

ROTATOR CUFF REPAIR - LARGE/MASSIVE - COMPREHENSIVE

Pre-Op	<p>Pre-op overall stiffness can be correlated to post-op stiffness. The best predictor of post-op stiffness at 6 wks is decreased pre-op IR vertebral level ROM (Trenerry et al, Clin Ortho Related Res, 2005).</p> <p>Pre-op exercises should be on increasing or maintaining overall ROM and muscle activation. Emphasis on improving behind the back horizontal adduction and IR.</p>
Factors Influencing Post-op Rehabilitation	<p>Type of repair: Open, mini-open, arthroscopic Size of tear: small-<1cm) medium (2-4cm) large to massive (5+cm) Location of tear and number of tendons involved Amount of tendon retraction Tissue degeneration/fatty infiltrate Pre-op stiffness Tissue quality: is affected by age, smoking, diabetes, chronicity of tear Surgeon preference Tissue healing: Soft tissue-to-bone healing is a slow and gradual process that requires at least 12 wks of healing to allow adequate pull-out strength of the repair (Ghodadra et al, JOSPT, 2009).</p>
	General Program Outline
	<p>ROM: Emphasis on PROM initially. Add AAROM supine ER at wk 4. Add AAROM elevation at wk 6. Add AROM elevation at wk 8 with emphasis on avoiding shoulder shrug. Goal of full ROM 12-16 wks.</p> <p>Muscle Activation: Important to prevent reflex disassociation, maintain muscle tone, and prevent muscle atrophy. Initiate with sub-max pain-free isometrics and AROM as outlined in the protocol.</p> <p>Strengthening: No aggressive strengthening for 12 wks. Goal of 75-80% strength by 5-6 months. Patients should continue with strength training at least 1 year post-op to maximize outcome.</p>

Phase I: 0-6 weeks	(Immediate post-op maximum protected motion phase)			
Goals	<ul style="list-style-type: none"> Protect anatomic repair Prevent negative effects of immobilization Gently begin PROM per tolerance except for IR Adequate pain control 			
Immediate post-op exercises	<ul style="list-style-type: none"> AROM for cervical spine, elbow, wrist, hand Gripping activities without lifting 			
Sling	<ul style="list-style-type: none"> 24 hours/day for 6-8 weeks. D/C based on MD approval Remove sling for bathing/dressing and exercises as outlined by PT Try to keep arm relaxed in sling and avoid protective posture to decrease muscle tension in cervical region 			
Precautions	<ul style="list-style-type: none"> Keep arm supported when in and out of sling. When laying supine, prop elbow on pillow to keep in line with the shoulder. No behind the back movements (avoid combined ext/add/IR). Try to keep elbow in line with shoulder. Avoid sudden movements or supporting body weight through the hand or elbow. No lifting or carrying of objects on injured side. Avoid pushing or pulling objects to minimize compression/shear to the shoulder 			
Recommendations	<ul style="list-style-type: none"> Initial emphasis on PROM per tolerance except for IR and ext. No AAROM for shld elevation No shld AROM or resisted motion 			
Modalities	<ul style="list-style-type: none"> Ice 15 minutes 3-5x/day, more often as needed for pain control IFC for pain management/inflammation control 			
HEP initiate at wk 1 post-op	<ul style="list-style-type: none"> Remove sling 3x per day for passive pendulum, AROM elbow / wrist / hand, gripping Passive pendulum with trunk rotation or opposite extremity Postural education to avoid forward head / rounded shoulders Cervical AROM: retraction in supine/seated/standing, flexion, side bending, rotation Overpressure and stretching for cervical side bending Thoracic AROM mid-range extension seated or standing Thoracic P-A self-mobilization in seated Active scapular retraction with depression 			
HEP wk 4	<ul style="list-style-type: none"> Add in supine AAROM ER in scapular plane 			
PROM	<ul style="list-style-type: none"> Initiate PROM and passive pendulum at 1 wk post-op. Gradually progress based on tolerance except for IR and extension which needs to be progressed cautiously. Start all motions, including ER, in scapular plane to minimize strain to supraspinatus (Hatakeyama et al, AJSM, 2001) At wk 4 progress working on ER from scaption to 60 deg of abd; add gentle IR ROM in scaption. No aggressive stretching. 			
	Goals to achieve /not exceed			
		0-2 wks	2-4 wks	4-6 wks
	Flexion / scaption	Per tolerance	Per tolerance (at least 0- 90)	Per tolerance (0-110)
	Abduction	0-45 deg	0-60 deg	0-75 deg
	ER in scapular plane	0-20 deg	0-40 deg	0-50 deg
	IR (GH) in scapular plane	To chest	To chest	0-20 deg
	ER at 60 deg ABD	None	Initiate at wk 3. 0-20 deg	0-40 deg
	ER at 90 ABD	None	None	None
	IR at 90 ABD	None	None	None
Extension	Neutral	Neutral	Neutral	
AAROM	<ul style="list-style-type: none"> Contraindicated on land for flexion / scaption / abduction until 6 wks secondary to high EMG supraspinatus activity (Dockery et al, Orthopedics, 1998) Wk 4: supine / standing ER in scapular plane. Contraindicated for IR Wk 5: Aquatics: Buoyancy-assisted AAROM <30 deg/sec per ROM guidelines (Kelly et al, JOSPT, 2000) 			

	Rotator Cuff Repair Large/Massive Compromised Tissue Quality
Phase I: 0-6 weeks	(Immediate post-op maximum protected motion phase)
AROM	<ul style="list-style-type: none"> • None
Treatment Interventions	<ul style="list-style-type: none"> • Warm up: Passive Pendulum or Hot pack • Emphasis on GH passive range of motion as outlined above. AAROM ER in scapular plane at wk 4. Gentle IR PROM in scaption at wk 4. No AROM • GH Mobilizations (in scapular plane) grade I/II for pain or muscle spasm • Thoracic spine P-A mobilizations as needed. 0-2 wks: seated. 2-4wks:Progress to prone as tolerated • Postural education: Avoid forward head/rounded shoulders • Active scapular retraction, scapular depression in neutral position • Scapular PROM in sidelying (if needed). Manual resisted scapular isometrics • AROM elbow, wrist, hand. Gripping activities without lifting • Cryotherapy. IFC if indicated

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Phase II: 6-8 weeks	(Intermediate moderate protection phase)																				
Goals	<ul style="list-style-type: none"> • Protect anatomic repair • Adequate pain control • Gently progress PROM per tolerance, Implement AAROM for shoulder elevation • Utilize aquatic to assist with ROM 																				
Sling	<ul style="list-style-type: none"> • D/C per MD approval 																				
Precautions	<ul style="list-style-type: none"> • No shoulder AROM for lifting. • Avoid prolonged unsupported arm positioning. • Avoid sudden movement or supporting body weight through the hand or elbow. • No behind the back movements (avoid combined ext/add/IR). Try to keep elbow in line with shoulder both in standing and supine. • No lifting or carrying of objects on injured side. • Avoid pushing or pulling objects to minimize compression/shear to the shoulder • No resisted movement. 																				
Recommendations	<ul style="list-style-type: none"> • Patient can perform ADL's below shoulder height • Treatment emphasis on restoring PROM /AAROM based on guidelines provided • Add low load long duration stretching (wk 7) if needed • Aquatic physical therapy • Facilitate thoracic extension 																				
HEP to initiate at wk 6-7	<ul style="list-style-type: none"> • Continue previous program as needed. • AAROM flexion / scaption to tolerance. AAROM abduction 0-90 deg only • Isometric elbow flexion / extension 																				
Modalities	<ul style="list-style-type: none"> • Ice 15 minutes 3-5x/day, more often as needed for pain control • IFC for pain management/inflammation control 																				
Aquatics	<ul style="list-style-type: none"> • Emphasis on ROM with water at shld height 																				
PROM / AAROM	<ul style="list-style-type: none"> • Continue with PROM with goal of full PROM by wk 12. Progress PROM ER at 90/90. Progress to gentle PROM IR at 90/90 at wk 7. Add gentle PROM ext at wk 7. • Add AAROM for shld elevation with goal of full AAROM by wk12-14. <table border="1" style="margin-left: 40px;"> <thead> <tr> <th colspan="2">Goals to achieve /not exceed</th> </tr> <tr> <th></th> <th>6-8 wks</th> </tr> </thead> <tbody> <tr> <td>Flexion / scaption</td> <td>Per tolerance (0-130)</td> </tr> <tr> <td>Abduction</td> <td>0-90 deg</td> </tr> <tr> <td>ER in scapular plane</td> <td>0-60 deg</td> </tr> <tr> <td>IR (GH) in scapular plane</td> <td>0-40 deg</td> </tr> <tr> <td>ER at 60 ABD</td> <td>0-50 deg</td> </tr> <tr> <td>ER at 90 ABD</td> <td>0-40 deg</td> </tr> <tr> <td>IR at 90 ABD</td> <td>0-20 deg</td> </tr> <tr> <td>Extension</td> <td>0-20 deg</td> </tr> </tbody> </table>	Goals to achieve /not exceed			6-8 wks	Flexion / scaption	Per tolerance (0-130)	Abduction	0-90 deg	ER in scapular plane	0-60 deg	IR (GH) in scapular plane	0-40 deg	ER at 60 ABD	0-50 deg	ER at 90 ABD	0-40 deg	IR at 90 ABD	0-20 deg	Extension	0-20 deg
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AROM	<ul style="list-style-type: none"> • Contraindicated for flexion, scaption, abduction. • IR / ER with arm in scapular plane through pain-free ROM 																				
Treatment Interventions	<ul style="list-style-type: none"> • Warm up: Passive Pendulum or Hot pack or AAROM on Nustep • Low-load long duration end-range stretch at wk 7 (if necessary) using wand and hot pack in supine for ER (Davies, Ellenbecker. Biomechanics, 1999). • GH Mobilizations grade I/II for pain, III/IV to increase joint mobility • Thoracic spine P-A mobilizations • Facilitate Thoracic extension: stretch in sitting with/without overpressure (ball / towel roll/ foam roller behind back) • PROM with end range stretching as outlined above • AAROM as outlined above: Pulleys, wand exercises, ball rolling on table • Aquatics • Postural education: Avoid forward head/rounded shoulders • Active scapular protraction, retraction to neutral, scapular depression • Scapular manual RROM in sidelying • AROM elbow, wrist, hand 																				

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Phase III: 8-12 wks	(Minimal protection phase with emphasis on normalizing ROM)																											
Goals	<ul style="list-style-type: none"> • Preserve the integrity of the surgical repair • Implement AROM for shoulder elevation avoiding shoulder shrug • Restore normal ROM with normal movement patterns • Decrease pain and inflammation • Initiate sub-max and pain-free muscle activation exercises 																											
Precautions	<ul style="list-style-type: none"> • Patient can perform ADL's up to shoulder height. • Limit overhead activities. • Avoid making sudden movements and lifting heavy objects. • No aggressive strengthening activities. • Avoid pushing or pulling heavy objects. 																											
Recommendations	<ul style="list-style-type: none"> • Treatment emphasis on restoring PROM / AAROM / AROM • Add AROM exercises avoiding compensatory shoulder shrug. Encourage normal movement patterns • Add sub-max pain-free shoulder isometrics (GH, RTC) • Add sub-max rhythmic stabilizations to encourage co-contraction • Continue with thoracic extension exercises • Continue with aquatics up to wk 10-12 																											
Modalities	<ul style="list-style-type: none"> • Ice 15 minutes 1-3x/day, more often as needed for pain control • IFC for pain management/inflammation control 																											
Aquatics	<ul style="list-style-type: none"> • Continue until wk 10-12. Work on increasing ROM with emphasis on normal movement patterns. 																											
PROM / AAROM / AROM	<ul style="list-style-type: none"> • Goal is functional ROM in all planes with normal movement patterns by 12-16 wks • Add gentle AAROM ext wk 8. • Add in gentle IR stretch behind the back vertebral level at wk 10 <table border="1"> <thead> <tr> <th colspan="3">Goals to achieve /not exceed</th> </tr> <tr> <th></th> <th>8-10 wks</th> <th>10-12 wks</th> </tr> </thead> <tbody> <tr> <td>Flexion / scaption</td> <td>Unlimited (0-150)</td> <td>Unlimited (0-170)</td> </tr> <tr> <td>Abduction</td> <td>0-120 deg</td> <td>0-150 deg</td> </tr> <tr> <td>ER in scapular plane</td> <td>0-70</td> <td>0-80 deg</td> </tr> <tr> <td>IR (GH) in scapular plane</td> <td>0-60 deg</td> <td>0-70 deg</td> </tr> <tr> <td>ER at 90 ABD</td> <td>0-60 deg</td> <td>0-70 deg</td> </tr> <tr> <td>IR (GH) at 90 ABD</td> <td>0-45 deg</td> <td>0-60 deg</td> </tr> <tr> <td>Extension</td> <td>0-40 deg</td> <td>0-55 deg</td> </tr> </tbody> </table>	Goals to achieve /not exceed				8-10 wks	10-12 wks	Flexion / scaption	Unlimited (0-150)	Unlimited (0-170)	Abduction	0-120 deg	0-150 deg	ER in scapular plane	0-70	0-80 deg	IR (GH) in scapular plane	0-60 deg	0-70 deg	ER at 90 ABD	0-60 deg	0-70 deg	IR (GH) at 90 ABD	0-45 deg	0-60 deg	Extension	0-40 deg	0-55 deg
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Muscle Activation Strengthening	<ul style="list-style-type: none"> • No aggressive strengthening activities • Add in sub-max pain-free shld isometrics for muscle activation. Muscle activation is important to minimize rotator cuff inhibition, maintain muscle tone, and minimize muscle atrophy (Ghodadra et al, JOSPT, 2009). • Strengthening will be with the weight of the arm focusing on quality movement and endurance (ie: initially 2-3 sets of 10 progressing to 2-3 sets of 30 reps of full flexion, scaption, abduction, ER. 1x/day, 5 -7 days per week per tolerance). • When progressing to shld isotonic in the next phase, the patient must be able to elevate arm without shoulder or scapular hiking. If unable, will need to continue with dynamic rhythmic stabilization GH joint exercises. • Add in arm supported bicep / triceps isotonic strengthening wk 8, progress to unsupported at wk 10 																											

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Phase III: 8-12 wks	(Minimal protection phase with emphasis on normalizing ROM)
Treatment Interventions	<ul style="list-style-type: none"> • Active warm-up: Codman's, UBE with no resistance (add light resistance at wk 9) • Low load long duration end-range stretch (if necessary) using wand and hot pack in supine for ER. Utilize for other movements as necessary. • GH Mobilizations • PROM with end range stretch • Therapeutic exercises: AAROM: Pulleys, wand. Add in extension past neutral wk 7, Add in gentle IR behind the back stretch wk 10 AROM: GH: All motions with emphasis on quality movement. Focus on endurance working up to 30 repetitions Scapula: (light resistance of <5 lbs with emphasis on endurance) protraction, retraction (seated progress to prone), rows to neutral, depression *** 4 keys exercises to maximize mid/lower trapezius and inhibit upper trapezius (Cools et al, AJSM, 2007) sidelye ER sidelye flexion prone horizontal abduction with ER prone extension Muscle activation: Sub-max pain-free GH isometrics Supported Biceps / Triceps isotonic, progress to unsupported wk 10 Rhythmic stabilization sub-max (to facilitate muscle activation / co-contraction): Wk 8: supine arm supported ER/IR wk 10-12: supine flexion 90 deg, low load CKC (<BW) ie: ball on table with patient standing • Encourage thoracic extension • Ice (in stretch if needed) 15 minutes • E Stim (IFC or NMES) if necessary

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Phase IV: 12+ wks	Regain Functional ROM / Strengthening and Conditioning Phase																				
Goals	<ul style="list-style-type: none"> • Establish and maintain functional ROM, mobility, and stability • Progress muscular strength, power, and endurance • Initiate higher level activities depending on functional demands and MD approval 																				
Precautions	<ul style="list-style-type: none"> • Patient must be able to elevate arm without shoulder or scapular hiking. If unable, need to continue with dynamic rhythmic stabilization GH exercises. • Patients should continue to perform strengthening exercises for up to 1 year post-op to maximize outcome. 																				
Recommendations	<ul style="list-style-type: none"> • Facilitate regaining functional ROM • Emphasize regaining strength and endurance with proper movement patterns • Continue with proprioceptive / kinesthetic exercises • Progress to independent strengthening at wk 20-24 • Assess posterior capsule for tightness 																				
Modalities	<ul style="list-style-type: none"> • Ice 1x/ day and /or after strenuous activities 																				
ROM	<ul style="list-style-type: none"> • No restrictions. Goal is functional ROM in all planes with normal movement patterns by 12-16 wks • <table border="1" style="margin-left: 40px;"> <thead> <tr> <th colspan="2" style="text-align: center;">Goals to achieve /not exceed</th> </tr> <tr> <th></th> <th style="text-align: center;">12-16 wks</th> </tr> </thead> <tbody> <tr> <td>Flexion / scaption</td> <td style="text-align: center;">Unlimited (0-170/180)</td> </tr> <tr> <td>Abduction</td> <td style="text-align: center;">0-170/180 deg</td> </tr> <tr> <td>ER in scapular plane</td> <td style="text-align: center;">0-80/90 deg</td> </tr> <tr> <td>IR (GH) in scapular plane</td> <td style="text-align: center;">0-70 deg</td> </tr> <tr> <td>ER at 90 ABD</td> <td style="text-align: center;">0-80/90 deg</td> </tr> <tr> <td>IR (GH) at 90 ABD</td> <td style="text-align: center;">0-70 deg</td> </tr> <tr> <td>Extension</td> <td style="text-align: center;">0-60 deg</td> </tr> <tr> <td></td> <td></td> </tr> </tbody> </table>	Goals to achieve /not exceed			12-16 wks	Flexion / scaption	Unlimited (0-170/180)	Abduction	0-170/180 deg	ER in scapular plane	0-80/90 deg	IR (GH) in scapular plane	0-70 deg	ER at 90 ABD	0-80/90 deg	IR (GH) at 90 ABD	0-70 deg	Extension	0-60 deg		
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Strengthening	<ul style="list-style-type: none"> • Target scapulothoracic, rotator cuff, glenohumeral, and total arm strengthening and endurance • Progress to unilateral scapulothoracic strengthening • Strengthening initially with uni-planar movements progressing to multi-planar movements • Wk 20: Isokinetic ER/IR power test at 90, 180 deg/sec • Wk 20: Progress to overhead strengthening (if needed) if adequate strength scores: <ul style="list-style-type: none"> MMT 4/5, Isokinetic ER/IR of 75% at 90 and 180 deg/sec; ER/IR ratio of 2/3 Isometric strength test (5 sec hold) for shld flexion and scaption of 75% compared to opp extremity. (Measure with hand-held dynamometer. Perform 3 reps and calculate the average) 																				

	Rotator Cuff Repair Large/Massive Compromised Tissue Quality
Phase IV: 12+ wks	Regain Functional ROM / Strengthening and Conditioning Phase
Treatment Interventions: (Examples of exercises but not an all-inclusive list)	<ul style="list-style-type: none"> • Active warm-up: UBE, rower • Continue with ROM activities as necessary • Scapulothoracic strengthening: <ul style="list-style-type: none"> chest press (+), rows in full ROM, press down, scaption (Moseley et al AJSM, 1992) prone horizontal abduction in neutral rotation, prone extension with ER, prone horizontal abduction with ER, prone full can, dynamic hug, serratus punch 120 deg, lat pull downs (wk 18) • Glenohumeral / rotator cuff strengthening: <ul style="list-style-type: none"> flexion, scaption, prone horizontal adduction with ER, press down (Townsend et al, AJSM, 1991) sidelying ER, isotonic IR/ER in scapular plane progress to 90/90 at wk 18 if needed, isokinetic IR/ER in scapular plane progress to 90/90 wk 20 if needed • Total arm strengthening: Triceps extensions, biceps curls • PNF patterns at wk 16 • Proprioceptive/Kinesthesia activities: <ul style="list-style-type: none"> rhythmic stabilization: supine flexion 120 deg standing flexion 90 deg bilateral progress to unilateral body blade • CKC exercises: sub-max BW: quadruped (euroglide / cuff link), wall push-ups Progress to full BW (wk 18): partial prone walk-outs, full prone walk-outs • Plyometrics: bilateral progress to unilateral • Cryotherapy, electrical stimulation, and biofeedback, and if necessary
Isokinetic IR/ER testing	<ul style="list-style-type: none"> • Wk 20 (5 months), wk 28 (7 months) and 12 months at 30/30/30 position or 90/90 (if appropriate)
Return to work/sport	<ul style="list-style-type: none"> • Based on MD approval, full ROM, minimal pain at rest or with activity, isokinetic power at 90%, isometric hand-held dynamometer testing 90% and/or MMT 5/5, and functional testing at 90 % compared to uninvolved side • 6-8 months: Return to interval throwing program per MD approval