



Some Essential Principles of  
**Orthopedic Massage**  
and their Application to  
Patella Tendon Injury

By Ben Benjamin

In the past several issues, I've described how the field of orthopedic massage offers a unique and valuable approach to the assessment and treatment of specific soft tissue injuries. My goal has been to impart some of the Essential Principles of working with those in pain and to teach the application of these principles to the kinds of injuries people generally bring to a bodyworker's office. Previously, I addressed collateral ligament injuries in the knee and several ankle and shoulder injuries. In this article, I return to the knee to discuss additional Essential Principles that help to assess and treat another commonly injured structure, the patella tendon.

## Introduction

Injuries to the patella tendon, sometimes called the quadriceps tendon, are the most frequently misunderstood knee injuries. A strain and/or partial tearing of an aspect of the patella tendon mechanism is a common cause of anterior knee pain. The injury can occur above, below, and/or on the inside or outside aspects of the patella, and usually causes a generalized ache in the front of the knee just below or around the kneecap. Because the pain can be felt in several different places, pinpointing its cause is often difficult.

Often called "runner's knee," "hiker's knee," or "biker's knee," patella tendon injury usually develops gradually. The pain often comes and goes according to the amount of activity performed, and may start several hours after a strenuous activity or even on the following day. People with this injury frequently feel pain while walking — especially when climbing stairs or hills, but sometimes when walking down stairs as well. Deep knee bends are often painful, particularly when straightening up. If the injury is recent and somewhat acute, the knee may ache all the time.

The patella protects the anterior knee joint and provides a fulcrum to increase the functional strength of the quadriceps muscles. When the quadriceps muscles contract, they pull on the patella tendon mechanism, which attaches to the tibial tuberosity below the knee, which in turn straightens the knee. Most tendons serve only one muscle, but the patella tendon serves all four of the strong muscles that form the quadriceps. This is quite a load. The patella tendon is one of the strongest

and thickest tendons of the body, and it can usually handle a great deal of stress.

Although it is often referred to as one tendon, the patella tendon mechanism consists of six distinct parts that function together as a single unit. The patella tendon proper (A) attaches the quadriceps muscles to the patella. As the tendon approaches the patella it flattens into an aponeurotic sheet and envelops the tendon. The edges of this structure called the medial quadriceps expansion and the lateral quadriceps expansion (C), wrap under the medial and lateral portions of the patella for about an eighth of an inch. Beyond the quadriceps expansion, flanking the patella, lie the most medial and most lateral parts of the mechanism: the medial patella

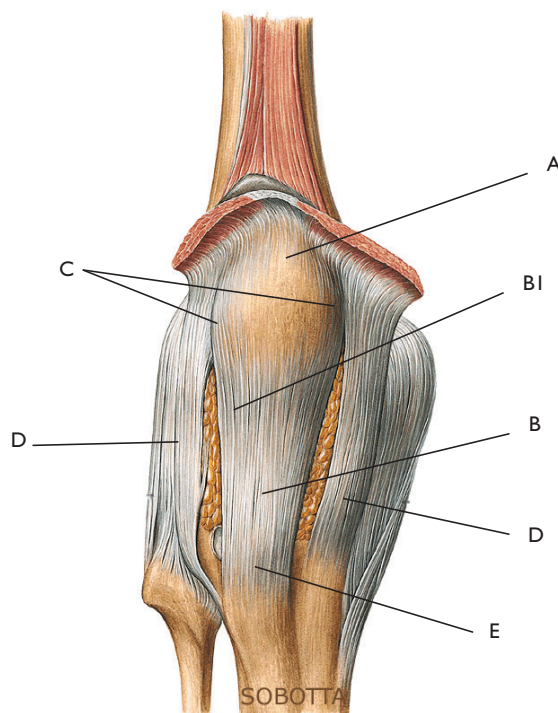
retinaculum and lateral patella retinaculum (D). In most people there is about a half-inch of space between the patella tendon and the retinacula, as seen in the illustration. Finally, the most distal part of the mechanism, called the patella ligament (B), attaches the patella to the tibia (E) of the lower leg at the tibial tuberosity. This last part of the structure, though technically a ligament because it connects bone to bone (patella to tibia), functions as a tendon connecting the patella tendon proper over the patella to the tibia.

There are two categories of patella tendon injuries: chronic and

acute. In an acute injury, some of the fibers are strained, swollen, and — in some cases — partially torn apart. In a chronic case, the fibers that were strained and torn have healed poorly, forming a matted scar that is painful and tends to re-tear with each new strenuous exertion. A severe acute case, if left unattended and untreated, may become chronic.

## Principle: Make a Thorough Assessment

Orthopedic massage brings a certain mind-set to massage and bodywork, emphasizing clear assessment and specific treatment rather than a hit-or-miss approach. We begin assessing an injury long before the client gets on the table. Here are four elements of a thorough assessment, incorporating some Essential Principles related to working with soft tissue injury.





### Let the Client Tell the Story

We all need to listen to our clients. Embedded in a person's story is often the key to understanding the person's pain or injury. A therapist who actively listens to a client's history has a better chance of narrowing down the possibilities, before examining the painful area. Allow your clients sufficient time to tell the full story behind their complaints. Although you may hear some extraneous details, careful listening will also yield information that's vital to your assessment. The history is particularly important in the knee for two reasons. First, the patella tendon is very strong and often does not test positive with a standard assessment test. Second, because there is no referred pain in the knee, the client's pain sensations are more accurately located than in other areas of the body like the neck and shoulder.

### Ask Appropriate Questions

As you listen to a client's story, begin to consider what questions might clarify the picture for you. For example, if your client routinely exercises, be sure to ask how she warms up. One Essential Principle that applies throughout

the body is that warming up a tendon or a ligament through activity causes increased circulation, which often reduces or temporarily eliminates pain. In contrast, a muscle that is not properly warmed up lacks adequate circulation and may remain stiff and somewhat rigid, thereby placing more stress on the tendon. Only by asking about your client's warm-up procedure (or lack thereof) can you determine whether it's helping or hurting.

### Examine the Affected Area

Prior to any hands-on treatment, examine the painful area visually. If the client's pain is around the joint and the knee is swollen, you can gain important information. For example, one Essential Principle states that tendon injuries do not cause joint swelling. The presence of swelling around a joint will lead you to consider ligament injuries, cartilage tears, or chondromalacia, while its absence indicates that a tendon may be causing the pain.

### Check the Body's Alignment

While some therapists have extensive training in assessing body alignment and others do not, every therapist should remember the Essential Principle that misalignment contributes to injury vulnerability. Connective tissues sometimes tear because they are under too much stress. Poor alignment is often at the root of this problem. Use your knowledge about proper body alignment to better understand the causes of an injury.

## Application: Thorough Assessment of Possible Patella Tendon Injury

### The Client's Story

Have you ever heard this one? "After I exercise for a while, my knee begins to hurt. So I rest for a day or so and then I feel fine. The next time I exercise the same thing happens. What's my problem?"

Such comments lead a therapist to take special care in eliciting this client's story. In the case of this particular knee pain, the history of the injury provides the most important information.

### Visual Examination

There are 23 different common knee injuries. We need all the help we can get to differentiate one injury from the rest. As stated earlier, injuries to the patella tendon can cause pain in a number of different areas around the knee, and therefore can be hard to identify. However, the Essential Principle that tendon injuries don't cause joint swelling helps us here. If the knee joint is not swollen, you can rule out injuries that cause swelling and consider further verification tests for patella tendon injuries.

### Questions To Ask

When a client has knee pain that goes away with rest and returns with exercise, ask detailed questions about the circumstances surrounding the painful activity. The most →

important question to ask is: Does the pain appear while climbing stairs or hills? As mentioned earlier, it's important to ask about warm-up procedures. Also ask about the levels of stress and tension in the person's life and what level of exertion is needed in the exercises they normally engage in. Excess muscle tension in the thigh is a possible cause of patella tendon strain, because a tense muscle fatigues more quickly, placing more stress on the tendon. Other causes of strain may include poor form in a particular athletic activity or running and jumping on cement surfaces. Learning about the types and locations of your client's athletic activities can give you insight into these contributing factors.

### Body Alignment

The knee joint is particularly susceptible to injuries resulting from misalignments in other areas of the body. For example, if the foot turns out more than five degrees while the knee moves straight ahead during athletic activity, inordinate stress is placed on a small portion of the patella tendon (usually the medial aspect) and can cause strain. Unless the alignment is corrected, the tendon will probably strain and tear repeatedly. If you suspect misalignment as a cause of your client's patella tendon injury, consider referring him to a professional who specializes in movement retraining (see Alignment Correction, page 109, for more details).

### Principle: Injury Verification Through Testing in the Stretched Position

An Essential Principle of testing tendons and muscles is that testing from a stretch position places greater stress on the structure. The greater the stretch, the more fibers are recruited to produce the movement. Therefore, you'll elicit more information from verification tests when the tendons and muscles are stretched than when these structures are relaxed.

### Application: Verifying Patella Tendon Injury

Verifying injury to the patella tendon mechanism can be problematic because the pain is often absent when the client comes to your office. For best results, you might try testing for this injury soon after an activity that makes the client's knee feel sore.

### Injury Verification Test

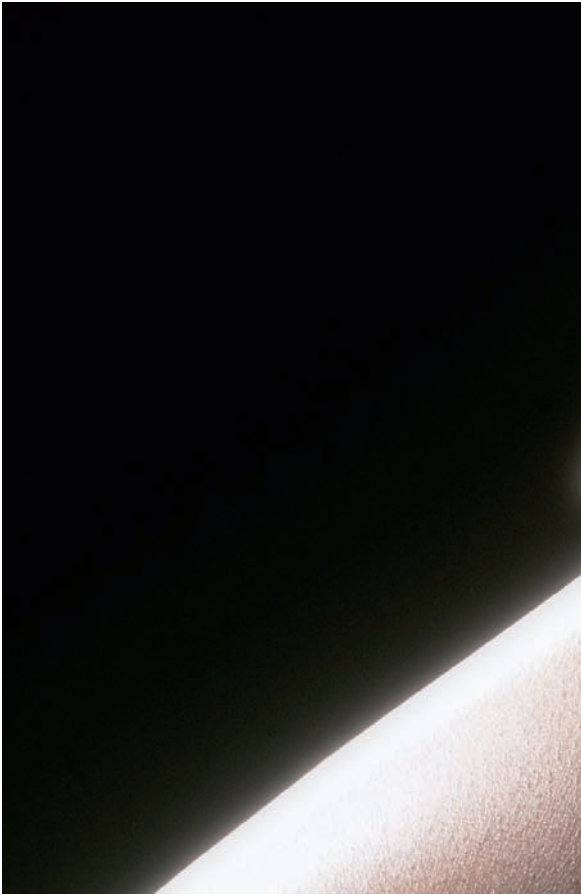
Have the client sit on a table with her legs hanging off the side, so there's a 90 degree angle between her thigh and her shin. Kneel in front of the injured knee and place both of your hands in front of the ankle. Ask your client to forcefully try to straighten her leg as you resist, not allowing it to move. This will cause pain if the patella tendon is injured. If the test fails to produce pain, increase the bend at the knee and try it again.

If the injury is not too severe, this test will not elicit pain unless the patella tendon has been stressed beforehand. For instance, runners often have to run five miles before the tendon begins to hurt. In such cases, ask the client to run five miles before coming to your office, and then test the knee. Having clients climb a lot of stairs often works well, too.

In addition to testing for patella tendon injury, you may also have to perform additional assessments. This injury is often mistaken for chondromalacia or bursitis of the knee, which cause a similar aching pain, though in different locations (under the kneecap or deep inside the knee). Sometimes a person has more than one of these injuries at the same time. To figure out what's going on, it's often necessary to assess each injury separately.

### Principle: Effective Treatment Choices

As I've discussed in each article in this series, healing of injured tissues can be supported by several different



types of therapies, ranging from self-treatment to treatments that require specialized training. It's important to know the range of therapies available to clients and to have them choose a treatment regimen that makes sense to them. At the same time, certain injuries respond better to one type of treatment than to others. Orthopedic massage provides very specific information to help a therapist guide a client toward choosing effective treatment for a particular injury.

### Application: Treatment Choices for Patella Tendon Injury

A number of treatment approaches are effective in working with patella tendon injuries. These include friction therapy, myofascial therapy, deep massage, exercise therapy, alignment correction, and injection therapy. Rest is often recommended as a treatment, but it is frequently ineffective, particularly in long-standing cases.



### Deep Massage and Friction Therapy

Deep massage is an excellent adjunct to friction, myofascial, and exercise therapy. By reducing tension in the thigh, especially the quadriceps muscles, deep massage provides a richer supply of blood and energy to the patella tendon so that it can better heal itself. I've used deep massage and friction therapy with great success on dozens of clients with patella tendon injuries. What follows is detailed information on friction treatment of patella tendon injuries.

Before initiating a friction treatment plan, first identify the precise location(s) of injury. There may be several, and they are usually quite discrete. Once you've established through the history and testing procedures that the patella tendon is injured, locate the precise spot by asking the client where he feels the pain and by palpating each of the tendon areas described below with one or two firm friction strokes. Because many tendons — even healthy ones — are tender to the touch, compare the level of discomfort in the injured knee to that in the other knee.

The patella tendon mechanism can be injured:

1. Above the patella (A, see page 99) in the tendon proper.
2. Below the patella (B) in the segment known as the patella ligament.
3. On either side of the patella (C) at the medial and lateral quadriceps expansions, where the tendon wraps around and under the edge of the patella for about an eighth of an inch.

4. In the patella retinaculum (D), where two slips of tendon run down on either side of the patella.

The most common site of injury is below the patella at (B), particularly where the tendon attaches to the bone (B1). This is called the tenoperiosteal junction because it attaches the tendon (teno) to the periosteum (bone skin). The tendon is also frequently strained at (B), in the body of the tendon. Children between the ages of 11 and 14 often get a severe strain and partial tearing at (E), called Osgood Schlatter's disease. This is best treated with proliferant injections.

It's not uncommon for the tendon mechanism to be strained and painful in many places at once. When planning your treatment approach, begin your work with the most painful spot. If there's just one area of injury, friction for 10 to 12 minutes. If there are two or three areas, work for 5 to 6 minutes in each spot. If four or more areas are injured, treat the three most painful spots and leave the others for another day.

As mentioned earlier, even healthy tendons are usually a little painful or sensitive to the touch, and this only increases with injury. When you begin frictioning, always go easy at first — don't do too much or use too much pressure on the first appointment. Wait until you can gauge the client's reaction to the treatment at the next appointment. After you've worked for about a minute or so, hyperemia will occur and cause a numbing effect, so you will gradually be able to go deeper and deeper during the treatment.

Once you've frictioned for 10 to 15 minutes, apply oil and do some transverse massage over the tendon and surrounding musculature with firm pressure. Use the pads and tips of your thumbs and fingers on the tendon, mimicking the friction strokes. After a few minutes of this, apply deep massage to the front thigh and shin, then to the back thigh and calf, using deep effleurage movements, transverse massage, compression, and brief holding pressure on trigger areas if and where needed.

### Friction below the patella

Sit on a stool at the side of the knee you will be working on. Using the web of the thumb of your headward hand, press firmly down on the upper (superior) edge of the patella. This will allow the lower portion to pop up slightly. Then place the thumb or forefinger of your other hand on the tendon where it attaches at the patella and apply friction horizontally. Friction with pressure only in one direction to give your finger and the client's body a momentary rest between strokes.

### Friction above the patella

Sitting as described above, use the web of the thumb of your footward hand to press firmly down on the lower (inferior) edge of the patella. This will allow the upper portion to pop up slightly. Now place the thumb or forefinger of your other hand on the tendon where it →

attaches to the upper portion of the patella and apply horizontal friction. When the tendon strain is above the patella, it is usually at the top inner or outer corner. Use your finger to reach under the patella as much as you can when you friction.

### Friction of the quadriceps expansion

To work on the inner (medial) portion of the quadriceps expansion, sit at the side of the knee and, with one thumb at the lateral side of the patella, push the kneecap firmly in the medial direction. While holding it there, place the index finger of your other hand underneath the medial edge of the patella, with the pad of the finger facing the ceiling. As you friction in a head-to-toe direction, press upward (anteriorly), compressing the thin, sheet-like piece of tendon just under the lip of the patella. This can be painful, so go easy at first.

When working on the lateral quadriceps expansion, sit on the side of the table opposite the knee you will be working on — frictioning is much easier from that side. Reach across the table to the knee and, from the medial side, push the patella laterally with your thumb. Hold it there with one hand and use the index finger of your other hand to work the lateral quadriceps expansion, just as you did with the medial portion. Press up under the lateral edge of the patella, compressing the piece of tendon that wraps around the side of the kneecap.

### Friction of the retinaculum

Injury to this part of the tendon mechanism is much less common. The client points to an area of pain a half inch to an inch to the right or left of the patella when performing resisted extension of the quadriceps. Cross-fiber friction is easily applied to this area once you locate the exact spot.

### Myofascial Therapy

In a certain percentage of cases, there is adhesive scarring in the myofascial layer covering the various structures described above. If you are trained and skilled in myofascial work, you may add this to your treatment protocol. To test whether there's a myofascial component, do a myofascial stroke over each structure. If working at this level of the tissue causes discomfort, perform myofascial therapy on these tissues before moving to friction therapy, which addresses the level of injury to the tendon, and then massage therapy.

### Exercise Therapy

Exercise therapy may be an effective treatment by itself if done correctly and regularly as outlined below, but it is far more effective when combined with massage and friction therapy.

### Patella tendon exercise program'

The exercise program that follows is the most effective one I've ever come across. The stretching realigns the scar tissue fibers so that they can heal correctly, and the

weight-calibrated exercises systematically increase the strength of the tendon. This procedure must be performed every single day for 6 to 8 weeks for it to be effective. If a client will not be able to do it consistently for any reason, this program is not a good choice. Try something different.

There are five steps to the program: warm up, stretch, exercise, stretch, and use of ice or heat. Give the client the following instructions:

1. First, warm up the tendon for a few minutes by walking around or by swinging the leg back and forth at the knee while sitting on a table or other high surface.
2. Stretch the tendon five times, for 30 seconds each time, by lying prone and pulling your foot to your buttock. If you feel no pull, either in the knee or in the front thigh, place a towel or pillow under the lower thigh just above the knee. This will elevate the thigh, increasing the angle and therefore the stretch. If your injury is fairly serious, take care getting into the stretching position. The following instructions will guide you safely into position to stretch your left knee. Reverse the directions if your right knee is injured. Begin sitting on your right hip, with both legs bent. Take hold of the top of your left foot with your left hand. Now twist to your right and slide down so that you're lying face down with your head turned to the left. Bring the bent leg in line with the straight one. It will tend to remain out to the side. Now draw your left heel gently toward the center of your left buttock, as far as it will go easily, resisting the temptation to bounce the foot. Rest a moment between stretches. Be sure to hold each stretch for 30 seconds and repeat it five times. Use a watch to track the time.
3. There are many quadriceps exercises you could use, but I've found the one described here to be the easiest. While wearing an ankle weight, sit on a table with your legs dangling. Slowly straighten your leg, hold it a moment, then lower it again. Repeat this 10 times before resting and starting again. Complete three sets of 10. If the exercise is too stressful on your knee, try lying down and supporting your leg by placing pillows of varying thickness under the knee. Begin at a 30 degree angle and later progress to a 60 degree angle.

Do this exercise slowly on the first and second days. On the third, fourth, and fifth days, increase your speed to a moderate tempo. On the sixth and seventh days, do the exercise a little faster. Always stick to three repetitions of 10.

For the exercise program to be effective, only the third set of 10 should cause some tiredness. This challenges the tendon structure and causes it to strengthen. Begin with one to three pounds. If you feel no stress or fatigue, you're not using enough weight. Try again the next day with a little more weight. If you feel stress or fatigue during the first 10 or 20 repetitions, you're using too much weight. Stop and begin the next day with less weight.

On the first day of the second week, increase the weight to an amount that will cause slight tiredness in the last 10 repetitions (usually this takes an increase of one or two pounds). Of course, if the original weight is still causing you some fatigue, stay at that level a little longer. At the beginning of each new week, increase the weight again.

Continue for six to eight weeks.

4. Stretch five times for 30 seconds each, as described in Step 2.
5. Apply ice or heat to the affected area for 5 to 10 minutes.

As stated earlier, this program must be done seven days a week for six to eight weeks. Otherwise it may not work. It's usually done once a day at first, but can be done twice a day after about two weeks. The client may feel slight discomfort afterwards. This is okay unless the soreness lasts for several days. If the discomfort persists, discontinue the program for a week or so.

### Alignment Correction

At the beginning of treatment, check to see whether there is a knee/ankle alignment problem that needs to be corrected. Misalignment is a frequent cause of patella tendon strain, and it will also hamper the tendon's healing capacity. If a person's alignment is poor, the arch will be dropped in an excessively pronated position and the feet will be turned outward as the knees point forward. Two types of approaches are useful for alignment problems. Well-fitted orthotic devices often correct the alignment and help redistribute weight evenly throughout the knee. Alignment retraining is also useful to help lessen the stress on the tendon while it's healing and to prevent further injury. Consider referring your client to a professional who is skilled in movement retraining. This may be a dance teacher, exercise instructor, Feldenkrais practitioner, Alexander teacher, yoga practitioner, or massage therapist with exercise training.

### Injection Therapy

Injections should be used only when all other treatments have failed. This will occur in some long-standing and severe cases in which the scar tissue is too tough to break down manually. Xilocane and corticosteroids are injected to deinflame the scarring. When there are many stubborn adhesions, the point of the needle can be used to actually puncture the scars. I once worked with a medical student who had extremely severe patella tendon strain for two years. She had pain constantly when walking or even sitting with her knees bent at a 90 degree angle. Climbing stairs was impossible. The pain made her so weak that I could keep her leg from straightening with just one finger during the test. She couldn't lift three pounds without pain. Deep massage, friction therapy, and exercise therapy were all ineffective. One injection made her 80 percent better and finally got her started on a recovery program that I could help her with.



### Conclusion

At least one of these treatment modalities will work in most cases of patella tendon injury. The longer the person has had the injury and the less cooperative the client is, the more lengthy the treatment will be. Once the client begins to get better, he or she will feel the urge to do more and more activity. It's like a starving person seeing food for the first time in weeks — the person will lunge for it and do too much. I always tell my clients that this is the time of greatest danger for re-injury. Encourage and educate your clients to return to full activity very slowly so they will remain injury-free. Pain is ephemeral; once it's gone, people seem to forget it. Teaching clients to warm up properly,<sup>2</sup> correcting existing alignment problems, using equipment properly, as well as helping clients approach activities in a more relaxed manner, are essential to a responsible and well-rounded massage and bodywork practice. **M&B**

### References

- 1 This program is adapted from Curwin, Sandra, and Stanish, William D. *Tendinitis: Its Etiology and Treatment*. Toronto: The Collamore Press, D.C. Heath and Company, 1984.
- 2 Benjamin, Benjamin. *Exercise Without Injury*. Chapter Four. New York: Summit Books, 1979.

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