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Ulnar Collateral Ligament Reconstruction Rehabilitation Protocol

	Range of Motion	Immobilizer	Exercises
Phase 1 0-6 Weeks	**0-1 weeks**: none **2 weeks**: elbow 30-100° **3 weeks:** elbow 15-110°	**0-1 weeks:** splint **2 weeks**: brace 30-100° **3 weeks**: brace 15-110°	**0-1 weeks**: wrist motion and hand motion, gripping exercises, shoulder ROM (no external rotation of shoulder), biceps isometrics **2 weeks**: active ROM shoulder, scapular isometrics, elbow flexion/extension isometrics **3 weeks**: Elbow AROM progress to 10-125°. Begin wall squats, lateral slide, single leg squats, leg press (no use of operative arm) hip and core exercise (no use of operative arm).
Before Phase II*: must have 10-120°, minimal pain, good testing of: wrist flexion; shoulder internal and external rotation, scapular abduction.*			
Phase 2 4-8 Weeks	**4 weeks**: elbow 10-120° **6 weeks**: elbow 0-140° Progress to full ROM	**4 weeks**: brace 10-120° **6 weeks**: brace 0-130° Discontinue Brace at 6-8 weeks	**4-6 weeks**: Begin light resistance exercises for arm (1 lb.) wrist curls, extensions pronation/supination elbow extension and flexion. Progress shoulder program emphasize rotator cuff strengthening. Shoulder IR strengthening exercise permitted through full ROM. Shoulder ER strengthening permitted through limited arc of motion – limit the amount of ER ROM until 6 weeks. Initiate scapular neuromuscular control exercises.

			Progress shoulder ROM & stretching exercises to normalize motion. **Starting Week 6**: Initiate Throwers Ten program for shoulder Avoid any valgus stress on elbow until minimum 2 months post operatively
Before Phase III: *Must have full, nonpainful elbow AROM, no pain or tenderness, appropriate clinical examination, completion of Phase II exercises without difficulty or pain.*			
Phase 3 9-13 Weeks	**Week 9**: • Initiate eccentric elbow flexion/extension • Continue forearm and wrist isotonic program • Continue shoulder Throwers Ten Program • Manual resistance diagonal patterns • Emphasize scapular and core exercises **Week 11**: • May begin light activities such as golf and swimming **Week 12**: • Initiate plyometrics – 2 hand drills only • May initiate interval hitting program for baseball players		
To advance to Phase IV*: must have full elbow, wrist, and shoulder ROM; no pain or tenderness; functional or isokinetic test that fulfills criteria for goal activity; appropriate clinical examination, completion of Phase III exercises without difficulty*			
Phase 4 14+ Weeks	**Weeks 14**: • Progress to 1-hand plyometrics: 90°/90° ball throw, 0° ball throw • Continue with Advanced Throwers Ten program • Initiate side plank with shoulder ER strengthening exercise • Continue Phase III exercises **Weeks 16 to 22** (if meets Criteria for Starting Interval Throwing): • Continue ROM and stretching programs • Continue Advanced Throwers Ten program • Continue plyometrics • Begin interval throwing program progressing from 45ft to 90 ft.		

	• Distance level may be increased ONLY when:
	  • No pain or stiffness while throwing
	  • No pain or stiffness after throwing
	  • Strength is maintained and fatigue is minimal after completion of final set
	  • Throwing motion is effortless with appropriate mechanics
	  • Accuracy and throwing lines are consistent
	• Athletes may progress through ITP at different rates/paces
	• Expected to complete throws of 0 to 27 m (0-90 ft) within 3 weeks of starting ITP and throws of 0 to 37 m (120 ft)
	
	Months 6-9:
	• Initiate ITP phase 2 (off the mound) when phase 1 is complete and athlete is ready
	• Pitchers may begin mound throwing after completing 120 ft distance. NO flat ground pitching. Start with catcher moved forward when throwing from the mound and progress to full distance.
	• Perform dynamic warm-ups and stretches.
	• Continue Advanced Throwers Ten program
	• Initiate gradual return to competitive throwing (estimated 7-9 months post-operatively)
	• Return to competition decision based on physician and rehabilitation team assessment
	
	Return to play may occur when all conditions are met: Trunk, scapula, shoulder motions are normal. Normal trunk, scapular, shoulder, and arm muscle strength are normal. No pain while throwing. Throwing balance, rhythm, and coordination are normal.

ROM: range of motion. Note: Some players may require additional time for return to play. These times serve as the recommended minimums for healing and progression. Above protocol adapted from: Cain EL Jr, Andrews JR, Dugas JR, Wilk KE, McMichael CS, Walter JC 2nd, Riley RS, Arthur ST. Outcome of ulnar collateral ligament reconstruction of the elbow in 1281 athletes: Results in 743 athletes with minimum 2-year follow-up. Am J Sports Med. 2010 Dec;38(12):2426-34. doi: 10.1177/0363546510378100. Epub 2010 Oct 7. PubMed PMID: 20929932.

Exercises in the Throwers Ten Exercise Program

- Diagonal-pattern D2 extension
- Diagonal-pattern D2 flexion
- Shoulder external rotation at 0° of abduction
- Shoulder internal rotation at 0° of abduction
- Shoulder abduction to 90°
- Shoulder scapular abduction, external rotation (“full cans”)
- Side-lying shoulder external rotation
- Prone shoulder horizontal abduction
- Prone shoulder horizontal abduction (full external rotation, 100° of abduction)
- Prone rowing
- Prone rowing into external rotation
- Press-ups
- Push-ups
- Elbow flexion
- Elbow extension
- Wrist extension
- Wrist flexion
- Wrist supination
- Wrist pronation

All exercises performed against resistance to improve strength.

Full description: *Wilk KE, Arrigo CA, Hooks TR, Andrews JR. Rehabilitation of the overhead throwing athlete: there is more to it than just external rotation/internal rotation strengthening. PM R. 2016; 8: S78– S90.*

Exercises in the Advanced Throwers Ten Exercise Program

Elastic Tubing/Band Resistive Exercises

- Shoulder external rotation at 0° of abduction while seated on a stability ball*
- Shoulder internal rotation at 0° of abduction while seated on a stability ball*
- Shoulder extensions while seated on a stability ball†
- Lower trapezius isolation while seated on a stability ball†
- High row into shoulder external rotation while seated on a stability ball†
- Biceps curls/triceps extensions while seated on a stability ball†

Isotonic Dumbbell Resistive Exercises

- Full can while seated on a stability ball†
- Lateral raise to 90° while seated on a stability ball†
- Prone T's on stability ball†
- Prone Y's on stability ball†
- Prone row into external rotation on stability ball†
- Sidelying shoulder external rotation
- Wrist flexion/extension and supination/pronation

*Contralateral sustained hold performed during exercise
†Exercises are performed in 3 distinct continuous movements per exercise: bilateral active exercise, alternating reciprocal movement, and a sustained contralateral hold

10 - 15 repetitions performed for each movement successively, without rest, to complete 1 set. Goal: perform 2 full cycles of the entire program without pain, using sound technique and no substitution.

Full description: *Wilk KE, Yenchak AJ, Arrigo CA, Andrews JR. The Advanced Throwers Ten Exercise Program: a new exercise series for enhanced dynamic shoulder control in the overhead throwing athlete. Phys Sportsmed. 2011; 39: 90– 97.*

Criteria to Initiate Phase 1 Interval Throwing (Long Toss)

- Full, painless ROM
  - Shoulder total ER/IR ROM in 90° of shoulder abduction within 5° of nonthrowing shoulder
  - Shoulder horizontal adduction of 40° or greater on throwing shoulder
  - Glenohumeral IR deficit < 15°
  - Elbow and wrist passive ROM within normal limits
- Shoulder, elbow, and wrist strength based on manual muscle test, handheld dynamometer, or isokinetic testing
  - ER/IR ratio of 72% - 76%
  - ER/abduction ratio of 68% - 73%
  - Throwing-shoulder IR > 115% compared to nonthrowing shoulder
  - Throwing-shoulder ER > 95% compared to nonthrowing shoulder
  - Throwing-arm elbow flexion/extension 100% - 115% compared to nonthrowing arm
  - Throwing-arm wrist flexion/extension and forearm pronation/supination 100% - 115% compared to nonthrowing arm
- Satisfactory clinical examination
  - No pain, tenderness, or effusion
  - Negative laxity testing: prone valgus stress and milking maneuver
  - Negative special test for other elbow or shoulder pathology
  - Physician and rehabilitation team clearance
- Successful completion of all steps in the rehabilitation process
- Satisfactory functional test scores o Prone ball-drop test (throwing side 110% or greater compared to the nonthrowing side)
  - One-arm ball throws against the wall using a 0.9 kg (2 lb) plyoball for 30 seconds without pain and exhibiting the ability to maintain 90°/90° arm position without compensation (throwing side greater than 90% of nonthrowing side)
  - Throwing into plyoback rebounder with 0.45-kg (1-lb) plyoball for 30 seconds with no pain, normal mechanics (without substitution) with good control
  - Single-leg step-down for 30 seconds, controlling pelvis and lower extremity alignment for both sides (limb symmetry: 95%+)
  - Prone plank test for time
- Minimum Kerlan-Jobe Orthopaedic Clinic throwers' assessment score of 85

ER: external rotation; IR: internal rotation; ROM: range of motion.

Adapted from: *Wilk KE, Arrigo CA, Bagwell MS, Rothermich MA, Dugas JR. Repair of the Ulnar Collateral Ligament of the Elbow: Rehabilitation Following Internal Brace Surgery. J Orthop Sports Phys Ther. 2019 Apr;49(4):253-261. doi: 10.2519/jospt.2019.8215. Epub 2019 Mar 12. PubMed PMID: 30862273.*