

MOTO PHYSICS

# IS THERE REALLY A CURE FOR ARM PUMP?

By Dr. Joseph McGinley





**A**nyone who has ridden or raced motorcycles knows the uncomfortable feeling of arm pump. Occasional symptoms are often not a problem and do not limit your ability to ride. For those who suffer from arm pump routinely, however, or have symptoms so severe they cannot ride, often medical intervention is required. Forearm pain that occurs while riding is not always due to arm pump. Riders with carpal tunnel syndrome, ganglion cysts, arthritis, neck abnormalities, tennis elbow and fractures all suffer forearm pain while riding; however, in the interest of brevity, we will only discuss arm pain due to Chronic Exertional Compartment Syndrome of the Forearm (CECSF). Previously, this meant surgery, which is risky and does not always work.

Not all cases of arm pump are severe. Riders often complain that they can practice all week without arm pump only to pump up on Sunday. Symptoms usually occur at the palm side (volar) of the forearm rather than the back side (dorsal side). This isn't uncommon with motorcycle racers. The tension of the race, increased heart rate of the activity and the infamous death grip motocrossers are known for all contribute to a small amount of arm pump in most riders (under certain circumstances). This numbness or tingling in the forearm and hand can occur on especially bumpy tracks, muddy days or on tracks with hard braking zones. Fortunately, the symptoms of this type of arm pump are temporary, and normal function quickly returns after a short rest.

Typically, a rider will pump up in the first moto but not in the second; this is partially due to muscle memory, lessened anxiety and increased blood flow. It is important to know that a small amount of arm pump is acceptable. Suffering from arm pump does not make you an automatic candidate for medical intervention. But, what if your forearms pump up so hard that you could strike a match

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**“THE HIGHER INCIDENCE OF ARM PUMP IN MOTOCROSS IS RELATED TO THE STRESS OF RACING. WE PUMP UP MORE ON RACE DAY BECAUSE FOREARM MUSCLES ONLY GET BLOOD FLOW WHEN THEY ARE RELAXED—AND THEY AREN'T THAT RELAXED WHILE RACING.”**

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on them? Not good. Persistent symptoms, especially ones that do not abate between motos, are worrisome and may indicate the start of an unacceptable level of arm pump. This acute compartment syndrome usually results from an injury but may occur after strenuous exercise. Acute forms of compartment syndrome are true emergencies and may lead to permanent muscle damage unless surgically treated in less than six hours.

The most famous case of acute compartment syndrome happened to Larry Brooks. Larry crashed at the Oakland Supercross, and his right arm began to swell instantly. By the time he reached the hospital, the swelling was so extreme that the blood flow to his hand and fingers was in danger of being cut off. Doctors told Larry that if they didn't act immediately, they might be forced to amputate his arm. Luckily, surgeons cut his arm open to relieve the swelling and, after a long recovery, Brooks returned to racing. Be forewarned: if you cannot move your fingers 15 minutes after you stop riding, you should be concerned and perform the following test.



*Once the needle placement is confirmed with an MRI, botulinum toxin is precisely injected into the forearms.*



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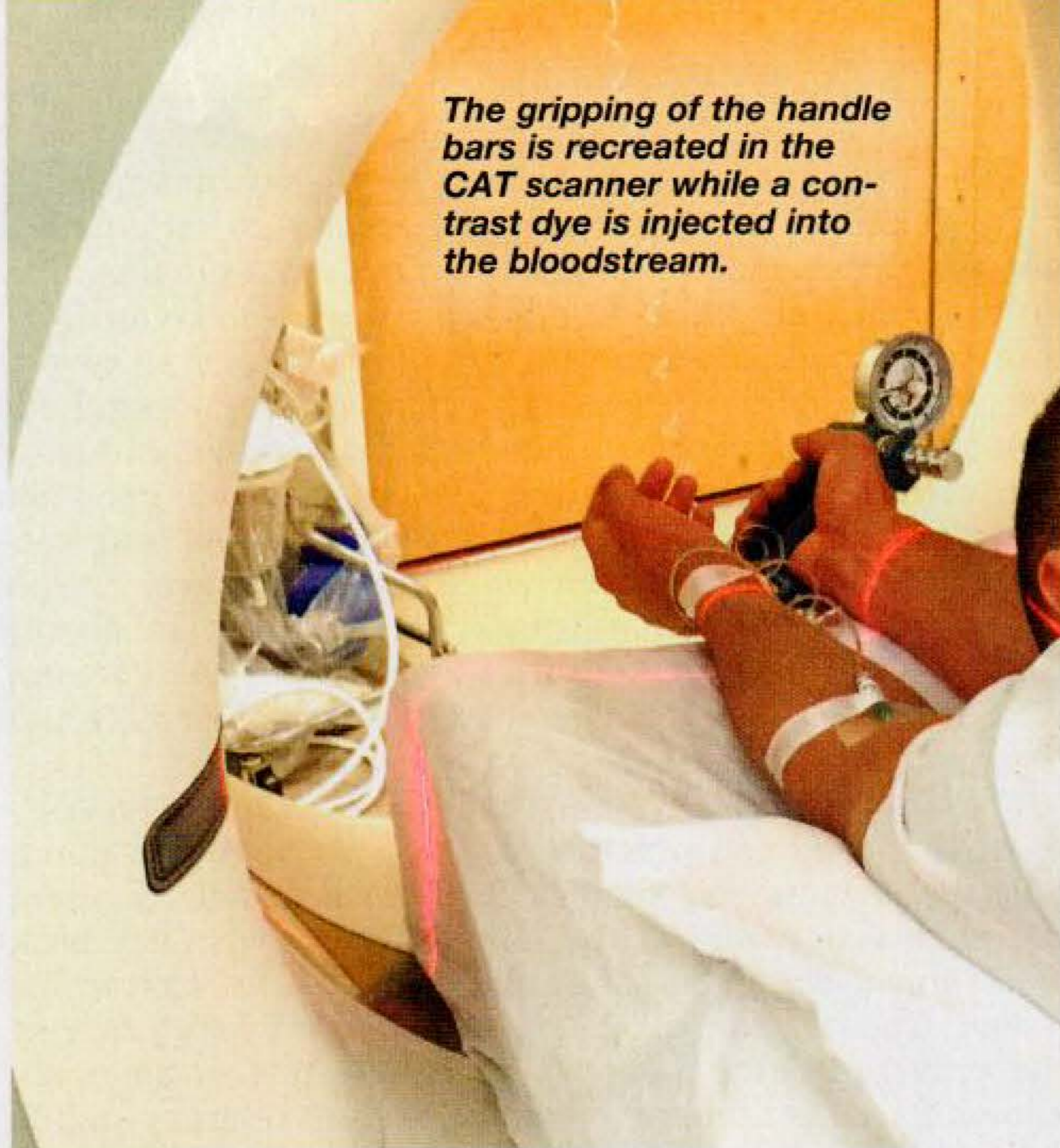
## ARM PUMP

**The test:** Have a friend move your fingers for you in both directions (flexion and extension). If this maneuver results in severe pain, go to a doctor. If your pain continues or increases long after riding stops, seek medical attention at once! If you have an acute form of compartment syndrome, don't assume it's just arm pump.

However, the less serious form of chronic compartment syndrome in the forearms of motocross racers is very common, probably more common than chronic compartment syndrome of the legs in long-distance runners. Why is it more common? The higher incidence of arm pump in motocross is related to the stress of racing. Thus, we pump up more on race day because our forearm muscles only get blood flow when they are relaxed—and they aren't that relaxed while we are racing.

Many famous motocross racers have undergone arm pump surgery. It involves the surgical release of the forearm fascia. A fasciotomy is not a new or difficult procedure, but it isn't always the cure. Many competitive racers have been unable to return to the same level of competition they enjoyed earlier in their careers. But, now there is a more advanced treatment available that, oddly enough, involves Botox.

*The gripping of the handle bars is recreated in the CAT scanner while a contrast dye is injected into the bloodstream.*



Yes, the same stuff women get injected into their faces to erase wrinkles. This treatment is called MVP, which stands for McGinley Vascular Pressure. To understand how MVP Treatment works, you must first understand exactly what causes arm pump (known to doctors as "forearm





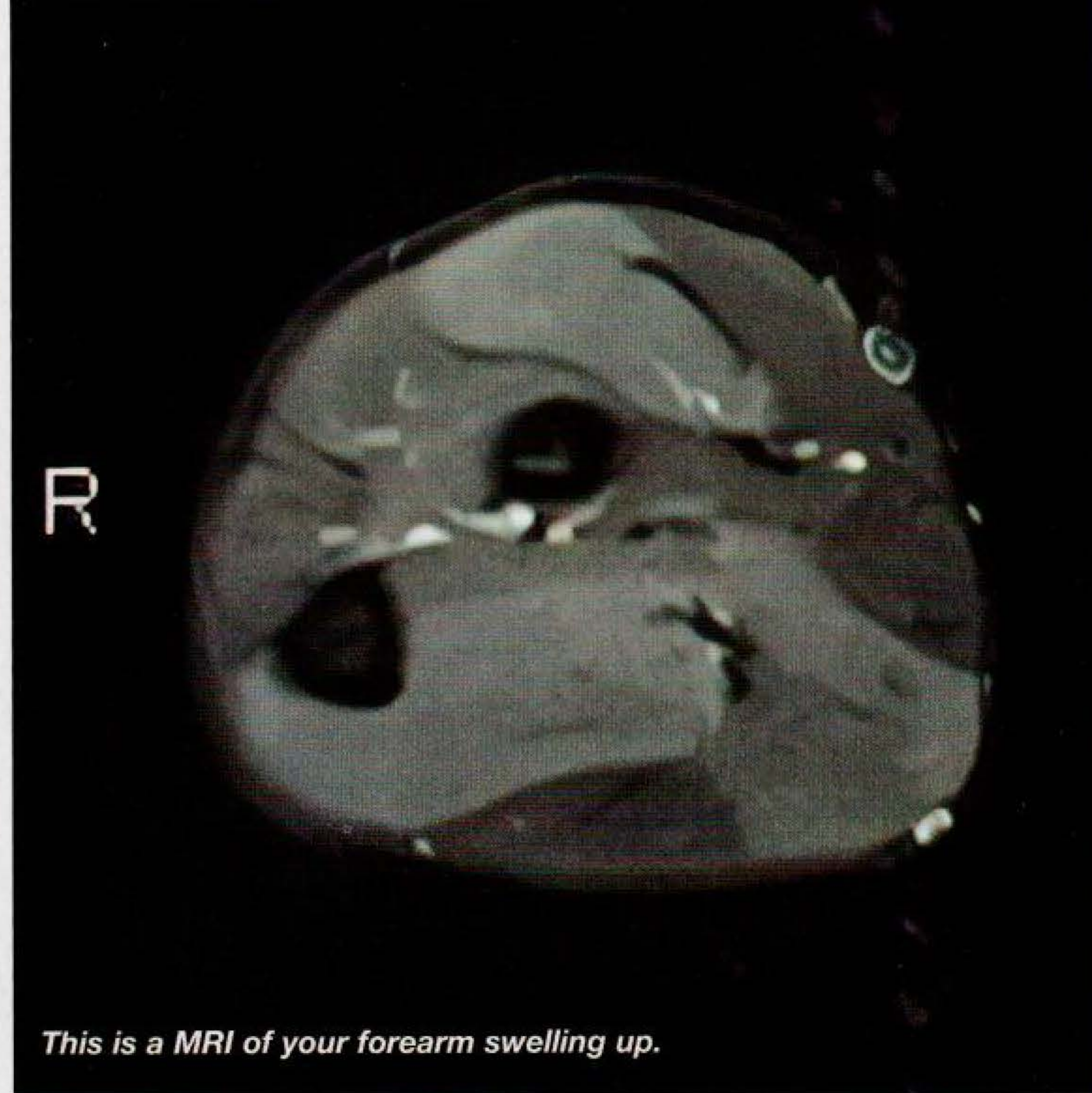
exertional compartment syndrome"). In the simplest sense, arm pump is caused by an imbalance of blood flowing into the forearm and blood flowing out.

If you think of the forearm as being similar to a motorcycle engine, the problem and solution are straightforward. In an engine, air passes through the carburetor and mixes with fuel to create the combustion process in the engine. After the fuel is burned, the byproducts are expelled through the exhaust system. A very similar process occurs in the muscles of the body. In the body, the heart pumps oxygen and nutrient-rich blood through the arteries to the muscles. As the muscles become more active, the heart rate increases and the arterial blood flow to the active muscles increases. Inside of the muscle, nutrients, fluid and oxygen cross from the arterial blood through leaky structures called capillaries. Capillaries allow flow into muscles based partially on the inflow and outflow pressures (similar to the valves of an engine). Once the blood passes through the capillaries, the veins act as the exhaust system and return the blood to the heart for refueling.

The problem that creates arm pump is a change in the normal inflow and outflow dynamics of the blood in the muscles. When you flex your muscles, they temporarily compress the veins. This is normal; however, if the muscles compress the veins too frequently or for too long, the blood flow can be blocked. This causes pressure in the outflow side to increase, which is felt at the level of the capillaries. In a motorcycle, blocking the exhaust would cause the engine to stall. In the body, the blocked exhaust causes more fluid to leak across the capillaries into the muscles. This starts a negative cycle of muscle swelling, further increases in compression of the veins, and additional swelling in the muscles. When you discontinue riding, the forearms relax, and the excess fluid begins to flow back into the capillaries and veins.

Another very simple way to demonstrate the mechanics of arm pump is with a tourniquet. When you have your blood drawn for lab work, a tourniquet is placed tightly on the upper arm. This causes the veins in the elbow, forearm and hand to expand, making it easy for the phlebotomist to find a vein to place the needle into. If the tourniquet is placed too tightly or for too long, you can develop symptoms identical to arm pump. The solution in this situation is to remove the tourniquet from the upper arm!

Current conservative treatments for arm pump focus on training, proper technique, nutrition, muscle relaxation and stretching of the fascia. For a lot of riders, these conservative measures do help fix the symptoms of arm pump; however, if your arm pump is severe, these techniques may not work. Arm pump surgery is very common in professional motocross ranks. Surgery essentially increases the space in which the muscle can swell by cutting or removing the covering or fascia. If the increased space is enough, you may no longer experience the symptoms of muscle swelling. The inherent problem with arm pump surgery is that there are four forearm compartments. Two of them are very hard to get to surgically, as they are deep in the



*This is a MRI of your forearm swelling up.*

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middle of the arm. You have to move a main nerve in the forearm to get to these compartments. Most surgeons will not attempt this surgery, as it is very risky. Racers who have had this surgery have experienced loss of feeling and severe infections; however, their arm pump has been cured in most cases when the surgery was done correctly.

The simplest arm pump surgery procedure is to release the fascia in the two easier-to-reach compartments. This surgery is covered by some insurance companies, especially if the patient has signs of carpal tunnel syndrome. There is an obvious gamble in this type of arm pump surgery, largely because there is no way of knowing if these two compartments are the arm pump culprits. It is not uncommon for this surgery to be unsuccessful. There are other

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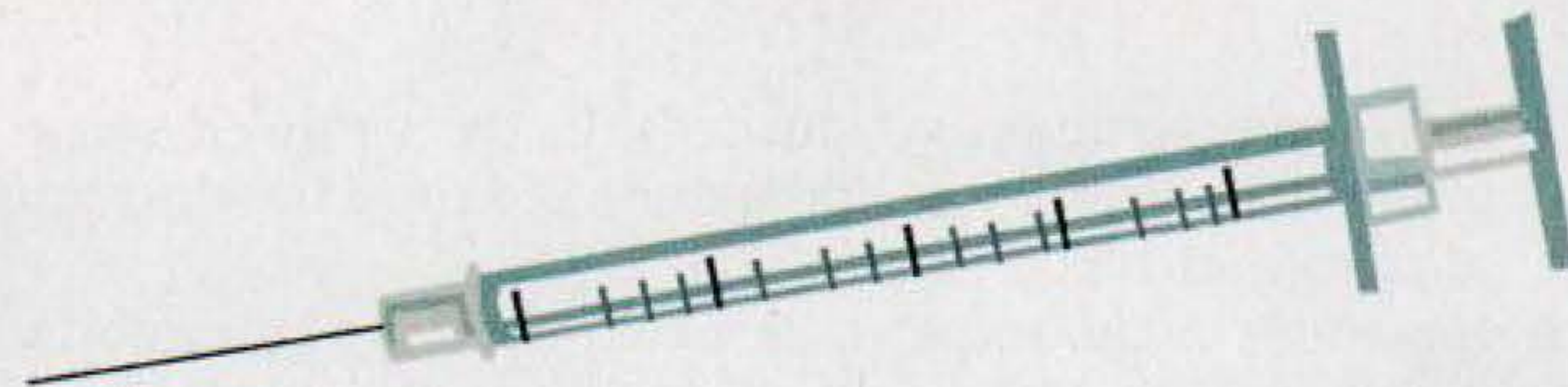
**“ IN A SIMILAR MANNER TO A MOTORCYCLE ENGINE, THE PROBLEM AND SOLUTION ARE STRAIGHTFORWARD. IN AN ENGINE, AIR PASSES THROUGH THE CARBURETOR AND MIXES WITH FUEL TO CREATE THE COMBUSTION PROCESS. AFTER THE FUEL IS BURNED, THE BYPRODUCTS ARE EXPELLED THROUGH THE EXHAUST SYSTEM. A VERY SIMILAR PROCESS OCCURS IN THE MUSCLES OF THE BODY.”**

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# MOTO PHYSICS

## ARM PUMP



issues associated with arm pump surgery. One of the most common is having the forearm muscles protrude out of the arm when the surgeon cuts the fascia open. In these cases, a skin graft must be used to close the incision, which often leads to the formation of scar tissue. Worst of all, the symptoms of arm pump will return after a few weeks or months.

MVP Treatment is a patented medical procedure that targets the underlying cause of arm pump—obstruction of the venous outflow. Advanced medical imaging is used to identify the location where the muscle is compressing the vein deep in the forearm. This is performed using Magnetic Resonance Imaging (MRI) in conjunction with a Computerized Tomography (CAT) scan. The process involves recreating the gripping of the handlebars in the CAT scanner while a contrast dye is injected into the bloodstream. The imaging study then shows the interaction of the forearm muscles with the blood vessels while gripping. The exact location of intermittent blockage is identified and targeted for treatment. MVP Treatment uses very small needles that are guided by ultrasound and a CAT scanner. The needles are placed in the forearm muscles at the site of compression within 1-2mm of the blood vessels. Once the needle placement is confirmed, botulinum toxin (commercially known as Botox) is precisely injected. The muscle is locally paralyzed by the Botox, allowing blood flow to resume normally. MVP Treatment is much less invasive than traditional surgical remedies, has a much shorter recovery time and less associated risk. This procedure is performed in an outpatient setting using only minimal local numbing medicine.

The treatment procedure is approximately 30-40 minutes in an outpatient clinic. There is minimal to no discomfort, and the patient is awake the entire time. Typically, the effects of the procedure are seen as early as two weeks with fully unrestricted riding by four weeks. Downtime is limited with MVP treatment. Exercise is restricted in the first two days after the procedure. There are limited restrictions after two days with most patients fully unrestricted and symptom free at one month. As with most medical procedures, this technique does not work for everyone. This is considered an "off-label" use of botulinum toxin, and the treatment typically is not covered by insurance; however, for the majority of athletes, this procedure is successful and offers a minimally invasive option to treat a problem that can end a rider's career. For more information go to [www.McGinleyInnovations.com](http://www.McGinleyInnovations.com) □

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**“ONCE THE NEEDLE PLACEMENT IS CONFIRMED, BOTULINUM TOXIN (COMMERCIALLY KNOWN AS BOTOX) IS PRECISELY INJECTED. THE NEEDLES ARE REMOVED, AND THE PATIENT IS ABLE TO LEAVE THE CLINIC WITHIN MINUTES.”**

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*The aftermath of a complex armpump surgery.*

