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Rehab and Return to Swimming for Breaststroker's Knee

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DIAGNOSIS

Breaststroker's knee or sore knees from swimming usually involves inflammation around the kneecap. (Chondromalacia, Subluxing patella-loose kneecaps)

EVALUATION Keys:

1. Structural – Foot Pronation, Knee Valgus/Varus, Q-Angle, Patella Tilt, Lateral Retinaculum.
2. Postural – Knee Hyperextension, Forward Hips
3. Functional – VMO Strength, Medial Hamstring Flexibility, Hip External Rotation, Alignment; Walking “heavy” involves the quads, while walking “light” involves the upper hamstrings.

EVALUATION Goal

No patella apprehension sign or swelling prior to kicking in the water.

CAUSES

Determining the causal factors of the injury will decrease the risk of re-injury and help in fine-tuning the Rehab & Return to Swim program. Four main causal factors that are controllable:

1. Too much too fast...2-4 weeks/year no Breaststroke kick.
2. Imbalances in strength and flexibility (VMO and hip external rotator strength versus medial hamstring flexibility).
3. Improper training techniques (insufficient warm-up...20% of workout should be warm-up; 1/3 to 1/2 of warm-up should be breaststroke kick for breaststrokers).
4. Faulty breaststroke kick biomechanics...wide thrusting quads versus glut/hip action.

The following is an overview of a suggested rehabilitation program for Breaststrokers' Knee.

PHASE I Therapeutic Rehab	Return to Swim I
Goals	Goals
General Concepts	General Concepts
Sample Exercises & Techniques	Sample Water Workout Recommendations
PHASE II Strength Rehab	Return to Swim II
Goals	Goals
General Concepts	General Concepts
Sample Exercises & Techniques	Sample Kick Progression/Correction
PHASE III Functional Rehab	Return to Swim III
Goals	Goals
General Concepts	General Concepts
Sample Exercises & Techniques	Sample Kick Progression/Correction
PHASE IV Maintenance Rehab	Return to Swim IV

Goals	Goals
General Concepts	General Concepts
Sample Exercises & Techniques	Sample Kick Progression/Biomechanics of Breaststroke Kick

Rehab and Return to Swim for BREASTSTROKERS' Knee

	Phase I	Phase II		Phase III	Phase IV
	THERAPEUTIC	STRENGTH		FUNCTIONAL	SHARPNESS
	-	A	B	-	-
Swelling	high	low	-	-	-
Pain	high	moderate	low	-	-
Activity	-	-	low	moderate	normal
Ice	20 min/hr	QID	BID	After Activity	PRN
Compression	+	+	-	-	-
Immobilization	+	-	Brace/Tape?	Brace/Tape?	-
Crutches	+	±	-	Orthotics?	-
Quadriceps Sets	10x10 seconds every hour	10x10 seconds 2-4 x/day	10x10 seconds 2 x/day	10x10 seconds 4 x/week	-
Straight Leg Raises	20x up to 50x; 0 lb up to 5 lb; 4 x/day	20x up to 50x; 5 lb up to goal (6- 15 lb); 2-4 x/day	20x up to 50x; goal weight; 2 x/day	50x; goal weight; 4 x/week	-
Terminal Extensions, progressing to Machines	-	-	20x; 0 lb up to goal (10- 15 lb); 2 x/day	3x 15 reps; 10 lb up to goal (1/3 body weight); Negatives 0°- 30°; 3 x/week	3x 15 reps; up to goal weight; Negatives 0°-?90°; 2-3 x/week
Hip Rotators with Prone External Rotation, progressing to Lateral Step- ups	-	Using tubing; 20x up to 50x; #2 tubing up to #3 tubing	If can't do terminal extensions, try 2" height; 2 x/day	4" up to 6-8" height' 1 min up to 5 min; daily	6-8" height; 5 min; 2-3 x/week
Neuro Balance	-	-	-	Tubing #2 up to #3 double; SLR up to TKEs; 4	2-3 x/week; Dyna Disc squats, box jumps,

Plyometrics				x/week; 30x as quick as possible	tubing, pilates
Quickness					
Pilates					
Hamstrings	20x up to 50x;	-	-	-	-
Prone Leg Raises	0 lb up to 5 lb; 4 x/day				
Hamstring Curls, progressing to Machines	-	20x up to 50x; 0 lb up to goal; 2-4 x/day	20x up to 50x; up to goal weight (6-16 lb); 2 x/day	3x 15 reps; 10 lb up to goal weight (2/3 quad); Negatives 0- 90°; 3 x/week	3x 15 reps; up to goal weight; (-s) full motion; 2-3 x/week
Adductors	10x 10 seconds 4 x/day	10x 10 seconds	10x 10 seconds 2 x/day	-	-
Pillow Squeezes		2-4 x/day			
Gastrocs	Towel pull and press 10x 10 seconds; 4 x/day	Ground up to step; 20x; 2-4 x/day	Bent knee up to advanced; 20x; 2 x/day	Advanced knee bend; 20x; 4 x/week	±
Toe Raises					
Flexibility	AROM knee until full ROM 4 x/day	Medial Hams, Gastroc 2 x/day	Add Quads, groin, soleus, hip flexors; 2 x/day	+ Daily	+ Daily
Cybex	-	-	Baseline	80% to return to full flutter kick	PRN
Swimming	Arms only Float Turns	Add Aquatic Rehab	"Stiff" flutter; Easy Push-offs	Work to Flutter up to Dolphin Kick; work to Full Push-offs	Work to Breaststroke kick

PHASE I...THERAPEUTIC REHABILITATION

Goals for Therapeutic Rehabilitation (Phase I):

- Relief of pain, swelling and spasm.
- Attempt to maintain strength of involved extremity.
- Begin re-education of VMO.
- Maintain cardiovascular conditioning and strength.

General Concepts for Therapeutic Rehabilitation (Phase I):

- Therapeutic exercise for quads, adductors, hams and gastrocnemius to increase range of motion, blood flow and healing. Do this 4 times per day.
- Re-educate movement patterns. This means VMO recruitment.
- Emphasize good posture.

Sample Exercises and Techniques for Therapeutic Rehabilitation (Phase I):

Therapeutic Exercise – Quad sets, straight leg raises, gastroc sets and stretches, Adductor sets, prone leg raises.

Stability Techniques – Quad sets with VMO palpation, EMS to re-educate the VMO, standing balance as tolerated, and light patella mobilization for lateral restrictions.

Return to Swim I

Goal for Return to Swim I:

- Maintain cardiovascular fitness, arm strength and power.

General Concepts for Return to Swim I:

- Active Rest – for the injured knee; no movement weight-bearing or kicking until no patella Apprehension signs and little to no swelling.
- Cardiovascular Maintenance – through pulling and dryland workouts to include upper extremity biking and/or 1-leg lower extremity biking.
- Weight Program – continued for upper body and trunk.

Sample Water Workout Recommendations for Return to Swim I:

- Pulling sets
 - Open turns with no push-offs or 1-leg push offs
 - 1-leg kicking sets allows increased body stability awareness as well as some bilaterally training effect for injured leg.
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PHASE II...STRENGTH REHABILITATION

Goals for Strength Rehabilitation (Phase II - A&B):

- A-Continued reduction of residual pain and swelling.
- A-Walking level without pain or crutches.
- A-Begin increasing strength more actively.
- A-Trial of knee flexion with weights to determine joint irritability.

- B-Reduce swelling to none.
- B-Minimize "pain."
- B-Walking stairs functionally advancing to flutter-kicking.
- B-Advance re-education and strength of VMO with active quad exercises.
- B-Baseline Cybex (Isokinetic testing)...Increase flexibility as needed.

General Concepts for Strength Rehabilitation (Phase II):

· Progressive Resisted Exercise...for Lower Extremity.

- o weights...building at 1-2 lb increments until goals
- o or increase weight-bearing from 50% to 100%
- o or tubing (1/8 inch diameter hole), progressing from #2 size (1/16 inch) to #3 size (1/8 inch)

· Re-educate Movement Patterns

- o VMO recruitment
- o Glut/hip recruitment off core

· Good Posture

Sample Exercises and Techniques for Strength Rehabilitation (Phase II):

· Progressive Resisted Exercises

- o Quad sets
- o Adductor sets
- o Straight leg raises
- o Ham curls standing, eventually adding terminal knee extensions
- o Hip external rotation, graduating to lateral step-ups
- o Gastroc toe raises, graduating to bent knee toe raises
- o Resisted medial hamstring and gastroc stretches
- o Aquatic rehab program additional benefits: Compressive forces of water help with swelling, while buoyancy forces allow sooner functional movements on weight-bearing.

· Stability Techniques

- o Quad sets with VMO palpation
- o EMS to re-educate VMO
- o Standing balance and alignment during lateral step-ups
- o Patella mobilization if lateral restrictions

Return to Swim II**Goal for Return to Swim II:**

- Start using involved leg and build yardage gradually.

General Concepts for Return to Swim II:

- Kick Technique – Focus on initiating all flutter kick from the hips with the trunk in the correct stable position.
- Progressive Kick Addition – Start with the easiest most pain-free for that swimmer and add one at a time; Guide easiest to hardest...Flutter, dolphin, breast kick.
- Build Kick Yardage Gradually – Guidelines:
 - o Frequency – initially 3-6 x/week, add 1 workout/week
 - o Duration – add 200 yards or meters every 2+ workouts.
 - o Intensity – easy, 75% (cruising), 100% (sprinting).
 - o Change only one variable every 2+ workouts (i.e. new kick, frequency, duration or intensity).

Sample Kick Progression for Return to Swim II:

- Warm-up arms only or with “stiff” flutter-kick.

- Kicking sets – Start with front flutter...Repeat with back flutter
 - o 200 easy
 - o 200 easy, 200 on side
 - o 200 easy or side, 200 build-up to 75%
 - o Each step (1-3) takes a minimum of 2 workouts each.
- Pulling sets
- Warm-down 100-200 sculling on front or side with easy flutter

Sample Kick Corrections for Return to Swim II:

- Flutter - Slight "pigeon toe" with hip rotators keeping kneecaps "in line;" Initiate kick from the hips with core keeping spine in neutral to slightly posterior tilt
- Push-offs – Initiate from gluts/hips with core keeping spine in neutral to slightly posterior tilt.

PHASE III...FUNCTIONAL REHABILITATION

Goals for Functional Rehabilitation (Phase III):

- Increase functional and stability strength.
- Isokinetic testing 80%+.
- Improve flexibility needs.

General Concepts for Functional Rehabilitation (Phase III):

- Progressive Resisted Exercise for lower extremity
 - o Continued endurance program of weights/tubing 4x/week
 - o Weights/tubing/weight-bearing...Maintain/reach goals
 - o Progress to heavier weights 3x/week
 - o Add neuromuscular components of quickness/balance
- Re-Educate movement patterns
 - o VMO recruitment
 - o Glut/Hip recruitment off core
- Good Posture

Sample Exercises and Techniques for Functional Rehabilitation (Phase III):

- Progressive Resisted Exercises...3x/week, Maintenance of Endurance 4x/week
 - o Quad sets 4x/week
 - o Straight leg raises 4x/week
 - o Lateral step-ups 4x/week
 - o Machine ham curls 3x/week
 - o Machine quad extensions 3x/week
 - o Tubing "quickies" SLR/TKE 3x/week
 - o Advanced bent knee toe raises 4x/week
 - o Resisted medial hamstring, quad, hip flexor, groin and gastroc/soleus stretches (daily)
- Stability Techniques
 - o Standing balance and alignment during: o Lateral step-ups
 - o Tubing quickies
 - o Advanced bent knee toe raises
 - o Resisted stretches

Return to Swim III

Goals for Return to Swim III:

- Good stroke technique.
- Full workouts.

General Concepts for Return to Swim III:

- Kick Technique – Focus on what part of the core is stabilizing versus initiating movement...move from the inside out.
- Progressive Kick Addition – Start with the easiest most pain-free for the swimmers and add one at a time; Guide easiest to hardest...Flutter, dolphin, frog kick.
- Build Yardage Gradually – Guidelines for:
 - o Frequency – initially 3-6x/week; add 1 workout/week
 - o Duration – add 200 yards or meters every 2+ workouts
 - o Intensity – easy, 75% (cruising), 100% (sprinting)
 - o Change only one variable every 2+ workouts (i.e. new kick, frequency, duration or intensity).

Sample Kick Progression for Return to Swim III:

- Warm-up easy freestyle and backstroke
- Kicking sets – Dolphin Kick
 - o 200 easy
 - o 200 easy, 200 easy on side
 - o 200 easy of side or front; 200 easy on back
 - o 200 easy; 200 build-up to 75%
 - o Each step (1-4) takes a minimum of 2 workouts each
- Free and back stroke sets (kick is ~75%)
- Pulling sets
- Warm-down 100-200 sculling front or side with easy flutter

Sample Kick Correction for Return to Swim III:

- Flutter – Focus on core abs, stabilizing in neutral of slightly posterior tilt while kick comes from hip/glut.
- Dolphin – Focus on pressing chest forward and down and then release forward and up; Energy flows down through abs into hips, while maintaining alignment.

PHASE IV...MAINTENANCE REHABILITATION

Goals for Maintenance Rehabilitation (Phase IV):

- Maintain functional and stability strength.
- Isokinetic testing 100%+.
- Improve/maintain flexibility needs.

General Concepts for Maintenance Rehabilitation (Phase IV):

· Maintenance and Sharpness Exercise for lower extremity

- o Neuro component...balance, quickness, plyometrics, pilates 2-4x/week
- o Maintain strength and endurance 2-3x/week.
- o Maintain flexibility daily.

· Reinforce Movement Patterns

- o VMO recruitment
- o Glut/hip recruitment off core

· Good posture

Sample Exercises and Techniques for Maintenance Rehabilitation (Phase IV):

· Maintenance and Sharpness Exercises...2-4x/week

- o Tubing quickies SLR/TKE
- o Pilates
- o Lateral step-ups
- o Machine hamstring curls
- o Machine quad extensions
- o ¼ squats...Dyna Disk squats...box jumps daily
- o Resisted medial hamstring, quad, hip flexor and gastroc/soleus stretches

· Stability Techniques

- o Standing balance and alignment during...
- o Lateral step-ups
- o Tubing quickies
- o Dyna disk, ¼ squats, box jumps
- o Resisted stretches

Return to Swim IV**Goals for Return to Swim IV:**

- Good stroke technique.
- Full workouts.
- Competitions.

General Concepts for Return to Swim IV:

- Kick Technique – Focus on what part of the core is stabilizing/anchoring versus initiating movement...move from the inside out.
- Progressive Kick Addition – Start with the easiest most pain-free for that swimmers and add one as a time; Guide easiest to hardest...Flutter, dolphin, breast kick.
- Build Kick Yardage Gradually – Guidelines:
 - o Frequency – Initially 3-6x/week, adding 1 workout/week
 - o Duration – Add 200 yards or meters every 2+ workouts
 - o Intensity – Easy, 75% (cruising), 100% (sprinting)
 - o Change only 1 variable at a time every 2+ workouts (i.e. new kick, frequency, duration or intensity).

Sample Kick Progressions for Return to Swim IV:

- Warm-up easy free and backstroke
- Kicking sets: Breaststroke kick
 - o 200 easy
 - o 300 easy/drills
 - o 400 easy/drills
 - o 200 easy/drills; 200 build-up to 75%
 - o flutter and then dolphin: 200 easy, 200 build to 100%
 - o 200 easy, 200 build to 100%
 - o Each step (1-6) takes a minimum of 2 workouts each
 - o After finish, add 200 kick/workout until full workout
- Free, backstroke and fly sets (kick is ~75% until first 5 done)
- Pulling sets
- Warm-down 100-200 sculling front or side with easy flutter

Goal Biomechanics Breaststroke Kick for Return to Swim IV:

- Kicking is an open- and closed-chain activity.
- Draw heels up without dropping knees (hips open).
- Narrow knees, reach feet out with action of hip rotators.
- Kick back and together at same time.
- "Anchor" feet and use gluts/hip rotators for propulsion...Quads.

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