

The Paralysis Center

PATIENT GUIDE

Stroke and Brain Injury

***Reversing Paralysis
& Restoring Movement***

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1. Injury to the Brain

When a patient suffers an injury to their brain, whether it be as a result of a stroke, trauma, or even having had a tumor removed from their brain, they can often suffer motor weakness. This kind of weakness usually comes in the form of hemiparesis or hemiplegia.

The term 'hemi' refers to one side of the body. Neuroanatomy is such that the right side of the brain controls the left side of the body and the left side of the brain controls the right side of the body. So whichever side of the brain had the greater injury, the opposite side of the body is the one that ends up weak.

2. Understanding Spasticity

Spasticity is one of the common consequences of a stroke or brain injury. It is also common following a spinal cord injury, multiple sclerosis, cerebral palsy and any other disorder that affects the central nervous system.

Spasticity occurs when the neurons in the brain that control movement are injured. The signals traveling along the axons between the brain and spinal cord are unbalanced. The spinal cord is used to having a balance between activation and inhibition – that is, it is just important to tell some muscles to relax as to tell others to activate in order to perform a coordinated movement.

One way to understand spasticity is to imagine a bad phone connection when you have received a call from your boss. If possible, you will dial up the volume on your cell phone as much as possible and do your best to make out any words that you can hear and try to respond to them appropriately. Now when you can turn the volume up high enough, you will likely hear static in addition to his muffled voice. Noises that are not helpful begin to come through. Similarly, When information that typically travels from the brain to the spinal cord is lost because those neurons or their axons are lost, the spinal cord below that level similarly begins to “turn up the volume.” This is done in order to respond to any remaining signals that might be communicating movement to the spinal cord from above. When the volume is turned up the “noise” is often the other input that the spinal cord at that level receives – sensation. Touch, pain or other stimuli now result in a very exaggerated response. This results in hyperexcitable stretch reflexes, increased muscle tone, and sudden jerky or involuntary movements that are difficult or impossible to control.

What Is Spasticity?

As discussed above, an injury to the brain can cause affected muscles to become overactive. After such an injury, the arms, the legs or even the face can become weak or paralyzed. When this is from a stroke, it typically affects one side of the body – referred to as hemiparesis (weakness of one side of the body) or hemiplegia (paralysis of one side of the body). Patients with hemiparesis, may have a typical pattern of muscle overactivity. Often, on the affected side, they will have a hand that is clenched with a wrist that is flexed. The elbow is also flexed and the shoulder pressed against the side and turned inward. They have difficulty opening the hand,

extending the wrist and extending the elbow. As a result, use of that arm can be severely impaired.

Brain injury is usually worse on one side, but can affect both sides to some degree. Spinal cord injury will typically involve both sides below the level of the injury.

When spasticity affects the leg, it typically results in an ankle that points down and turns in with toes that are in a “fist.” This also requires stretching and most patients are offered an ankle-foot orthosis or AFO brace that holds the foot in a neutral position to aid walking.

Sometimes, with milder spasticity, you might be able to move your muscles, but they may resist your movements instead of moving smoothly. Moving requires significant effort. Stretching the limb and using braces to restore a more normal limb posture are usually an important part of therapy to control this spasticity. Medications may help as well.

If left untreated, spasticity can lead to shortened tendons and limbs that can no longer be straightened out, or contractures. A contracture results from a muscle that is contracted in a shortened position for so long that it essentially becomes fixed in that position and loses its ability to be straightened out. Muscles fingers, wrist, elbow and shoulder may become so tight that they lead to deformity of the joints. This can also lead to skin breakdown and pressure sores and will dramatically impair your potential to recover useful function in that limb.

Spasticity can be a challenging problem, but there are solutions and ways to effectively control it or eliminate it entirely.

What Causes Spasticity?

After an injury like this takes place, initially, the patient will have very limited movement, and then slowly some muscle tone returns and spasticity develops over the next few weeks to months. The first type of management for a patient like this is to undergo appropriate physical therapy. They will work with a therapist to learn how to compensate for their deficit. They are instructed in stretching and often are fitted with braces and devices that allow them to function a bit better in spite of their poor movement.

After such an injury, the brain does its best job to compensate for the injury. It in effect rewires. This rewiring is referred to as plasticity. Plasticity is driven by demand. That is, if you don't have a need to move that limb, the brain does not invest as much work in plasticity. ON the other hand, if you are highly motivated and work at recovering movement the way an athlete would train for a sporting event, the brain will see that the demand is persistent and will try to adapt and make those movements more efficient. It is important the as much function as possible is gained this way before considering restorative surgery.

By the end of the first year from the stroke or brain injury, from twelve months to sometimes 18 months, we typically hit a plateau. The patient eventually reaches a new level of function that is still not back to normal, but better than previous. At this point the patient has gained as much recovery of function as they're going to without help. Physical therapy, bracing and what we call conservative measures don't go on to gain much additional function, after that time.

3. Time To See A Paralysis Specialist

At this point, we recommend seeing a Paralysis Specialist who will examine you and determine treatment options that could offer you the best chance of achieving further gains in function.

Diagnosis & Treatment

A year of rehabilitation is usually the first course of treatment before surgery or other treatments are considered. Once a functional plateau is reached, further reconstructive interventions may be considered.

Treatment techniques our team uses to restore function include:

1. Botox injections
2. Partial cutting of an overactive nerve (selective peripheral neurotomy)
3. Transfer of nerves to exchange spastic function for good control in important muscle groups (nerve transfer)
4. Lengthening or cutting of tendons that are shortened and immobile
5. Rerouting of tendons to balance forces across a joint (tendon transfer)
6. Finally, spinal cord stimulation is finding its place as an emerging treatment to reduce spasticity and improve function in patients with UMN injuries

4. Treating Spasticity

Treating Spasticity With Botox

a. What Is Botulinum Toxin?

Botulinum toxin is a muscle-relaxing medication that can be used to decrease spasticity related to neurological conditions. Botulinum toxin is a medication derived from a neurotoxin produced by bacteria (*Clostridium Botulinum*) and is used in millions of procedures around the world in cosmetic medicine. In its natural form, this toxin causes botulism, a severe condition that can be fatal. The botulinum toxin medication is designed to be used safely without causing botulism. Three formulations of botulinum toxin A are currently approved by the FDA for the treatment of spasticity:

- Abobotulinum toxin A (Dysport®)
- Incobotulinum toxin A (Xeomin®)
- Onabotulinum toxin A (Botox®)

b. How Does Botulinum Toxin Work?

Normally, the brain sends messages to the muscles so they can contract and move. These messages are transmitted via the nerves to the muscles by a substance called acetylcholine. Botox blocks the release of acetylcholine from the nerve to the muscle, and the muscle relaxes. Typically, Botox injections last 6-12 weeks before the procedure needs to be repeated.

c. *Am I A Good Candidate For Botox To Treat My Spasticity?*

Using Botox to treat spasticity is usually considered when the spasticity is predominant in a few specific muscle groups. It should be used in combination with other treatments for spasticity, including bracing and therapy.

Botox is often the right treatment earlier, following an injury, when you are still making progress, before consideration of a permanent intervention. Once recovery plateaus and you are no longer making additional functional gains (usually 1-2 years from your injury), we use Botox to demonstrate the effect of a selective peripheral neurotomy to ensure that you will be happy with the results of the procedure.

Your Paralysis Specialist can only decide if Botox therapy is right for you after they have completed a full assessment of the location and cause of your spasticity. For more severe cases of spasticity, Botox therapy may not be a suitable treatment and your Paralysis Specialist will be able to offer better treatment alternatives to help you.

5. Reconstructive Neurosurgery Options

a. *Selective Peripheral Neurotomy (Precise nerve branch cutting)*

A selective peripheral neurotomy is a procedure used by our Paralysis Specialists to improve hand and arm movement and enhance walking ability. This procedure is typically performed on patients who have experienced brain or spinal cord injury due to stroke, tumor, or trauma, and suffer with spasticity as a result.

Performed under a microscope, a selective peripheral neurotomy is a procedure where nerves that contribute to spastic muscle groups are precisely "cut back" in such a way that reduces spasticity, but maintains control, allowing more normal functioning of that muscle.

Cutting a portion of the nerve reduces the "noise" being relayed back to the spinal cord, which contributes to the spasticity. However, during a selective peripheral neurotomy, enough remaining nerve is typically preserved in order to control the muscle and avoid completely paralyzing it. The muscle is preserved, and there is often no need to cut or lengthen the tendon.

There are different goals depending on the level of function of the patient. If a patient has no active function whatsoever in the limb, our goal may simply be to relax the arm and hand to reduce pain and assist hygiene. We can relax the limb so it's much easier to put clothes on. This can also reduce pain because a tightly spastic arm can be very uncomfortable. Sometimes even these basic goals are significant quality of life enhancements.

But if we do find that a patient has some hidden function within the limb, our goal is to try to achieve active use of that limb - to get the hand to grasp and release, to get the arm to reach to be able to bring food to the mouth, and accomplish some basic tasks of daily living. This is often achievable through the use of selective peripheral neurotomy. In other cases a neurotomy may

be one part of a strategy that also employs tendon transfer to balance the forces around a particular joint or even nerve transfers to restore active movement.

Is a Peripheral Neurotomy Right for You?

A selective peripheral neurotomy may be appropriate for you if you have spasticity resulting from a brain or spinal cord injury as a result of stroke, tumor, or trauma. People with cerebral palsy or multiple sclerosis may also benefit from this procedure. If you have spasticity and are no longer making progress with therapy, this can be a very impactful procedure.

More Effective Than Botox

A selective peripheral neurotomy is a more precise, more effective, and a longer lasting alternative to Botox injections. Anyone who receives some benefit from Botox treatments can get more effective and longer lasting relief from spasticity with a selective peripheral neurotomy.

Quick Recovery

Selective peripheral neurotomy is a relatively simple procedure. Typically the procedure takes less than an hour and no special post-operative care is required – that is, no braces or immobilization. Also the sutures are absorbable and with skin glue you can shower and won't need to apply any particular dressing. Rehabilitation can begin 72 hours after the procedure.

b. Tendon Transfer

The second modality (or intervention remedy) for a stroke is a tendon transfer. Tendon transfers are also commonly used to restore movement in limbs. This procedure takes a working muscle or muscle with good control and moves one end of it (the distal tendon) from its original attachment to a new attachment site to produce a more important movement.

To understand a tendon transfer, it's important to know a little about the relationship between muscles, tendons and nerves. Tendons attach our muscles to our bones. Every muscle has a starting point called the "origin". The muscle tapers down to a tendon, which attaches the muscle to a bone. Where the tendon attaches to the bone is called the "insertion". When the muscle receives a signal to move, it contracts and the muscle shortens, causing the joint to move.

Tendon transfer surgery involves taking a tendon from its original insertion and attaching it to another site. The starting point or origin of the muscle, the nerve supply and the blood supply are all left in place. Depending on the particular injury, the tendon may be attached to another bone or to another tendon to restore function to the injured area. Once this is completed, when this muscle contracts, it produces a new action depending on where the tendon is inserted.

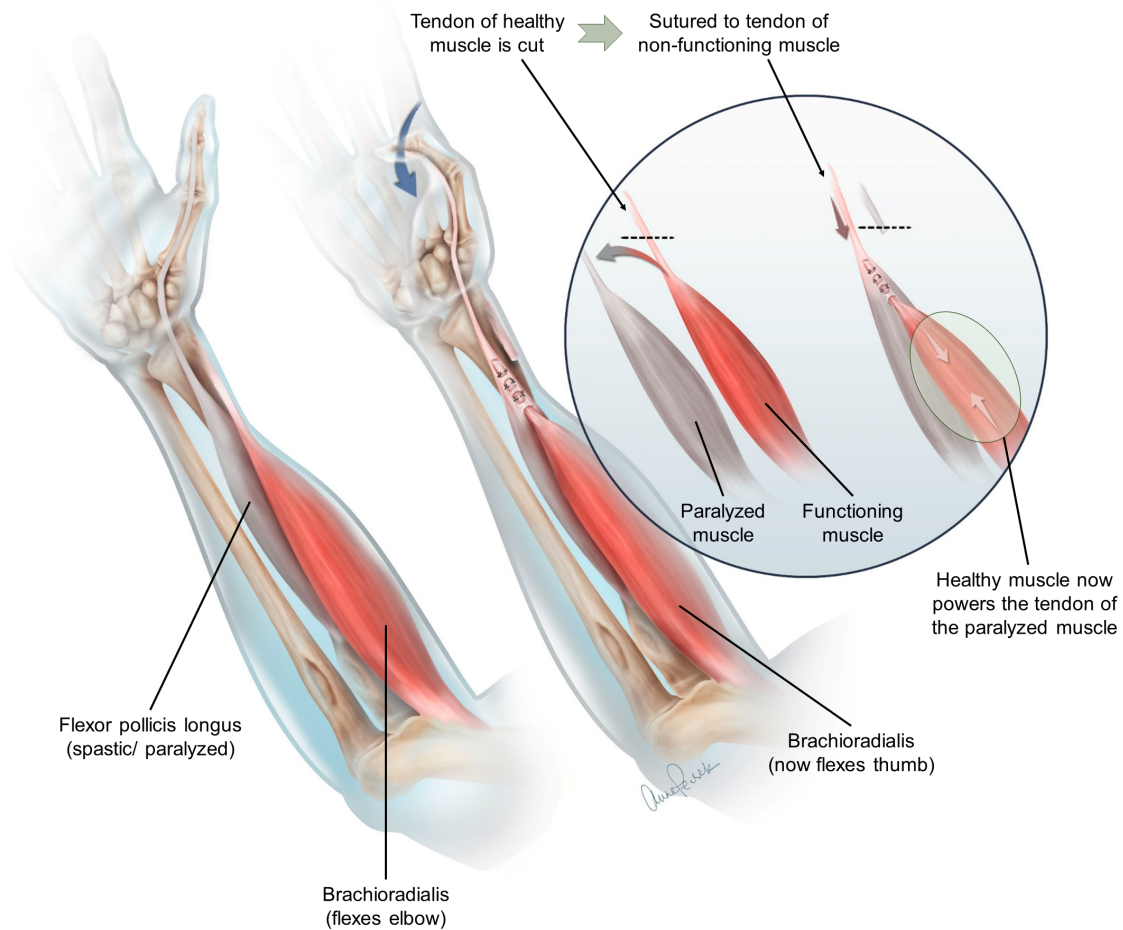


Figure 1. Tendon transfer: A muscle that is under good control is cut and sutured to the tendon of a non-functioning muscle. This allows the paralyzed movement to be restored by a new method.

After this procedure is performed there is typically a period of immobilization where the limb is placed in a splint to allow that tendon repair to heal and become more secure. The recovered movement is available almost immediately, but the limb must be treated with care for at least 6 weeks following the operation. Therapy is involved early to move the limb passively (without applying opposing force or resistance) and avoid scarring of the nerves. This procedure can be performed well after the nerve injury occurs as there is no prescribed procedure time limit.

c. Nerve Transfer

In a nerve transfer, a branch or fascicle (portion of a nerve trunk) of a functioning nerve is cut and sutured to a nerve that is not functioning well. Doing so allows the axons from the

functioning nerve to grow into the paralyzed nerve and restore movement to its associated muscle.

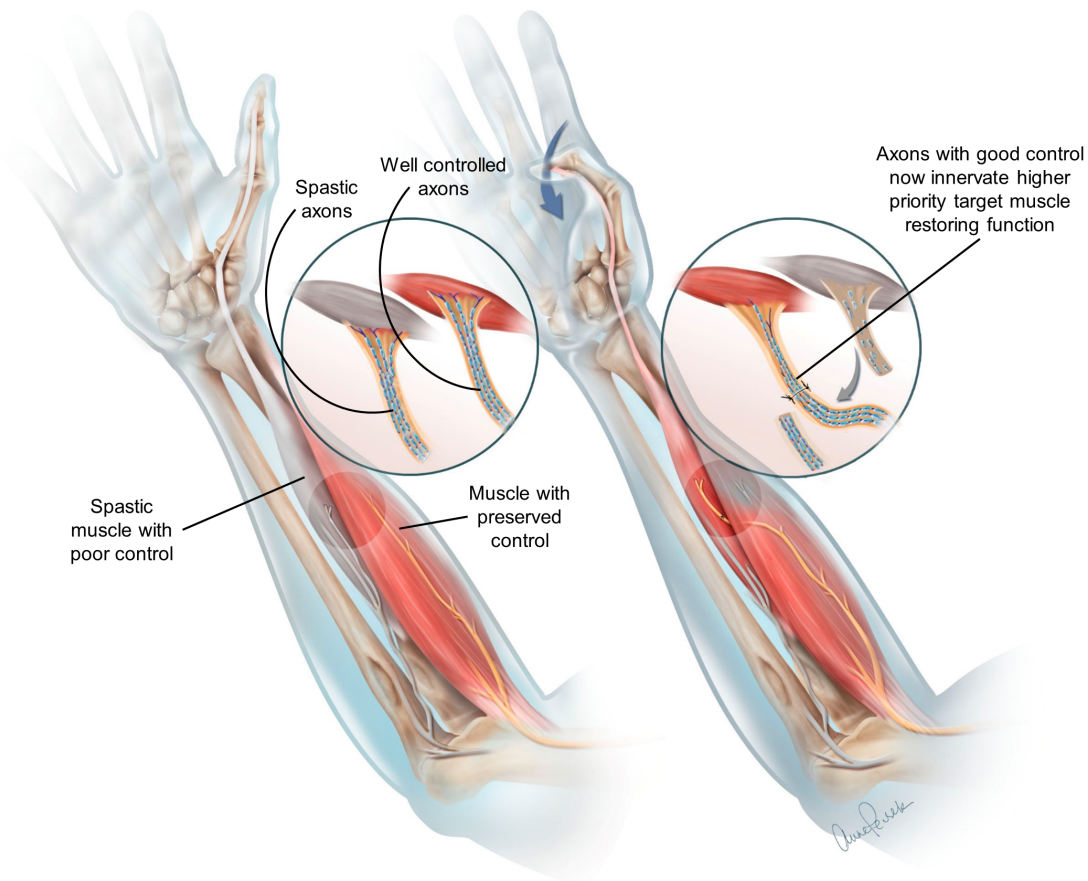


Figure 2. Nerve transfer: following a stroke, nerve transfers are an important surgical option. In this case we take nerves from muscles that have good control but are a lower priority function and transfer then to nerve that serve muscles with a much higher priority function. Restoration of an effective grasp and pinch is critical.

In patients with spasticity, there are occasionally nerves and muscles within the limb that have good preserved function. Unfortunately the retained function may be in muscle groups that are not as useful as another muscle group would be. For example, sometimes the ability to rotate the wrist up and down is retained but the fingers do not effectively open and close. In that case the nerves that are under control can be transferred to the nerves that control the finger opening and closing to restore that function.

Another nerve transfer that has found promise in hemiplegia is the contralateral C7 nerve transfer. This transfer is something we've used for a decade or so in a different type of injury, called Brachial Plexus injuries.

In this procedure a major nerve from the normal arm is transferred to the other side of the neck to connect to the nerve roots that control the weak and spastic arm. This C7 nerve root, while big and important, can be cut with minimal consequence if the rest of the nerves on the “good arm” are still working well. Sometimes there is a brief period of tingling in the fingers and mild weakness in the chest and arm that all usually resolves in a couple months. The trade off from this is a boost of function in the paralyzed limb, sending axons that the brain has good control of to “help out” the weak arm.

In this procedure, we can take a good, healthy nerve from the opposite side of the body with a C7 nerve root. We can transfer this across to the side that’s not working at all. For example, if the patient has complete loss of function in the left arm, we could take this nerve from the right arm and pass it to the opposite side of the neck and use these nerve fibers to run specific functions in the arm that has no function at all.

6. Are You a Candidate for Restorative Surgery?

Now that you've learned more about hemiplegia and spasticity and the various procedures that may be able to restore functionality, you may be wondering whether nerve reconstruction is right for you.

As a reconstructive neurosurgeon, I believe that anyone with a debilitating weakness and paralysis is a potential candidate for reconstructive procedures. BUT undergoing reconstructive surgery is not for everyone. It is important that anyone considering such surgery be prepared to work hard, participate in therapy, and fight to achieve as much as possible. Rehabilitation is hard work.

With the elderly, special consideration has to be given to their health status and the risk of undergoing surgery. Age doesn't disqualify someone from a reconstructive procedure but it does require special consideration and evaluation. When people learn that surgery can potentially reverse their paralysis and restore their functioning, they are usually enthusiastic about undergoing the procedure. However, what they're sometimes less willing to agree to is the long, hard road to recovery. Recovery means hours of physical therapy which is not always pleasant. Recovery requires home exercise. Recovery requires on-going follow up appointments for as long as three years, sometimes longer. Not surprisingly, people who cannot commit to the post-surgical requirements tend to have less than optimal outcomes. Compliance matters. Also, people who have ongoing, debilitating chronic pain may have difficulty with the post-operative rehabilitation program because of their pain levels.

None of these situations automatically exclude a patient from consideration for treatment. Each patient is evaluated independently and decisions are made based on their clinical presentation and the best treatment options for their injury.

7. *Creating Your Personal Treatment Plan*

Our Paralysis Specialists work with you to develop the most effective plan for reducing spasticity and restoring function.

In order to determine the best course of treatment for each individual case, we:

- Identify the activity present in each muscle. This involves a detailed examination, electrical testing (EMG) and sometimes video motion capture.
- This information will help guide us in devising the best reconstructive strategy for removing the impediments to well-controlled movement

What You Can Do To Help

Regularly stretching your tight muscles and exercising to develop better control of that limb can help avoid contractures, reduce spasticity and improve function. Physical therapy and scheduled home exercise routines can be very helpful with this, but they are not always easy to do.

8. Physical & Occupational Therapy and Taking Good Care of Yourself

Physical Therapy Immediately After Stroke Or Injury

As you will be aware, you need therapy with a detailed treatment plan and goals immediately following the stroke or injury. This will assist your recovery and keep your muscles and joints in the best possible shape. With time, if people aren't getting therapy and taking good care of themselves, the joints can lose function and develop other problems.

Post Operative Rehabilitation

Successful surgical reconstruction doesn't end with the surgery. Following surgery, it is imperative that a patient engage in an active therapy program. There is a lot of work involved in achieving new function, learning how to operate the new connections, and developing the skills to make the new limb operate in the most functional way possible. This is a big commitment and is similar to training for a sport. Exercises are multiple times daily and continued effort is required with good supervision from a trained therapist. Our team will also work with you, helping you identify new movements and tracking your progress. If we see that you are running into obstacles, we will help identify those and find a strategy to overcome it. We will do our best to take you from here to there, but please don't sign up for surgery unless you are in for the long run!

9. Timeline

“If you have done a good job keeping those limbs mobile for years, then there's no reason at 10 years you wouldn't have the same options that you would have had at two years. So you can undergo these restorative procedures anytime, but the qualifier is, you must have taken good care of yourself - keeping joints moving and limbs mobile to avoid these other problems.”

What I typically tell my patients is “Come see me after six months from the injury.” Now, while I probably won't operate until two years, most of the recovery has taken place by the sixth month – probably the 70% mark. Then I can direct them to the goal that they should be aiming for with their therapy. When I see them, I will probably schedule the next consult for six months after that and we can see how much progress they have made towards their goal, and whether they are continuing to make gains.

I will follow their progress for 18 months or even two years. When it's clear that they're no longer making the gains in spite of steady hard work, then we will typically intervene.

But it's important for a patient to have clear goals of what they are trying to accomplish in therapy – both for them and for the therapist. We want to make sure they are doing the things that are the most appropriate for them to achieve the functional goals that they want.

10. Patient Story

We've talked a lot about stroke and brain injuries and some of the ways that we can restore functionality to damaged nerves.

And, we've talked about the reasons why being seen by a Paralysis Specialist will give you the very best treatment plan and chance for success after the injury and post-operatively. Now it's time to meet a patient and hear about his journey in his own words.

Shaun's Story

"I have always been a very active man. I played a lot of softball all year round. I also played ice hockey and a little street hockey too. And of course, in the winter time here on the East Coast, we play indoors. I went to Baltimore in March of 2017. It was a Friday. We had games on Saturday, March 4.

I was on the field playing during my third game for the day. It was a little bit after noontime. I didn't feel right. I went into the dugout. I had hypertension and I was on medication but I did not take it as I was supposed to, during the day. I had my medication with me. I knew something was wrong. I felt as if I was talking out of the side of my mouth.

I grabbed my blood pressure medicine. I took the medicine and went outside of the dugout to get up to bat. As I stepped out onto the on-deck circle, the bat fell out of my left hand.

I bent down to pick it up and it fell out again. Luckily enough, I had a police officer on my team. I called him over and he looked at me. He sat me down. He knew the signs. He said I was having a stroke. I needed to relax and he got on the phone and got 911. Seven minutes later, I was loaded into an ambulance with a blood pressure of 250/175. Being in Baltimore, they took me to a hospital nearby, which was Baltimore MedStar Medical Center where I was diagnosed with having a stroke with a little brain bleed. So the reversal drug was going to be of no use to me. I spent four days there. I was then admitted into Massachusetts General Hospital. On March 27, while I was still being treated, I had a second stroke. The second stroke basically landed me in the ICU where I had to be resuscitated.

I couldn't work. I was paralyzed on the left side of my body.

My arm was stuck to my chest and my left leg just didn't work. I developed some blood clots in my left leg because I wasn't able to get it moving. I went in and they cleaned out the DVTs and ended up back in rehab again. And that rehab was Spaulding Rehabilitation Center in Boston, MA.

So while there, I entered PT, OT, and speech therapy. My speech didn't really get affected too much, but being paralyzed on the left side was really hard for me to adjust to. I was able to drop the speech therapy to add more time for OT and PT, where they were able to get me to at least get weight on my leg and walk with a quad cane.

I needed assistance. So I had to have two therapists with me at all times if I tried to get up. Well, during that, I started to receive Botox injections in my arm to try and get my left arm working.

And the doctor that did the injections referred me to Dr. Brown at Mass General. She told me all about him, and I made an appointment to see him. I was still in a wheelchair.

Upon meeting with Dr. Brown, he made some suggestions about 'getting my leg back' first. He did the surgery behind my knee which has allowed my foot to free up, and gave me more balance so that I could at least start walking on my own with a single cane.

In the meantime, I was fitted for a carbon fiber brace that went around my calf with a footplate on it which allowed me to walk even better. So from that point on, and with meeting Dr. Brown, for the next six to seven months, I did more physical therapy and occupational therapy. With these therapies and with the Botox injections, they were able to free up most of my arm so it wasn't stuck to my chest.

At my next visit with Dr. Brown, he discussed options and asked me which way I wanted to go. He makes you feel very comfortable when discussing things with you.

So he did surgery on the inside of my elbow, the inner part between the bicep and the forearm, where he was able to loosen up some of the tendons and everything that allowed me to lift my arm. I can get it up over my head. It also loosened up a lot of my fingers so that they weren't making a fist all the time. He was able to free up my shoulder too, which gave me a lot of shoulder movement.

Some time after that, I had a 3rd stroke and I woke up about five days later in the ICU and they had moved me into a regular room where I spent about three more days. So back to the rehab for one last time.

In May of this year, upon visiting with Dr. Brown, we decided we were going to go and try and get my toes from curling. So by now, I was walking with a walking stick, but every time I would stand up, my toes would try to grip the ground.

So we had a third surgery and he went into my ankle and did something with the toe extenders. Now my toes stay flat when I'm walking. So since then I will not use any cane, no walking stick. About three months ago, I stopped wearing the carbon fiber brace.

So I went from being told I would never walk again to, with the help of Dr. Brown, being able to walk again. I do make sure of my surroundings. So that's where I stand and I'm going to meet with Dr Brown again in December to discuss what else he can do for my hand.

Dr Brown's advice to me was all these surgeries wouldn't make me worse. It could either only stay the same or make it better. And after three surgeries, he has made me 100% better. I appreciate everything that he has done. I've set many goals and that's what you have to do when you've suffered the catastrophic injuries that I've had.

My advice to anyone looking for help is, "Don't give up. Speak to Dr. Brown even if it's just a consultation with him. Let him evaluate your individual case and go from there. Dr. Brown is an unbelievable doctor and I look forward to seeing him again in December."

Dr. Brown's Comments

Shaun is a fighter and that is often what it takes to make a great recovery after such an injury. While each of these procedures will immediately make a change for the better, not everyone goes on to be able to walk without a brace and cane. Surgery must be followed by hard work

and good rehabilitation. Shaun did all of these things and each time we meet he has met another milestone. Functional recovery is a team effort and patients cannot come expecting a magic pill, but a team strategy that outlines what we can provide and what he would have to invest to get the best outcomes. These surgeries should not be undertaken until someone is mentally ready for the challenge. Shaun was and he is a testimony to what team effort and hard work can achieve when coupled with the right procedures.

11. Tips To Help You Prepare For, And Get The Most Out Of Your Appointment

We know that seeing a new specialist can be stressful. We want you to be fully informed and be an active participant in your care. You will be sharing a lot of information at that first visit. You'll be asked a lot of questions. You may be sent for tests. It's a lot to take in.

Here are some tips we give to our new patients to help them prepare for that first appointment:

- Bring along a family member or friend. You'll be receiving a lot of information. It's hard to remember everything. Having someone along will help you remember information.
- Write down the details of your injury, or get someone else to do this for you. Knowing when it happened and the circumstances is important information for your doctor.
- If you have copies of pertinent records, bring them. If you don't, that's ok. We can request what is needed from past physicians.
- Please bring most recent imaging on a CD – MRI or CT scans are helpful to understand your injury.
- Make a list of your past treatment for your injury. Knowing what treatment has helped (or not) is important for your doctor to know.
- Bring a list of all medications you may be taking. Don't forget to include any supplements or over-the-counter meds you may take.
- Don't be afraid to ask questions. Make a list of questions that you have.
- At the visit, write down the surgical plan, treatments, or tests that have been recommended. Also write down any new instructions your specialist gives you.
- Ask if your condition can be treated in other ways.
- Know why a test or procedure is recommended and what the results could mean.
- If you have a follow-up appointment, write down the date, time, and purpose for that visit.
- Know how you can contact your Paralysis Specialist if you have questions.

Once your diagnostic evaluation and testing are complete, you and your specialist can discuss treatment options and recommendations that can give you the best chance of restoring function after your injury.

Coming for a consult or evaluation doesn't necessarily mean surgery is imminent. As healthcare providers, our role is to give you our best recommendations and provide you with the best care possible. Once your evaluation is complete, the steps you take next are up to you. We understand that you may not be ready for a surgery yet. It's ok if you need to take some time to think it through. It's a lot to take in and we want you to make the best decision for you. We are here when you are ready.

12. Conclusion

It is my hope that you've found this Guide informative and you now have a more thorough understanding of your injury and the best treatment options available.

*Science and technology have given us tools that were unavailable even just a few years ago. We now have a number of surgical procedures available to treat injuries once dismissed as untreatable. Whether it's peripheral neurotomy, nerve transfers, physical therapy or treating neurogenic pain, **there is always something we can do to help.***

I hope that you found our patient story inspiring. Shaun has shared his actual experiences with some of the very treatments you may be considering. It has been my privilege to treat him and I thank him for his honesty.

We have now reached the end of our journey together in this Guide, but I hope not forever.

If you have a specific question about something I didn't cover, then I welcome you to contact me via the contact form on our website www.ParalysisCenter.com

If there is one takeaway from this Guide it's that it's never too late to gain some improvement of function that could enhance your life.

If you would like to schedule an initial consult with me at the Paralysis Center in Boston, MA – we are accepting new patients. Mass General accepts just about all forms of medical insurance and also offers a financial assistance program. Additionally if you are an international or out-of-town patient, Mass General provides you with support to book your travel and accommodation. Please visit www.MassGeneral.org for more information.

I encourage you to never give up hope, to always ask the hard questions and see a paralysis specialist as soon as possible.

I wish you good health and good luck as you continue on your journey.

Justin M. Brown M.D.
Director & Founder,
The Paralysis Center

13. About Dr. Brown

Justin M. Brown, MD is a board-certified neurosurgeon and global pioneer in Reconstructive Neurosurgery – an emerging specialty focusing upon surgical interventions to reverse the effects of paralyzing conditions. Dr. Brown believes that patients suffering from conditions of paralysis have had limited access to the treatments that would improve their condition because most centers across the world focus on only a single type of paralyzing condition. Specialists in Brachial Plexus injury did not see patients with spinal cord injury. Specialists in spinal cord injury hand reanimation often did not have expertise in spasticity. Developing expertise across all of these disorders both provided benefit for each of these individual conditions, and opened up options for conditions not previously focused on in a surgical program. Bringing all of the treatments for each of these conditions together into a single center has now allowed for all comers to receive the best in paralysis reversal care without the obstacles that would otherwise limit care to those who do not fit the most commonly treated diagnoses. Dr. Brown has received widespread international recognition for this work. He is an avid educator and a regular featured speaker at medical symposiums around the world.

Dr. Brown's own training has been multidisciplinary in nature. He earned his medical degree from the Eastern Virginia Medical School in Norfolk, Virginia and completed an internship in General Surgery and residency in Neurosurgery at Baylor College of Medicine in Houston, Texas. Following, based on his desire to understand these problems from the perspective of another surgical specialty, Dr. Brown completed a peripheral nerve surgery fellowship in the Division of Plastic and Reconstructive Surgery at Washington University School of Medicine in St. Louis, Missouri. Then, in collaboration with a notable pioneer in Restorative Neurology, Milan R. Dimitrijevic, MD, PhD, he helped establish the International Society for Restorative Neurology. Dr. Brown is also a member of the American Society for Peripheral Nerve, The American Association for Hand Surgery, the AANS/CNS Section on Disorders of the Spine and Peripheral Nerve, the Congress of Neurological Surgeons, the American Association of Neurological Surgeons, and the Pan-African Association of Christian Surgeons.

Dr. Justin Brown currently serves as Director of Reconstructive Neurosurgery at Massachusetts General Hospital, is Associate Professor of Neurosurgery at Harvard Medical School, and is the Founder and Director of the Paralysis Center.

14. The Paralysis Center At Massachusetts General Hospital

Founded in 2017 in conjunction with Spaulding Rehabilitation Hospital, the Paralysis Center is a world-class patient treatment and medical research center for all conditions resulting in weakness and paralysis

Using a team approach, the Paralysis Center unites a multi-disciplinary team “under one roof” who are leaders in their respective fields: Neurosurgery, Neurology, Physical Medicine and Rehabilitation, Physical and Occupational Therapy, Orthopedics and Plastic Surgery. We employ the best imaging and neurophysiology techniques available to give us the best information to inform our treatment plan.

At the same time, our research endeavors to both augment our current practice, as we collect detailed diagnostic, intervention and outcomes data for each patient, and, pave the way for new interventions that we hope to implement in coming years, which will further enhance the lives of our patients. Basic science endeavors are exploring methods, such as stem cell treatments, that will enhance our ability to apply even more effective treatment strategies in the future.

Such comprehensive care gives patients access to the most cutting-edge technology and proven paralysis-reversal treatments — providing a best-in-class treatment facility for every aspect of patient recovery.

No matter what form of paralysis you or a loved-one suffers from, or what medical advice you may have received before – there is hope. We *can* help you get movement back.

Schedule a consult with Dr. Brown today to better understand your treatment options by calling (844) 930-1001.

For more information, please visit: paralysis.mgh.harvard.edu