

ACI (Autologous Chondrocyte Implantation) Rehabilitation Protocol

PHASE I: Generally post-operative weeks 1 - 8									
PRECAUTIONS:	*Wear brace at all times (except while using the CPM)*								
CRUTCHES:	Begin with touch weight-bearing <ul style="list-style-type: none"> o Weeks 1-4: Foot-flat (touch) weight-bearing @ 0-25% body weight o Weeks 5-6: partial weight-bearing @ 25-75% body weight o Weeks 7-8: weight-bearing as tolerated @ 75-100% body weight 								
BRACE & ROM:	Locked at 0° extension during ambulation for 6 weeks ROM: Diligently work to obtain full extension and ~90° flexion by 2 weeks post-op								
WOUND:	Post-op dressing remains intact until post-op day #2 (~48 hours after surgery) May begin showering after post-op day #2 (no need to cover incision site) *Do NOT submerge knee in tub or pool for 4 weeks*								
REHABILITATION:	Bilateral compression stockings for 3-7 days: unilateral use thereafter as needed Suture/staple removal @ 10-14 days per Ortho/PT								
~Weeks 1-2	Frequent use of cryocuff and/or ice with lower extremity elevated Exercises should be done as part of a home exercise program 2-3 x per day Calf pumping (using theraband), Assisted heel slides, Quad sets (with e-stim) Supine passive extension to 0° extension Gentle hamstring stretching <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">CPM use</td> <td style="width: 50%;">Assisted heel slides 2-3 x daily</td> </tr> <tr> <td>o Wks 1-2: begin at 0-30° and add 5-10° per week (8-12 hours daily)</td> <td>o Wks 1-2: 0-90°</td> </tr> <tr> <td>o Wks 3-6: add 10-15° per week as tolerated (6-8 hours daily)</td> <td>o Wks 3-4: 0-105°</td> </tr> <tr> <td></td> <td>o Wks 5-6: 0-120°</td> </tr> </table>	CPM use	Assisted heel slides 2-3 x daily	o Wks 1-2: begin at 0-30° and add 5-10° per week (8-12 hours daily)	o Wks 1-2: 0-90°	o Wks 3-6: add 10-15° per week as tolerated (6-8 hours daily)	o Wks 3-4: 0-105°		o Wks 5-6: 0-120°
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~Weeks 3-4	SLRs: front direction – progressively add weight Discontinue e-stim when quality SLRs are performed								
~Weeks 5-6	Stationary bike for ROM ∪ ∪ half circles - progress to biking for conditioning Hip Abduction wall slides - (hip abduction strengthening)								

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~Weeks 7-8	<p>Heel raise progression: begin bilateral heel raises - progress to unilateral</p> <p>Double leg mini-squats (0-45°) - progress to single leg</p> <p>Gait training (cone walking, marching, retrowalking, cariocas, shuffles, etc.)</p>
<p>FOLLOW-UP:</p> <p>DOCUMENTATION:</p> <p>PHASE I GOALS:</p>	<p>Physical Therapy: Bimonthly; Ortho: ~6-8 weeks post-op; Supervised rehabilitation: 2-3 x per week as needed</p> <p>Precautions, pain level, medications and modalities</p> <p>Observation: (incision sites) - Signs/symptoms of infection? Site healing well? Effusion? Neurovascular status: Distal pulses, motor and sensation intact? Presence of calf pain? Knee ROM, & quadriceps function</p> <p>Normal gait and stair ambulation; ROM: full knee extension, ~120° knee flexion (If goals are not met, consider remaining on phase I for 2 additional weeks)</p>

PHASE II: Generally post-operative months 3 - 6	
PRECAUTIONS:	<p>*Gradually increase standing and walking time*</p> <p>*NO jogging/running until 6 months post-op*</p>
BRACE:	None required
<p>REHABILITATION:</p> <p style="text-align: center;">~Months 3-4</p>	<p>Continue phase I exercises as needed</p> <p>Progress to the following exercises and increase intensity gradually when patient is ready (i.e., no increase in knee pain or effusion since the previous exercise session)</p> <p>*Note: all strengthening should be done starting with low weights, high repetitions, and in a painless ROM*</p> <p>Stationary biking for conditioning (~80-100 RPMs) - may add elliptical gradually</p> <p>General LE stretching (calf, HS, quads, HF, hip adductors)</p> <p>Forward, lateral, and retro step-ups (start with 4", progress as tolerated)</p> <p>Progressive standing balance exercises (body blade, plyoball, platform training, etc.) (progress in duration, intensity, double leg to single leg, etc.)</p> <p>Progressive strengthening (calf & leg press, squats (0-45°), lunges, hip abd/add)</p>

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<p align="center">~Months 5-6</p> <p>FOLLOW-UP:</p> <p>DOCUMENTATION:</p> <p>PHASE II GOALS:</p>	<p>(first set: 20 repetitions, then 2 additional sets at the same weight to muscle failure) Progressive aquatics program (optional)</p> <p>Elliptical and/or stairmaster Progressive functional training (2 legged plyometrics, jump roping, etc.)</p> <p>Progressive strengthening (calf & leg press, squats (0-60°), lunges, hip abd/add) (first set: 15 repetitions, then 2 additional sets at the same weight to muscle failure)</p> <p>PT: ~every 3-4 weeks; Ortho: ~3 & 6 months post-op Supervised rehabilitation: 2-3 x per week as needed</p> <p>Precautions, pain level, medications, modalities Effusion, knee ROM, quadriceps function, & gait</p> <p>Full knee ROM with minimal or no effusion Hop without pain using good form (If goals are not met, consider remaining on phase II for 2-4 additional weeks)</p>
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PHASE III: Generally post-operative months 7 - 9	
PRECAUTIONS:	* NO participation in sports or advanced military schools*
BRACE:	None required
REHABILITATION:	Continue other phase II exercises as needed Progress in duration and intensity of exercise only if there is no increase in knee pain or effusion since the previous exercise session.
~Month 7	Warm-up: 5-10 minutes (bike, elliptical, stairmaster) General LE stretching: 5-10 minutes (calf, HS, quads, HF, hip adductors) Progressive strengthening (calf & leg press, squats (0-90°), lunges, HS curls, hip abd/add) (first set: 10 repetitions, then 2 additional sets at the same weight to muscle failure) Progressive balance training Progressive functional training: Begin at 25-50% intensity and progress gradually (jumping, hopping, directional jogging, cariocas, shuffles, agility ladders, etc.) Walk to run progression program (on a treadmill)
~Months 8-9	Warm-up: 5-10 minutes (bike, elliptical, stairmaster) General LE stretching: 5-10 minutes (calf, HS, quads, HF, hip adductors) Progressive strengthening (calf & leg press, squats (0-90°), lunges, HS curls, hip abd/add) (first set: 6-8 repetitions, then 2 additional sets at the same weight to muscle failure) Progressive balance training as needed Continue running progression Progressive functional training: Begin at 50-75% intensity and progress gradually (jumping, hopping, directional jogging, cariocas, shuffles, agility ladders, etc.) Functional knee program I & II (optional)
FOLLOW-UP:	PT: Monthly; Ortho: ~9 months post-op; Supervised rehab: 1-2 x per week as needed
DOCUMENTATION:	Pain level, medications, modalities Effusion, knee ROM, quadriceps function, posterior drawer, hop for distance

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PHASE III GOALS:	Jog at own pace without pain, hop for distance > 90% compared to uninvolved side Strength return of > 90% for quadriceps and hamstring compared to uninvolved side (If goals are not met, consider remaining on phase III for 1-3 additional months)
MISCELLANEOUS:	After 9 months post-op: Exercises in phase III are continued, gradually increasing intensity & duration as tolerated. Individual sport specific drills are initiated as applicable. The recommendation is to wait until >12 months post-op to return to contact/collision sports or aggressive military training (i.e., airborne school). This time period may be adjusted slightly by the surgeon and therapist according to patient progress.