |  | • Protection<br>• Facilitate healing<br>• Minimize pain and swelling<br>• Passive range of motion (PROM)<br>• Scapular plane | • Minimal pain with PROM |

Adapted from: The Brigham and Women's Hospital, Inc. Department of Rehabilitation Services and Lahey Hospital and Medical Center

## Postoperative Brace



## Phase I: Maximal Protection Therapeutic Interventions

Patient Education:
- Bathing, dressing
- Brace donning/doffing
- Cryotherapy
- Postoperative protocol

Scapular patterns

## Phase II: AROM Week 6-12

| Range of Motion | Strength | Goals | Criteria for Progression |
|---|---|---|---|
| ✓ | ✗ | • Restore functional PROM<br>• Begin AROM<br>• Wean from brace<br>• Retrain transferred tendon | • Minimal pain with AROM<br>• Appropriate recruitment of transferred tendon |

Adapted From: The Brigham and Women's Hospital, Inc. Department of Rehabilitation Services and Lahey Hospital and Medical Center

## Phase II: AROM Therapeutic Interventions

Biofeedback

Assisted Flexion

## Phase III: Strengthening Week 12-24

| Range of Motion | Strength | Goals | Criteria for Progression |
|---|---|---|---|
| ✓ | ✓ | • Retraining of transferred tendon with AROM<br>• Improve strength and stability | • Appropriate recruitment of transferred tendon with AROM<br>• Proprioceptive awareness |

Adpated from: The Brigham and Women's Hospital, Inc. Department of Rehabilitation Services and Lahey Hospital and Medical Center

## Phase III: Strengthening Therapeutic Interventions

Proprioception

Gravitational progression

Facilitated flexion

## Phase IV:
## Advanced Strengthening/Return to Activity
## Week 12-24

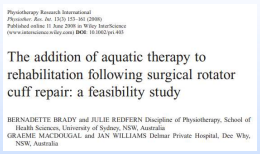
| Range of Motion | Strength | Goals | Criteria for Progression |
|---|---|---|---|
| ✓ | ✓ | • Restore endurance, strength, power<br>• Enhance neuromuscular control | • Strength: 75-80% of uninvolved<br>• Function: >50% improved |

Adapted From: The Brigham and Women's Hospital, Inc. Department of Rehabilitation Services and Lahey Hospital and Medical Center

## Phase IV:
## Advanced Strengthening/Return to Activity
## Therapeutic Interventions

Anti-gravity flexion

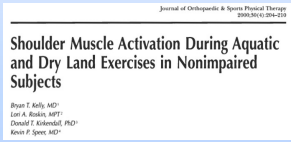
## Aquatic Therapy



Physiotherapy Research International
*Physiother. Res. Int.* 13(3) 155–161 (2008)
Published online 11 June 2008 in Wiley InterScience
(www.interscience.wiley.com) DOI: 10.1002/pri.403

The addition of aquatic therapy to rehabilitation following surgical rotator cuff repair: a feasibility study

BERNADETTE BRADY and JULIE REDFERN Discipline of Physiotherapy, School of Health Sciences, University of Sydney, NSW, Australia
GRAEME MACDOUGAL and JAN WILLIAMS Delmar Private Hospital, Dee Why, NSW, Australia



Journal of Orthopaedic & Sports Physical Therapy
2000;30(4):204–210

Shoulder Muscle Activation During Aquatic and Dry Land Exercises in Nonimpaired Subjects

Bryan T. Kelly, MD*
Lori A. Raskin, MPT†
Donald T. Kirkendall, PhD‡
Kevin P. Speer, MD*

Kelly, 2000
Brady, 2008

## Aquatic Therapy

Pendulums

Flexion walk backs

Active assisted ER

## Aquatic Therapy

Isometric ER strength

Isotonic strength

Rhythmic Stabilization

| Postoperative Week | Phase | Range of Motion | Strength | Goals | Criteria for Progression |
|---|---|---|---|---|---|
| 0-6 | Maximal Protection | ✓ | ✗ | • Protection<br>• Facilitate healing<br>• Minimize pain and swelling<br>• PROM<br>• Scapular plane | • Minimal pain with PROM |
| 6-12 | AROM | ✓ | ✗ | • Restore functional PROM<br>• Begin AROM<br>• Wean from brace<br>• Retrain transferred tendon | • Minimal pain with AROM<br>• Appropriate recruitment of transferred tendon |
| 12-24 | Strengthening | ✓ | ✓ | • Retraining of transferred tendon with AROM<br>• Improve strength and stability | • Appropriate recruitment of transferred tendon with AROM<br>• Proprioceptive awareness |
| 24+ | Advanced Strengthening/ Return to Activity | ✓ | ✓ | • Restore endurance, strength, power<br>• Enhance neuromuscular control | • Strength: 75-80% of uninvolved<br>• Function: >50% improved |

Adapted From: The Brigham and Women's Hospital, Inc. Department of Rehabilitation Services and Lahey Hospital and Medical Center

## Tissue Specific Protocols

- **Posterosuperior tears**
  - Sling x8 weeks
  - 6-8 weeks: passive flexion and ER
  - 8 weeks: hydrotherapy and biofeedback
  - 14-24 weeks: gentle strengthening
- **Pectoralis transfer**
  - Immediately passive range of motion
  - Flexion in IR
  - 6 weeks: aarom
  - 10 weeks: strength
  - 12 weeks: resisted IR
- **Latissimus dorsi + teres major transfer**
  - Sling x6 weeks
  - 4 weeks: passive, ER to neutral
  - 8 weeks: aarom
  - 12 weeks: gentle strength

Elhassan, 2016



## Conclusions

1. Understand the specific procedure
2. Set matched expectations: improvements not perfection
3. Implement intentional therapeutic interventions



## Acknowledgements


- Bassem Elhassan, MD
- Aaron Hellem, PT, DPT, OCS, SCS, CSCS
- Joshua Rowe

## References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8. https://www.shoulderdoc.co.uk/article/1380
9. https://www.shoulderdoc.co.uk/article/1381
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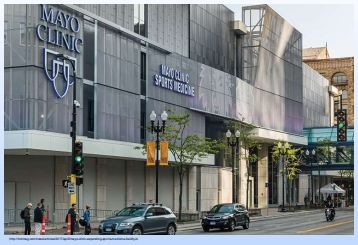
## Thank you

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