

The Coaches Guide to Bicipital Tendonitis

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The problem of tendonitis in swimmers' shoulders is certainly not a new occurrence, but it is a recurrent problem that often presents even the most knowledgeable clinicians and physicians with very difficult decisions related to cure and further prevention. The key to avoiding tendonitis in the swimmer's shoulder has not been completely isolated, but the identification of the problem in a relatively timely manner is certainly one way to avoid much of the pain, discomfort, and down time that is customary. Therefore, the most logical approach to preventing the injury and treating it rapidly is to educate the coaching profession early identification of the problem. This coaches guide is directed at that goal.

Definition:

Suffix "itis"; inflammation of:

Tendon:

Often described as an elastic rope with shiny white skin. It can either be slightly round, completely flat, or broad and flat.

Function is to transmit strength and power from the distal aspect of a limb where the muscular attachment is broad, to a small point on the adjacent limb or body part. In order for this to be accomplished the tendon passes around the intervening joint in a small groove. In essence, the tendon provides efficiency of movement by being small enough to avoid interrupting joint function, while having the intrinsic strength to sustain the pull placed on it by the muscle.

The micro structure is that of a well formed matrix, very tightly woven in a specific pattern with a smooth outer surface. This structure provides for an essentially avascular tissue, those known to be almost without circulation, which draws a majority of its nutrients from the surrounding fluid environment. All tendons have an enveloping sheath whose interfacing space is fluid filled. This synovial liquid is composed of blood plasma and lymph which provides a very high resistance to friction from shear stresses, but is not without a point of failure if the load is too high.

Biceps:

A muscle whose function spans both the elbow and shoulder. It has two heads, or "ceps", wherein lies the name.

The primary function of the muscle is forceful su-

pination of the hand. Secondary function is flexion of the elbow, with other secondary functions to include flexion of the shoulder and horizontal adduction.

It attaches from the proximal aspect of the forearm at either side and lies on the medial inside of the arm. At the upper arm one of the heads is secured to the humerus, while the other long head attaches to a tendon which passes up over the ball and is secured onto the scapula.

Shoulder Anatomy:

The shoulder is composed of three bony parts, the scapula, or shoulder blade and socket, the humerus or shoulder ball, and the clavicle or collar bone. The entire structure is suspended at the side of the body over the upper rib cage by the trapezius muscles attaching from the neck to the scapula. Position at the side of the shoulder is maintained by the strut like clavicle which maintains the ball and socket at an appropriate distance from the sternum or breast bone.

The ball of the humerus is maintained in the socket by a ring of ligament which deepens the concave surface and forms a lip preventing the ball from subluxing. Muscular support is provided primarily by the deltoid muscle and actions of rotation are performed by the small scapular muscles.

As the biceps pass over the ball of the humerus it passes beneath a band of ligament that holds it in the bicipital groove. This ligament structure is interfaced closely with the overlying supraspinatus tendon and the underside of the deltoid muscle.

Stress During Swimming

Freestyle:

The biceps muscle is very active during many facets of the freestyle. At the point of entry and initial catch the hand is forcibly supinated and followed immediately by the high elbow pull. Both actions are primary roles for the biceps and indeed find the long tendon to be at its most vulnerable position as it virtually presses almost out of its groove.

At the mid phase of the pull, from the start to the end of the keyhole pull, the biceps is active as a hand supinator, elbow flexor and horizontal adductor. This is a critical point in the stroke because the arm is being rotated inward thus stressing the front of the

shoulder as a fulcrum of the force. As a result, the biceps long tendon located at the front of the shoulder sustains not only a muscular contractile force, but a stretching force as the front of the joint rolls open.

Butterfly:

Hand entry and pull are similar to freestyle with the exception that the bilateral pull requires more bicipital muscular work. Whereas the freestyle allows for some shoulder rotation and more positive alignment of the large girdle muscles, pectoralis and latissimus, the butterfly fixes the shoulder and stresses the tendon from the entry to the hand exit from the keyhole. The recovery is likewise stressful as the hand exits the water and the entire arm is levered around the fulcrum at the front of the shoulder.

Backstroke:

Hand exit from the water is the initial contribution of the biceps to the stroke effort. The entry phase is potentially aggravating in that a poor shoulder roll will press the anterior shoulder tissues, with the biceps long tendon, up into the overlying bone structure causing an impingement between the humerus and scapula.

The next phase of the stroke placing the tendon at risk is the middle one third of the pull, because the hand is being supinated with a strong biceps contraction as the elbow is being flexed. This portion of the stroke also stresses the front of the shoulder because the trunk is synchronously rolling away from the stroke side to prepare for the opposite hand entry.

Breaststroke:

The initial hand pull from entry to scull is the point where most stress is placed on the biceps long tendon. This is caused by the supinated hand position and right angle elbow pull just prior to the hands being drawn inward.

Injury Stages/Symptoms

Stage I:

Inflammation of the tendon which produces a mild prolonged pain over the front of the shoulder that is noticeable for several hours after exertion, and can be reproduced by a direct pressure over the tendon. During this stage there may be a mild pain in the shoulder at the start of warm-up, but this subsides without notice and is not a factor until the completion of the workout and may not be apparent until several hours after the workout.

Special diagnostic tests to identify this stage and reproduce the symptoms are not 100% reliable. The swimmer's explanation of "Where it hurts" and "When it hurts", and noticeable stroke changes are the best source of evaluation.

Stage II:

Pain exists during some aspects of the workout and is noticeable following the workout. Usually the swim-

mer needs a noticeably longer warm-up and tends to avoid hard pulling sets as these aggravate the problem. Pain usually dissipates during the workout to the point of tolerance, but sprint or quality work intensifies the problem and as a result the swimmer may develop a dropped elbow pull. Discomfort continues unabated several hours following practice, but does not limit daily activities at home or at school.

Diagnosis is confirmed by specialized tests and history, along with observable changes in the stroke pattern.

Stage III:

Pain in this stage is noticeable during practice, immediately after practice, and is generally prolonged throughout the hours of the day. A slow gradual warm-up does not dissipate the pain to a tolerable level and heavy overarm work such as pulling is extremely aggravating. Swimming butterfly or backstroke also reproduces the pain, and kicking with arms fully extended over the board does not seem to alleviate the problem. The pain may subside after practice, but discomfort can continue through the day, sometimes accompanied by intermittent severe pain or a stabbing sensation. The swimmer may at this point take several days off to rest, only to find that resuming workouts produces exactly the same kind of pain and discomfort as before.

The stage is easily diagnosed by palpation and diagnostic tests, because of the swimmer's facial expressions, apprehensive behavior and body gestures. When the tests are performed the swimmer may close the eyes, grit the teeth or vocalize the pain, while a dip of the sore shoulder or withdrawal from the test stimulus is a likely phenomenon.

The swimmer is generally aware of the advance nature of the problem and will seek help only after discovering that he cannot swim through the pain and that kicking an entire workout is a boring and ineffective way of training.

Stage IV:

The pain is chronic and generally unchanging which produces a disruption of normal activities, along with avoidance of regular practices and team functions. Feelings of inadequacy and fear of losing the camaraderie of the other swimmers because of not being able to "contribute" is common. Pain and discomfort are so severe that the swimmer awakens at night, or notes having difficulty in certain rest positions. Daily activities, such as carrying school books or a grocery sack, or reaching up to a high shelf, are painful and must be avoided. In general, there is a period of denial about the severity of the pain, but the daily inability of the individual to reduce the symptoms causes a change in personality that may result in some swimmers thinking that no resolution or cure is possible and swimming may have to be stopped.

Evaluation:**Diagnostic Tests:**

(1) Palpation: Point tenderness will be a major tool in determining if a problem exists and how far it has progressed.

To perform the test have the swimmer hold the arm down by their side and ask them to rotate it outwardly. Next, place your hands at the front of the shoulder and lightly press the skin as you feel for the biceps tendon. When you encounter it you will feel a cord like structure that rolls gently from side to side with slight pressure.

In Stage I the response will be some pain that is barely perceptible, but definitely more noticeable than on the other arm. Stage II is a definite yes, but without perceivable shoulder apprehension and hesitation. In Stage III there is apprehension at the start of the test and slight withdrawal or facial change. At Stage IV the swimmer can barely tolerate slight pressure over the area and will withdraw from this in a very distinct manner.

(2) Observation: In the late Stage II and beyond to Stage IV there are often perceptible changes with motion. In the most severe cases the swimmer can be asked to lift the arm from the side of the chest using a short lever technique. This is essentially a fully flexed elbow position with the hand touching the front of the shoulder. As they raise the arms together, the affected shoulder will shrug up about midway through the lift, indicating that the suspensory muscles are compensating for the true abductors. In some cases there will be little compensation, but the motion will be slow and purposeful, or the affected arm will rise with much more difficulty than the unaffected arm. If the motion is performed well, observe the swimmer's facial expression. In Stage III difficulties the short lever arm raise will probably present the swimmer with some discomfort but no perceivable change in motion. Ask the swimmer to fully extend the arms and to raise only the affected limb. In advanced phases of this stage a noticeable shoulder shrug will be evident to act as a compensatory measure for pain avoidance.

In early phases of Stage III and late phases of Stage II the motion will be unimpaired until a light pressure is applied to the arm. This will cause some apprehension, but not prevent the completion of the motion.

(3) Muscle Testing: In essence, a clinical muscle test is performed not to assess strength, but to determine the motions which elicit pain. Of the numerous possible tests there are four which should be conducted.

A) Internal Rotation: From a fully abducted horizontal arm position the elbow is flexed 90 degrees so that the hand points toward the ceiling. With moderate pressure on the palm of the hand have the swimmer slowly press down so that the forearm moves to a

horizontal or subhorizontal position. Pain with motion is usually noted in Stages III and IV, indicating that the inflammation is probably not confined to the biceps long tendon but has also affected the surrounding tissues.

B) External Rotation: The arm is raised to the side until it is parallel to the floor and the palm is turned to also face the floor. Have the swimmer flex the elbow to a 90 degree position and then place moderate pressure on the back of the hand. The swimmer slowly rotates the arm upward until the fingers point toward the ceiling. Pain with this motion will be indicative of Stage II problems, with the possibility that the overlying supraspinatus tendon is also involved.

C) Abduction: With the arm fully extended by the side a moderate amount of pressure is placed on the wrist and the swimmer is asked to bring the arm upward. If pain is present through the first 30 degrees of motion this will confirm that the supraspinatus is involved, and that the biceps long tendon may be a cause of the problem, but has no inflammation.

D) Raised Abduction: From a side raised position of 90 degrees the hand is placed face down and moderate pressure is exerted on the arm. The swimmer is requested to hold this position under load. A positive pain response can be indicative of a Stage III problem, as well as bursitis or other complications.

4) Special Tests:

A) Yergason Sign: This test is performed by having the swimmer flex the elbow to 90 degrees and keep it close to the side of the body. The arm is then positioned by rotating the upper arm and shoulder outward so that the forearm is away from the body with the palm facing forward. Moderate pressure is placed on the palm and the swimmer is asked to rotate the arm inward so that the forearm comes to a stop at the waist. If a popping occurs at the front of the shoulder with pain, the biceps long tendon is subluxing from its groove. This is usually accompanied by a late Stage II or Stage III biceps tendon problem. If pain is present without the popping sensation a Stage III problem is definitely present.

B) Apley Scratch Test: This is performed by asking the swimmer to bring the affected arm behind the body in an attempt to scratch the opposite shoulder blade. A positive response to pain at the front of the shoulder is indicative of a Stage IV, but can also be useful in determining the presence of a case of bursitis, if palpation indicates Stage I tendonitis has developed.

C) Supination Sign: Insofar as the biceps is a primary muscle of supination, stress placed on the tendon by resisting muscle function will be a good indicator of how far the problem has advanced. To perform the test have the swimmer flex the elbow to 90 degrees and then place the elbow close to the waist. The

forearm faces forward parallel to the floor, and the palm is face up to the ceiling. To test the swimmer, use your same hand as the side being tested and grasp the small finger side of the palm with your whole hand. When you have a secure grip apply an even downward rotating motion to turn the palm over and have the swimmer try to resist. At Stage I there may be no real response, only that they feel the pressure. Stage II will give a definite indication for pain and Stage III will be accompanied by apprehension in the form of a shoulder dip.

D) Supination With Extension: For a more definitive test to determine the extent of a Stage I and II this is the test of choice. From the position previously described in the Supination Sign you will apply pressure in a second direction simultaneously. As you are applying the downward rotational pressure, also force the swimmer's elbow backward, trying to make it pass behind the line of their back. A positive response here will help to confirm a Stage I found by palpation and will always be positive for Stage II.

E) Straight Arm Extension: This is another test used to confirm the presence of Stage II. The swimmer stands upright with the arm by their side and the palm facing forward. A slow moderate pressure is exerted on the wrist, pushing the entire arm backward while the swimmer resists. Positive responses are indicative of the biceps long tendon under stress from a forced flexion motion.

F) Empty Can Test: This test is used to determine if the supraspinatus tendon is involved, as opposed to or in conjunction with, the biceps long tendon. The swimmer stands with the arm by their side and the palm turned inward so that the back of the hand touches the leg. From this position the thumb points backward and they are asked to raise the arm forward to a position where it is parallel to the ground. Once the arm is up it is moved to the outside, away from the chest to a 45 degree position. The arm is therefore positioned midway between front and side. A gentle moderate pressure is then placed on the arm and a positive response here will be indicative of supraspinatus involvement. If this is accompanied by point tenderness over the front of the shoulder at the biceps long tendon, then supraspinatus tendonitis is the probable affliction.

G) Swim Stroke Pull Test: This test is unique to the evaluations of Ted Becker. It is a mirror drill of a high elbow pull from entry to the start of the keyhole pull. The swimmer is standing with the affected arm held upward above the head. Place your hand, which is the same side as the one being tested, to their hand, palm face up. Have the swimmer then bend the wrist forward so that the palm side of their fingers touch your palm. From there, ask them to perform a high

elbow pull, as they would while swimming, against the pressure of your hand. You will move your hand downward in a moderately slow fashion, following the pattern they are pulling.

This test mimics the stroke, and the swimmer is asked to say "Now", at the point or points in the motion which cause pain. In general, all Stages, I through IV, will respond positively, but in differing degrees of severity. The test is most important because it can help detect the cause of the problem. If pain is present at the initial pull, the biceps long tendon is being stressed in the bicipital groove, in which case the anterior deltoid muscle needs to be strengthened. If pain is present at the keyhole section, the supraspinatus and middle deltoid must be strengthened to avoid the stressful overload.

H) Impingement Sign: An impingement occurs when the soft tissues between the ball of the humerus and the overhanging acromial arch are pressed upon as the arm is raised above the head. This is often the case at the hand entry of backstroke and freestyle as the initial pull phase begins. When the ligamentous arch and tendons at the front of the shoulder are inflamed this test will be positive.

The test position requires that the arm be brought up to a position directly in front of the shoulder and parallel to the ground. The elbow is then flexed to a 90 degree position. A gentle moderate pressure is exerted on the wrist in a downward rotation direction, while the elbow position is maintained parallel to the floor. As the wrist rotates downward, the ball of the humerus will contact the arch, reproducing the mechanism of injury and the associated pain. In cases of positive response it is wise to assume that the biceps long tendon is not solely involved, and that a Stage III tendon problem probably exists.

Identification of Stage I

The swimmer who has no history of shoulder problems must consider that a change in stroke technique will stress muscles that previously have presented no pain or ache. The problem may in fact be muscular strain. This shoulder pain is of particular importance to the swimmer who is resuming training after a long layoff, or to the swimmer who has lost a good feel for the water during the break between summer's end and the beginning of fall training.

The most frequently occurring muscle pain mistaken for tendonitis is in the anterior deltoid muscle, which covers the front of the shoulder just over the biceps tendon. The stress is imposed on the muscle as the swimmer attempts to keep the elbow high when the arm is rotated toward the chest and brought into line with the shoulder. The anterior deltoid muscle is also partially responsible for the last half of the high elbow recovery before hand entry, so it is understandable

that major stroke changes to perform correct mechanics will stress the muscle.

The characteristics of muscular strain are tenderness over the muscle when moderate pressure is applied, heaviness or slowness in performing daily activities the next day, and a feeling that there are muscles where they didn't exist previously. When a swimmer works out hard the next day with this soreness, the ache and slowness may go away after the initial warm-up, but the muscle may retain some residual damage. Further hard activity may aggravate the condition. When the muscle does not function well due to fatigue, the underlying tendons and ligaments must accept an undue stress, which may lead to the initial stages of tendonitis.

Differentiating the symptoms of muscle strain from Stage I tendonitis is best evaluated by the Muscle Test Procedures and the point tenderness palpation. The internal rotation test will be uncomfortable and the point tenderness will not be limited to the area directly over the tendon, but will generally be evident over the entire front of the shoulder.

Progressive Deterioration; Stage I to Stage IV:

The majority of cases of tendonitis can be treated very quickly and effectively if they are diagnosed quickly and treated correctly. Unfortunately, most cases proceed beyond the Stage I phase into the Stage II because swimmers and coaches are unwilling or unable to deal with the problem soon after it begins. While it is more than appropriate to have swimmers ignore pain while working, they must be made aware of the need to identify and report isolated anterior shoulder pain that persists following training sessions.

More often than not the overuse type of injury, of which tendonitis is one, will be ignored and muscular training pain will result in a typical progression of an increasing problem. As the stages progress, periods of rest may be tried that last anywhere from one to several days, but invariably the resumption of training will cause a resumption of the symptoms. If the swimmer attempts to swim through the problem it only becomes more severe, and while therapy and medication can control the symptoms, the cause persists, making the problem progress to a greater stage of disability. The usual result is a swimmer who is able to swim, but unable to train, where massive amounts of kicking are desperately tried to substitute for quality training. Several attempts are also usually undertaken to pursue competitive events, some with varying degrees of success, that prolong the idea that the tendonitis will resolve itself spontaneously. The delay in securing a comprehensive rehabilitation plan and following an acceptable "resting" program of exercise and activity usually produces the inevitable need for a prolonged rest.

If a rest period is inevitable, it usually is unplanned and when the training resumes the pain often returns, sometimes suddenly, sometimes gradually, but with a greater degree of severity than on the previous occurrence. The pain of tendonitis always increases with succeeding bouts and is increasingly resistant to subsiding with each episode. In the final stages, the pain and associated inability to perform daily tasks convinces the swimmer to either retire, or undergo surgery, in hopes that the corrective process will bring about a quick and decisive solution. These latter measures are usually only mildly successful and require a long rehabilitation period for the symptoms to be completely resolved.

In the progression from one stage of inflammation to another the tendon and its overlying intrinsic layers will gradually undergo microscopic changes which will alter the tensile and elastic properties of tendon, placing it at risk of having a recurrence of the problem. This is a particularly important concept concerning tendonitis, because the swimmer must be aware that preventing the problem will require a regular routine of maintenance exercise for the duration of their competitive careers.

Treating Tendonitis:

General Guideline:

- 1) For every day that a swimmer swims on a bad shoulder they require one day of rehabilitation time.
- 2) When tendonitis symptoms subside and there is cause to believe that the problem is gone, have the swimmer go 5 days completely symptom and pain free before resuming workouts.
- 3) When training under "rest conditions", and awaiting the full recovery always use a form of mild heat before practice and taken an exceptionally long easy warmup.
- 4) When training under "rest conditions", always avoid hard quality sets, and try to concentrate on long easy work that stresses technique and stroke mechanics.
- 5) When training under "rest conditions", always ice the shoulder for 20 minutes using a large zip loc freezer bag filled with small ice cubes or crushed ice. This is far superior to ice cups.
- 6) The shoulder should be iced 45 minutes two or three times per day during the rehabilitation phase, and there should be at least one and one half hours between icing sessions. This includes waiting between post practice ice and the 45-minute therapeutic session.
- 7) Rehabilitation exercises should be started one or two days after the initial diagnosis of tendonitis, and upgraded as the injury clears itself.
- 8) Always let "Pain be your guide", when training

during a "resting rehabilitation". Do not push any stroke too hard and don't be too anxious to get back into the quality work.

- 9) Start taking two aspirin four times a day almost immediately, and continue at least five days back into the resumption of training.
- 10) Always continue rehabilitation exercises for the duration of the season, and determine what strength deficits were responsible, so that they can be corrected.
- 11) ** Tendonitis tends to recur during a rapid increase in yardage quantity. Swimmers with a history of tendon problems should be eased up in yardage over a 3-4 day period.
- 12) ** Tendonitis tends to recur during a rapid increase in yardage quality. Swimmers with a history of tendon problems should be eased into quality sets by starting with a few and then adding a few more every day, until the total amount is achieved.
- 13) ** Initial episodes of tendonitis occur in adolescents who have long arms that are not heavily muscled. They are in the middle or end of a growth spurt, and the limb length allows them to swim better, but the muscles are incapable of sustaining a protective function over the tendon and joint.
- 14) ** Muscular imbalance and poor posture are two key contributors to the onset of tendonitis in young swimmers.
- 15) Swimmers who have tendonitis should kick with a modified board grip. This type of grip will place less stress on the tendon and promote healing, instead of aggravating the situation. For instance: If the right arm is injured, the left arm would be placed on the board so the hand is gripped on the top right side. The forearm is layed across the board diagonally, and the left elbow is on the left side of the board at the bottom. The right hand grasps the lower right corner of the board and the elbow is allowed to hang down below the board surface.
- 16) Swimmers who have a history of tendonitis can avoid recurrent episodes by being informed of when to practice preventative therapy.
 - A) When rapid increases in yardage or quality are scheduled, begin taking two aspirin four times per day, and ice 20 minutes after practice, as well as use ice once a day for 45 minutes. Also, use some sort of analgesic rub on the shoulder before practice.
 - B) Always ease into high yardage and quality increases over the course of several days.

Specific Guideline for Tendonitis Treatment:

- 1) Stage I: Start aspirin two four times per day,

ice after practice 20 minutes, and ice 45 minutes several times a day with at least two hours between intervals of application.

- 2) Stage II: Considerable alteration of swimming yardage, and concentration on easy freestyle and breaststroke as choice of strokes. Avoid fly and back. Use ice and aspirin as in Stage I, and be sure to have a good warm up and warm down. Consult your team physician, and consider physical therapy in the late stages of the problem to help hasten recovery.
- 3) Stage III: Concentrate on aerobic training using dryland devices, especially stationary bicycles, and pursue rehabilitation exercises in earnest. Ice and medication as prescribed. Do not push this stage to proceed too quickly, as it is better to get through this correctly to avoid recurrent problem. Consult the team physician, and use ice as in the other stages.
- 4) Stage IV: Patience!!! Gradual resumption of activities with pain reduction. The daily activities and sleeping must be comfortable and without pain before starting on further steps toward the resumption of swimming. Medication and physical therapy are essential.

Rehabilitation Training Programs—Samples

Each program of rehabilitation training needs to be custom made for the swimmer according to age, level, program, time of year and stage in the career. The following two programs listed are examples of programs that have been used successfully in the rehabilitation of swimmers with tendonitis. Each of these two swim phases of the program are always accompanied by a graduated program of rehabilitation exercises that are progressed in stages as the swimming is progressed. The exercises are not listed here as they tend to be very individualized and would not apply in generalized cases.

Program I. Designed for a 14 year old female.

- Week 1. free 200 easy / 5-100 repeats about 1:20+ / 2-200 moderate / kick 500 / free 200 easy / Total 1800
- Week 2. free 500 easy / breast 500 / kick free 400 / kick back 400 / 2-200 moderate / free 300 easy / Total 2500
- Week 3. free 700 easy / breast 500 / kick free 400 / kick back 400 / 3-200 moderate / free 300 easy / Total 2900
- Week 4. free easy / breast 300 / back 200 / kick

- 500 / 1-300 moderate / 1-500 moderate / 3-100 on 1:20+ / easy 600 / Total 3400
- Week 5. free 600 easy / breast 200 / back 200 / fly 100 / kick 500 / 3-200 on about 2:25+ / 2-500 moderate / 600 easy / Total 3900
- Week 6. free 600 easy / breast 200 / back 200 / fly 100 / kick 500 / 4-200 on about 2:25+ / 2-500 moderate / 600 easy / Total 4000
- Week 7. free 500 / breast 200 / back 200 / fly 200 / kick 500 / 5-100 on 1:20+ / 4-200 on about 2:25+ / 3-500 moderate 100 easy / Total 4500
- Week 8. free 1000 / back 200 / kick 600 / 500 easy / 5-100 moderate 3-500 on 5:20+ / easy 700 free / Total 5000
- Week 9. free 500 / pull 300 / back 200 / kick 600 / easy 500 3-300 free moderate / 2-500 easy / 5-200 moderate easy 400 free to finish / Total 5400
- Week 10. free 500 / kick 500 / pull 500 / back 200 / breast 200 easy 600 / 3-500 hard / easy 5-200 / moderate 2-100 / Total 5500
- Week 11. free 500 / kick 500 / pull 500 / back 200 / fly 100 easy 700 / 6-200's moderate / 2500 hard / 800 easy / Total 6000
- Week 12. free 500 / kick 500 / pull 500 / back 200 / breast 200 fly 200 / easy 500 / 2-200's on 2:25 / 4-500's easy 1000 / Total 6000
- Week 13. free 800 / kick 500 / pull 200 / back 200 / breast 200 pull 200 / breast 200 / pull 200 / easy 500 4-200's on 2:20+ / 4-500's moderate / easy 400 / Total 5800
- Week 14. free 800 / kick 400 / pull 200 / breast 200 / 6-200's 3-500's moderate / 4-50's / 6-25's / easy 1000 / pull 150 / Total 5800
- Week 15. free 800 / kick 500 / pull 300 / breast 200 / fly 100 6-200's / 3-500's / 8-50's / easy 800 / kick 400 / Total 6200
- Week 16. free 800 / kick 500 / pull 500 / easy 400 / fly 100 breast 200 / 6-200 / 3-500 / 8-100's / easy 200 / Total 6200
- Week 17. free 800 / kick 500 / pull 500 / easy 500 / 8-200's 4-500's / easy 300 / Total 6200
- Week 18. free 600 / kick 400 / pull 400 / moderate 500 8-200's on 2:18+ / 4-100's / 2-500's / 4-50's easy 200 / Total 5500
- Week 19. free 500 / kick 400 / pull 500 / moderate 500 10-100's on 1:15+ / 5-200's / easy 300 / 10-50's easy 800 / Total 5500
- Week 20. free 500 / kick 400 / pull 300 / 4-300 moderate 10-50's / 8-100's / easy 500 / long rest / 10-25's easy 350/Total 4800
- Week 21. free 200 / breast 200 / back 200 / fly 200 easy free 500 / 10-50's / negative split 4-100's 5-200's / 8-25's / easy 800 / Total 4400
- Week 22. free 500 / kick 500 / pull 500 / easy free 500 / 8-25's / long rest / hard 8-100's / easy 3-200's negative split 4-50's / easy 200 / Total 4200
- Week 23. free 500 / kick 500 / pull 300 / easy free 300 8-25's hard / negative split 8-100's / 3-200's easy negative split 4-50's / easy 200 / Total 3800
- Week 24. Taper weeks / easy on fly work, easy on back work, do easy work between sets. / Total 3800

This particular case was an early Stage III, and she has progressed nicely back into full participation.

Program 2. Designed for a college swimmer, primary stroke fly.

Jan. 8-14 Week start—easy yardage to tolerance 7-8000 no back or fly.

Mid week—5600 (include 5-800 quality) no back or fly

Jan. 16-21 Week start—8000-8400, no back or fly.

Mid week—5800 (include 700-900 quality) no back or fly

Jan 23-28 Week start—8400-8600, no back or fly

Mid week—6200 (include 900-1100 quality) no back or fly

Jan 29- Week start—7800 (include 500 back or fly)

Feb 4 Mid week—5600 (include 1100 quality) no back or fly

Feb 5-11 Week start—8000 (include 700 back or fly)

Mid week—5800 (include 500 quality and include 500 back or fly).

Feb 12-18 Week start—7600 (include 1000 back or fly)

Mid week—5600 (include 800 quality, include 500 back or fly)

Feb 19-25 Week start—7400 (include 1200 back or fly)

Mid week—5200 (include 800 quality, include 800 back or fly)

Feb 26 to mid March—Continue to taper according to plan with emphasis on individual stroke.

This female collegian had a very successful championship meet after beginning the program with a Stage II tendonitis.

The planning of rehabilitation programs for tendonitis should always be prepared with the swimmer's individual needs in mind. This is especially so for the younger swimmer, and those in the collegiate programs, because so much of the problem has to do with the maturity and demands of the training regimes. It is a proven fact that those cases of tendonitis treated early result in shorter periods of training interruption and greater degrees of resistance to recurrence. While the evaluation and diagnostic techniques are not fool-proof, they are good quick indicators of where the

problem lies and how to proceed thereafter, be it training adaptations, or medical follow-up. Overall, the best prevention is through exercise and gradual increases in work load at all levels, but when the

injury does arise, as surely it will, the best result occurs from quick effective treatment.

This paper is dedicated to Keith Sutton.