Starting Strength

How Not to Tear a Pec While Bench Pressing

by

Mark Barroso

The pectoralis major (PM) is the main chest muscle, often called the "pecs" for short. The pectoralis major attaches to the anterior humerus via its tendon which inserts to the lateral lip of the bicipital groove. The main function of the PM muscle is to adduct and internally rotate the shoulder. In June 2018, I tore my PM tendon off the humerus, got it surgically reattached, and am currently undergoing physical therapy. After this injury occurred, I reached out to John Petrizzo, PT, DPT, SSC and Assistant Professor of Exercise Science at Adelphi University to get more insight about pectoralis injuries, bench pressing and the road to recovery. I also did my own research to see what the scientific literature says about the topic.

"The most common types of injuries with weight training are back injuries, followed by shoulder injuries and knee injuries," says Petrizzo. "Tendon injuries occur from rapid eccentric overload of the muscle belly – the meaty part of the muscle – and the tendon structure. I had a patient with a pectoralis tendon avulsion who was a firefighter. He fell responding to a fire, hyper-abducted his arm away from his body, and the resulting rapid stretch on the PM is what tore the tendon loose. I've also seen people rupture their pectoralis tendon kitesurfing and snowboarding as well, but most tendon avulsions and tendon repair patients I have seen injured themselves doing innocuous things around the house like slipping and falling, not usually from training in the weight room."

With regards to weight training, the bench press is the usual venue for a PM tear, Petrizzo says. Football players can also be susceptible to tearing their pecs from the force placed on the arm when they are reaching out to make a tackle. So what does the literature say about PM tears?

The Research

There are more than 400 reported cases of PM ruptures in scientific research, according to a 2016 Case Report in Orthopedics study. I'm not going to drag you through 400 study summaries, but these are worth mentioning.

- A military member tore his PM in Kuwait while bench pressing. Six months later, he returned to active duty. His case study was published in 2013 in the journal Physical Therapy.
- Watch this video (see supplementary material) to see a dude tear his PM while bench pressing 468

pounds. That guy isn't me, but I also injured myself on the third rep, although I was benching 300 pounds. There's more information about his tear and recovery at that link.

- A street cleaner worker tore his PM tendon at the humeral tendon-bone junction (like me) during a motorcycle accident. His case was published in a 2017 Case Report in Orthopedics study.
- And my MRI report read, "There is a complete tear of the pectoralis major tendon from the insertion on the humerus. The torn tendon is retracted by 3.3 cm. The pectoralis minor is intact."

Based on scouring the peer-reviewed journals for PM tears, it seems the barbell bench press is the most frequent cause of injury. However, chest injuries can also occur using dumbbells, so be careful with those too.

"PM ruptures can certainly occur dumbbell bench pressing, but I haven't worked with anyone who has torn their PM while doing so," Petrizzo says. "If you think about the eccentric portion of the lift, if you lose control of the dumbbell and it rapidly overstretches the PM, it could result in an injury. I don't think that dumbbell bench presses are necessarily safer than the barbell bench when it comes to avoiding these types of injuries due to the inherent differences in stability between the two movements."

For me, the issue was two-fold: I went too heavy without training for the weight, and I didn't warmup properly. I made these mistakes for three reasons: 1) I had benched the weight before, but it was three years prior. 2) My client who I was training for endurance previously wanted to start training Starting Strength-style. I wanted to see if I could bench his goal weight. 3) I was pretty caffeinated on the cold brew coffee concentrate I made at home. This was my weight progression on the barbell bench press:

Set 1: 135 for 5 reps

Set 2: 185 for 5 reps

Set 3: 225 for 5 reps

Set 4: 265 for 4 reps

Set 5: 300 for 3 reps (torn PM tendon on rep 3)

Looking back, I should've had a workload more like this:

Sets 1-2: Empty bar for 5 reps

Set 3: 95 pounds for 3 reps

Set 4: 135 pounds for 3 reps

Set 5: 165 pounds for 2 reps

Set 6: 195 pounds for 1 rep

Sets 7-10: 225 for three sets of five. If I felt good, 235 for a fourth set of five.

My main question regarding my injury was why was it the tendon and not the muscle belly? Why is my PM completely intact but the tendon detached from the bone? After all, there are more collagen fibers in the tendon making it stronger than the PM.

"The most common cause of PM injury during a bench press is the result from too much tension on the muscle belly or tendon in combination with a forceful eccentric contraction or stretch

reflex. It's more common to have muscle belly injuries than tendon injuries because tendons resist tensile force better than muscle bellies," says Petrizzo. "It takes more force to tear the tendon than the muscle belly and most PM injuries occur at the musculotendinous junction. But for some reason, your tendon gave out before your muscle belly, which unfortunately can happen, but it is hard to be able to say exactly why that is the case in your particular situation."

After the injury, I knew it wasn't a PM muscle belly tear because the initial swelling/redness was on my upper arm instead of my chest. Before I got my MRI result, I even considered I could've torn my pectoralis minor (PMI) because I didn't know a tendon tear was possible. But Petrizzo says a PMI is unlikely during weightlifting.

"The PMI isn't going to tear during the bench press," says Petrizzo. "The PMI doesn't attach to the humerus: it attaches to the rib, thorax and coracoid process which is part of the scapula. It doesn't contribute to the bench press like the PM. You're not really at risk for rupturing the PMI when you're lifting weights."

Recovery from Muscle Belly Tears

A muscle belly injury will not require surgery unless you tear the muscle from the tendon. Attaching a muscle to a tendon at the musculotendinous junction is a more complicated repair than attaching a tendon to a bone.

There are different types of muscle belly tears:

- Grade 1: minor injury
- Grade 2: partial thickness tear
- Grade 3: full thickness tear – It's torn all the way through.

The overwhelming majority of muscle belly tears are not full thickness and can be rehabbed without surgery, says Petrizzo. For grade 1 and 2 muscle belly tears, Petrizzo suggests using the Starr Protocol to rehabilitate the muscle.

"The Starr Protocol is absolutely useful in instances of muscle belly injuries," says Petrizzo. "Even though there is no "peer-reviewed" research to support its use aside from anecdotal evidence from the lifters who have successfully used it over the years, my wife (who is also a physical therapist and SSC) and I have used it with our patients. It works."

Here's Petrizzo's abbreviated guide on how to implement the Starr Protocol which will take approximately three weeks in most cases. The Starr Protocol is NOT for tendon, back or joint injuries, says Petrizzo. (I did not adhere to this protocol since I tore the PM tendon.)

Step 1: Within the first few days after the injury, perform the exercise that caused the injury. So if it's the PM and bench press, you'd bench press with a very light load, usually the empty bar or even a light bar, for high reps, between 20-25 reps. Do three sets of 20-25 reps with perfect form.

Step 2: Do the exercise the next day and every day, increasing the weight and eventually decreasing the reps to 20, then 15, and then 10.

Step 3: Within three weeks, most people are back to regular training loads if it's a relatively minor muscle injury like a grade 1.

"For any type of muscle belly injury such as the quadriceps, PM, or hamstrings, the Starr Protocol is very useful in preventing excessive scar tissue formation," says Petrizzo. "We think it works because using the muscles while they heal prevents a scar from forming, and the higher repetitions help bring blood flow to the area to a much more significant degree than any sort of passive modality like heat, electric stimulation, or ultrasound that is typically used in physical therapy treatment. When someone has a muscle belly injury, working the muscle with high repetitions and relatively light weight and gradually loading the tissues seems to work very well in getting them back quickly to pre-injury lifting numbers."

Grade 3 muscle belly tears may require surgery or an alternate rehabilitation. As for tendons, the recovery process takes longer than muscle belly tears since a tendon has a very poor blood supply when compared to other tissues such as skeletal muscle.

Recovery from A PM Tendon Injury

I was immobilized in an arm sling for six weeks, which is on par with what the research and Petrizzo's report. During this six weeks, I did only unweighted biceps curls on the affected arm and some forward shoulder raises. The amount of stiffness and the lifter's experience level will dictate their function at the six-week mark.

"At the end of the six weeks, if you haven't done any sort of therapy, you might be too stiff to even get through the full range of motion on the barbell bench press using an empty bar," says Petrizzo. "You may have to use a partial range of motion and gradually progress the range of motion as you regain strength. You have to be patient because, using the current rehab protocol recommended by most surgeons and physical therapists, it's going to take several months to get back to full strength and range of motion."

"Once you have a tendon rupture and have the tendon reattached to the bone, you can't rehab it as aggressively as a muscle belly injury because it takes time for the repair itself to heal," adds Petrizzo. "The site is not strong during the initial six weeks and you can re-tear the tendon from the bone if you're not careful. The big difference between muscle belly strains or partial tears and a full thickness tendon rupture requiring a repair is that the most common tendon repair protocols force you to wait six weeks (and sometimes longer) before you gradually load the muscle and tendon again, whereas a muscle belly injury can be loaded again – lightly, of course – within the first couple of days."

When you finally start back, be careful. Start with the empty bar (or lighter if necessary) and work through the full, available range of motion, adding weight gradually – 5 or maybe 10 pounds per workout – for sets of 5. Returning to full strength post-injury is just like running the Novice Linear Progression with the exception that you have to pay a little more attention to how your body is responding to the loading than a previously un-injured novice would.

Of course, the goal is to avoid injuries altogether, not recover from one. Read on to see Petrizzo's top tips for chest injury prevention while bench pressing.

Don't Wreck A Pec

1. Learn your perfect warmup routine.

Adequate warmup is important in preventing these injuries: you're preparing the muscle and tendon for the heavier load that will come later in the training session. The biggest mistake most novices make is that they think they don't need to start with the empty bar.

"I have every one of my clients start with the empty bar, and I start with the empty bar in every exercise," says Petrizzo. "The amount of reps and sets will vary with the age of the trainee, their injury history, the temperature of the facility you're training in (a colder environment can require more warmup). Make sure you're doing enough sets and reps with a light load."

I know what you're thinking: What about the warmup protocols in *Starting Strength: Basic Barbell Training*? Petrizzo says the warmup examples in the book are just examples, and they have to be tailored to your individual circumstances.

"A master's (age 40+) athlete might require more warmup sets/reps such as 2-3 sets of 5 with an empty bar compared to someone in their 20s," says Petrizzo. "You can't make specific recommendations about warmups – you just have to learn the principles. It helps to have a coach guide you through the process but you can learn the warmup process through experience too."

2. Don't do the Ascending Pyramid.

The majority of bodybuilders and high school/college football players do the ascending pyramid where they incrementally increase weight and decrease reps as they work towards low-rep sets. This approach won't increase strength.

"The pyramid is not really made for strength training because by the time you get to your heavier weights, you're already fatigued from all those repetitions," says Petrizzo. "If the goal is to perform a strength workout, you're not going to have high-rep sets that are loaded with any significant weight. Once we put weight on the bar, I don't have anyone do more than sets of five on the warmup sets. As lifters gain experience, I taper the warmup reps. So, it's a set of 5, then a set of 3, then a set of 2, then several singles to get them up to their work set weights."

3. Control the Negative.

Our muscles and tendons have what is referred to as "viscoelastic properties," which means that the rate at which these tissues are loaded or stretched will affect their response. An increased velocity of lengthening will result in an increase in stiffness in the muscle and tendon (which is great for force transfer), as well as a stronger stretch reflex, but unfortunately, can also result in an increased likelihood of tissue overload and injury to the muscle belly or tendon. "If you do not properly control the eccentric portion of a particular lift, you may be unnecessarily exposing the muscle belly or tendon to injury," adds Petrizzo.

4. Don't Bounce the Bar Too Much.

"Avoid heaving the bar off your chest during the bench press," says Petrizzo. "Even if you're doing a touch-and-go bench press, don't bounce the bar too much."

Petrizzo's other injury prevention form tips are to maintain tightness through your upper back, and arch hard through your lower back throughout the movement. This will help to keep the chest up and minimize the leverage that the PM has to work against out of the bottom of the movement, minimizing the likelihood of overloading the PM out of the bottom of the bench press.