7

Chapter Seven
RSD: Really Stupid Diagnosis

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temper changes …
the bravest soldier
becomes a coward…
in cases of burning pain …
the most terrible of
all tortures which a nerve
wound may inflict."

Really Stupid Diagnosis

"Perhaps few persons who are not physicians can realize the influence which long-continued and unendurable pain may have on both body and mind… Under such torments the temper changes, the most amiable grow irritable, the bravest soldier becomes a coward, and the strongest man is scarcely less nervous than the most hysterical girl. Nothing can better illustrate the extent to which these statements may be true than the cases of burning pain, or, as I prefer to term it, *Causalgia*, the most terrible of all tortures which a nerve wound may inflict."

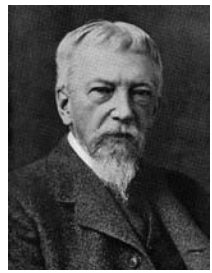

Figure 7-1. Silas Weir Mitchell, MD, Neurologist during the time of the American Civil War, wrote these quotes in his book, *Injuries of Nerves and their Consequence*, Philadelphia, 1872.

"Of the special cause which provokes it, we know nothing, except that it has sometimes followed the transfer of pathological changes from a wounded nerve to unwounded nerves, and has then been felt in their distribution, so that we do not need a direct wound to bring it about. The seat of the burning pain is very various; but it never attacks the trunk, rarely the arm or thigh, and not often the forearm or leg. Its favorite site is the foot or hand… Its intensity varies from the most trivial burning to a state of torture, which can hardly be credited, but reacts on the whole economy"

The pain that Mitchell wrote about came from injuries that were caused by musket and rifle and cannon balls. These were blunt, tearing, crushing injuries. Nerves often were not completely disrupted. There was much injury to the surrounding soft tissues. If a limb did not have to be amputated, and could be saved, the pain that resulted from these nerve injuries could be

severe, tormenting, burning pain, which was usually in the pattern of the nerve that was injured. This, by definition, came to be called CAUSALGIA.

Pain, just by itself, can cause responses in the area of the pain related to nerves to the blood vessels, sweat glands, and hair follicles. The phrase, "I was so scared, my hair stood on end," reflects the sympathetic nerves' innervation of a small muscle beneath the hair follicle. When scarred, the reflex response is to make the hair "stand up." When we are cold, the sympathetic nerves make the small muscle cells in the walls of the blood vessels constrict. This is a reflex response to cold stimulation. The hand then gets cool as blood as kept within the body to maintain core temperature. The hand may turn whitish or purple, as blood flow patterns change. When we get "nervous" we sweat, reflecting the innervation of the sweat glands by the sympathetic nerves. *So when pain affects a wider area than that related to a single nerve, this area can have temperature change, color change, and sweating. This seems like a reflex response of the sympathetic nervous system to the injury.* For these reasons, pain outside the distribution of a single nerve, associated with these types of sympathetic responses was given then name REFLEX SYMPATHETIC DYSTROPHY (RSD).

The whole name thing for pain became increasingly confusing after that. Some patients did not get better when the sympathetic nerves were blocked with a local anesthetic. So around 1986, some new names arose; sympathetic-maintained and sympathetic-independent pain (SMP and SIP). Well to most patients who remained in chronic pain, SMP just meant "some more pain." And then the International Association for the Study of Pain (IASP) around 1994 decided to change the name again: Chronic Regional Pain Syndrome I or II (CRPS I or II). You should know that CRPS I = RSD and CRPS II = Causalgia. To get it straight some people now remember this by saying they have CRPS/RSD. History repeats itself? To most people who remain in chronic pain, CRPS is like "craps," you gamble on a treatment to see if it will help you or not (see http://www.IASP-Pain.org/terms-p.html).

I still like the concept of a reflex response to an injury. At some level, the injury involves a nerve. If I can figure out which nerve or nerves is sending the pain signal, then I CAN HELP RELIEVE THE PAIN BY STOPPING THE PAIN SIGNAL FROM THAT NERVE.

"RSD" means " really stupid diagnosis" because most of the time it is possible to identify the source of pain, focus on eliminating that nerve(s)'s pain signal(s), and stop the pain. Here are two examples:

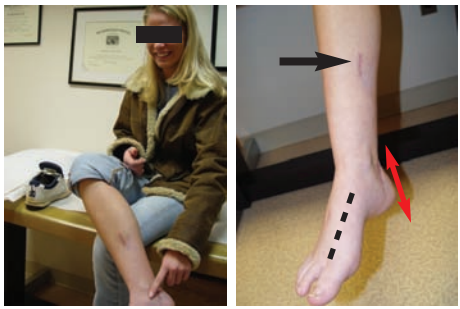

Figure 7-2. After a fall with an ankle sprain and knee dislocation when she was 15 years old, this 19 year old young woman had progressive, irreversible pain, "RSD." She received temporary help from sympathetic nerve blocks in her back. She remained on home schooling throughout high school, unable to walk very far without her pain returning and her foot swelling. Left: Smiling, one year after surgery. Right: Surgery included removal of the saphenous nerve (black arrow), neurolysis of the deep peroneal nerve (dashed line) and release of the tibial nerve and its branches (red arrow, tarsal tunnels syndrome).

Figure 7-3. Left: After having a "Morton's Neuroma" (see chapter 6) removed, this woman developed RSD and would not allow her foot to be touched, nor could she walk. She suffered with this for three years. The incision on the bottom of her foot is where the painful neuroma was removed and the nerve implanted into the arch of her foot, while the incision near the ankle was to correct her tarsal tunnels syndrome. Right: One year after the surgery described, she is back at work, off all drugs, and walking without pain.

Definitions of Chornic Pain

It is useful to have the Reflex Sympathetic Dystrophy Syndrome Association definitions available (RSDS.org).

Complex Regional Pain Syndrome Type I (RSD)

1. The presence of an initiating noxious event, or a cause of immobilization

2. Continuing pain, allodynia, or hyperalgesia with which the pain is disproportionate to any inciting event

3. Evidence at some time of edema, changes in skin blood flow (skin color changes, skin temperature changes more than 1.1°C difference from the homologous body part), or abnormal sudomotor activity in the region of the pain

4. This diagnosis is excluded by the existence of conditions that would otherwise account for the degree of pain and dysfunction

Complex Regional Pain Syndrome Type II (Causalgia)

1. The presence of continuing pain, allodynia, or hyperalgesia after a nerve injury, not necessarily limited to the distribution of the injured nerve

2. Evidence at some time of edema, changes in skin blood flow (skin color changes, skin temperature changes more than 1.1°C difference from the homologous body part), or abnormal sudomotor activity in the region of pain

3. This diagnosis is excluded by the existence of conditions that would otherwise account for the degree of pain and dysfunction

There is no single laboratory test to diagnose RSD/CRPS. Therefore, the physician must assess and document both subjective complaints (medical history) and, if present, objective findings (physical examination), in order to support the diagnosis. There is a natural tendency to rush to the diagnosis of RSD/CRPS with minimal objective findings because early diagnosis is critical. If diagnosed early, physicians can use mobilization of the affected extremity (physical therapy) and sympathetic nerve blocks to cure or mitigate the disease. If untreated, RSD/CRPS can become extremely expensive due to permanent deformities and chronic pain. At an advanced state of the illness, patients may have significant psychosocial and psychiatric problems, they may have dependency on narcotics and may be completely incapacitated by the disease. The treatment of patients with advanced RSD is a challenging and time-consuming task.

How Common is RSD?

The Reflex Sympathetic Dystrophy Syndrome Association, on its website (RSDS.org) has these estimates of how many people have RSD:

"RSD may affect millions of people in this country. This syndrome occurs after 1 to 2% of various fractures, after 2 to 5% of peripheral nerve injuries, and 7 to 35% of prospective studies of Colles (wrist) fracture. The diagnosis is often not made early and some of the very mild cases may resolve with no treatment and others may progress through the stages and become chronic, and often debilitating."

What are the Traditional Treatments?

After your doctor recognizes that you have pain out of proportion to your injury, or are taking a different healing course after surgery, you most likely will be sent to an Anesthesia Pain Management group to receive sympathetic nerve blocks in your neck (stellate ganglion block) if the pain is in your hand, or lumbar sympathetic nerve blocks (low back) if the pain is in your foot or leg. You most likely will be given oral medication to decrease sympathetic nervous system activity. You most likely will be given non-narcotic neuropathic pain medication (which are forms of anti-seizure or anti-depressant drugs). You will be given anti-inflammatory drugs. And if the pain is still severe, you will be started on long-acting narcotics, with some narcotic given for breakthrough pain. You may require a sleeping medication. You may require narcotic patches, where the drug is absorbed through your skin. You may be moved up to narcotic lollipops (Actiq™). And then a spinal cord stimulator as in Figure 7-4 (see Chapter 10, Stimulators). For some patients an intrathecal morphine pump may be suggested to pump morphine directly into your spinal cord.

Unfortunately, more often then not, this approach creates people so drugged they cannot function. They are the walking dead. The come into my office like a zombies, carrying their x-rays, and their plastic bag of drugs. Electrical devices strapped to their belt or implanted into their body.

I believe the Dellon Institutes for Peripheral Nerve Surgery® have a better approach.

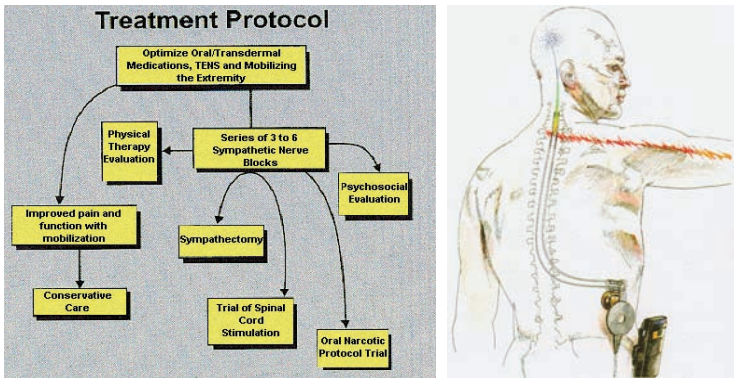

Figure 7-4. Left: Traditional Treatment Options (RSDS.org). Note that there is no option for peripheral nerve surgery. By the time patients reach me, they have been through this. Right: Representation of a spinal cord stimulator used to treat R.S.D. See Chapter 10 in PAIN Soluitons for a discussion of this pain treatment modality, and its complications. Just say "No" to this approach. The best hope for you is to find the source of the pain.

Where does the Pain Signal Start?

For your brain to perceive pain, a signal must come from somewhere. This signal enters your spinal cord relay system from a site that is where either your hand or your foot became injured. On the way to sending the pain message to your brain, an automatic response to the pain arriving at the spinal cord is a message sent to they sympathetic nervous system. This message system must go back to our origin from animals or creation from the cosmos. If an organism is going to be threatened by something that is causing pain, then the organism must prepare to defend itself (fight) or run away (flight). So a message goes out to the hands and feet to prepare them to do one or the other. Each of you has felt the "adrenalin rush" as you almost get into an accident, and your body prepares for the worst. Here is the

mystery, this "fight or flight" response, in "RSD" continues to occur even after the initial threat is gone.

How about if instead of concentrating on why the usually non-painful sympathetic response now hurts, or instead of trying to stop the sympathetic response, we focus instead on stopping the pain signal itself from coming into the spinal cord. The following cartoons illustrates this:

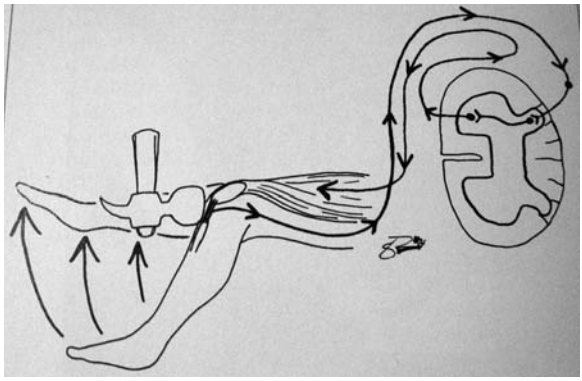

Figure 7-5. Typical reflex. Hammer strikes knee. Sensory input goes to spinal cord. Relay in spinal cord to motor neuron. Motor (muscle) response is extend the knee.

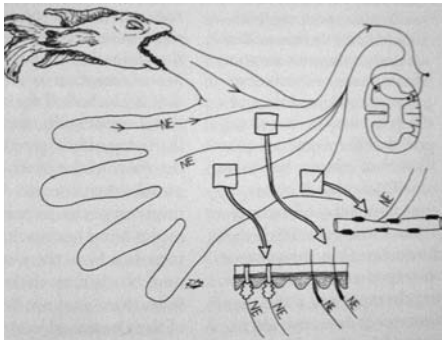

Figure 7-6. RSD pain model. A painful sensory stimulus (fish bite to thumb) sends pain message so spinal cord. Relay in spinal cord to sympathetic motor neuron. Motor output is usually non-painful to blood vessels, hair follicles, and sweat glands, where the chemical messenger norepinephrine (NE) causes the muscle to constrict blood vessel, erect hair follicles, and sebaceous glands to sweat. We might suppose that in patients with RSD this NE messenger also reaches the pain fibers and continues to send pain messages. Dellon Institutes approach is to block the pain message by removing the fish, instead of removing the sympathetic messages. Fish represents the injured nerve.

Floss and Finger RSD

Most of us do it every day. We usually use our index fingers. Floss our teeth! How could something recommended by every dentist in the world cause RSD?

Hans came to see me from Germany (not his real name or real country, but he was from Europe). Two years previously he had diligently wrapped his dental floss about his right index finger, and vigorously flossed. His gums were emaculate. *But he could not get the dental floss off his finger.* The dental floss cut into his finger. His finger turned white. Finally, after an interminable three minutes, he removed the noose from his strangulating finger. It turned pink again. But the pain never went away. His index finger shriveled at the tip, and was always cold. His skin became shiny. He had to take medication. His finger was swollen and his joint became stiff. He could not bend his finger. He began to use his middle finger instead of his index finger. His evaluation by a top Hand Surgeon confirmed he had injured his blood vessel to one side of the finger. He had arthritis. What could he do?

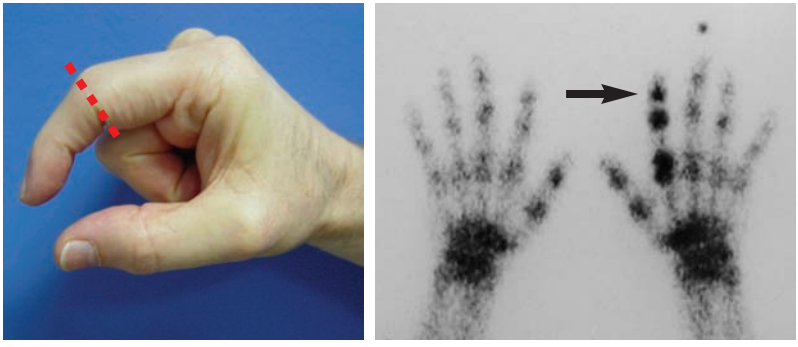

Figure 7-7. Left: Red dashed line is site at which dental floss injury occurred to the right index finger three years ago. The index finger cannot bend any more than is shown. Right: Bone scan demonstrating increased (darker black) uptake of radioactive dye indicating the increase blood flow (arrow) by which the body is responding to continuing pain message from this finger. Arteriogram demonstrated a partially closed digital artery on one side of the index finger. Increased uptake in the thumb, middle finger and wrist is suggested. This is consistent with RSD, rather than a single joint arthritis.

"Doctor Dellon, can you help me?" Hans asked.

"Yes Hans, I can help you," I replied.

"What can you do? I cannot keep taking these drugs. I cannot think straight any more. I cannot do my work!"

"Hans, there is no standard operation to do for a person with your problem. What I would suggest is that I remove the scar tissue from the nerves in your finger, and free the blood vessel from scar."

"Will my finger ever bend the same as normal again, Doctor?"

"Hans, I think I can help the pain and help the coldness in your finger by doing the neurolysis. I can help the nerve and the artery. I probably cannot reverse the arthritis and stiffness in the joint," I replied honestly.

RSD of the Hand

Beverly was 31, and came to see me with her grandmother. Beverly was not married. She worked with handicapped children. One of them closed the classroom door on her left elbow, forearm and wrist. That was four years ago. Beverly developed RSD. She had so much pain whenever she moved her wrist that they put her into a splint and told her to never bend her wrist again. That was four years ago.

Figure 7-8. Beverly had her left wrist, forearm and elbow crushed in a door four years ago. She has been wearing a splint ever since. She does not like any part of her hand to be touched. She has horrible pain in her wrist and in her elbow. All her fingers are numb. She has RSD. She has had stellate ganglion blocks. She now has a frozen shoulder.

"Doctor Dellon," Beverly said, "Can you help me?"

"What bothers you the most Beverly? What would you like to do with that hand again?" I asked her.

"Doctor Dellon, I want to move my shoulder again so I can put my hand and arm in different positions. And I want my fingers to stop tingling. I do not care if I can't bend my wrist again. I am still teaching at the school for the handicapped. They need me. I can do that without bending my wrist, if it would just stop hurting. I cannot take all the drugs they want me to take and still teach. I love to teach, Doctor Dellon. Oh, and the scar where they did my carpal tunnel surgery hurts if it is touched. Can you help me?"

"Yes Beverly. I can help you a lot. We are going to do a test with a computer on your fingertips. It will not hurt them. It has no electric shocks. Then, I will examine your hand. After that I will know which nerves need the most help," I said.

The neurosensory testing with the Pressure-Specified Sensory Device™ demonstrated (see Figure 7-10) severe loss of function of the ulnar nerve at the elbow (cubital tunnel syndrome), the median nerve at the wrist (carpal tunnel syndrome), and the radial nerve in the forearm (radial sensory nerve entrapment). The scar where she had the previous carpal tunnel surgery was too painful to touch (see Figure 7-9). She would tolerate no movement of

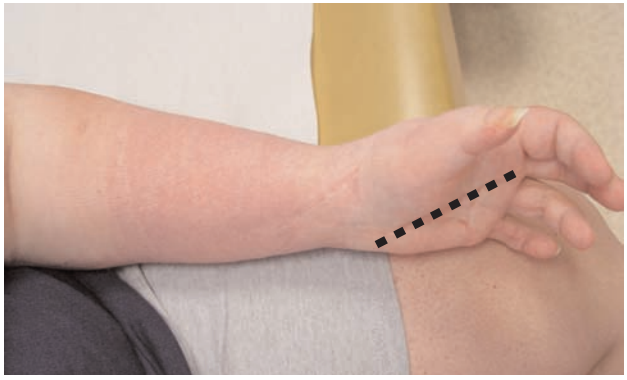

Figure 7-9. Left. The palm side of Beverly's left hand. Dashed line is the painful carpal tunnel surgery scar. Note the increased redness and swelling in her hand.

the wrist without severe pain. Her hand was clearly swollen and the fingers stiff. She was tender over the ulnar nerve at the elbow, and the radial sensory nerve in the forearm. I could actually move her shoulder, but she was extremely tender over a small bone (the coracoid) near the front of her shoulder. I knew that I could help her. It would require 3 surgeries.

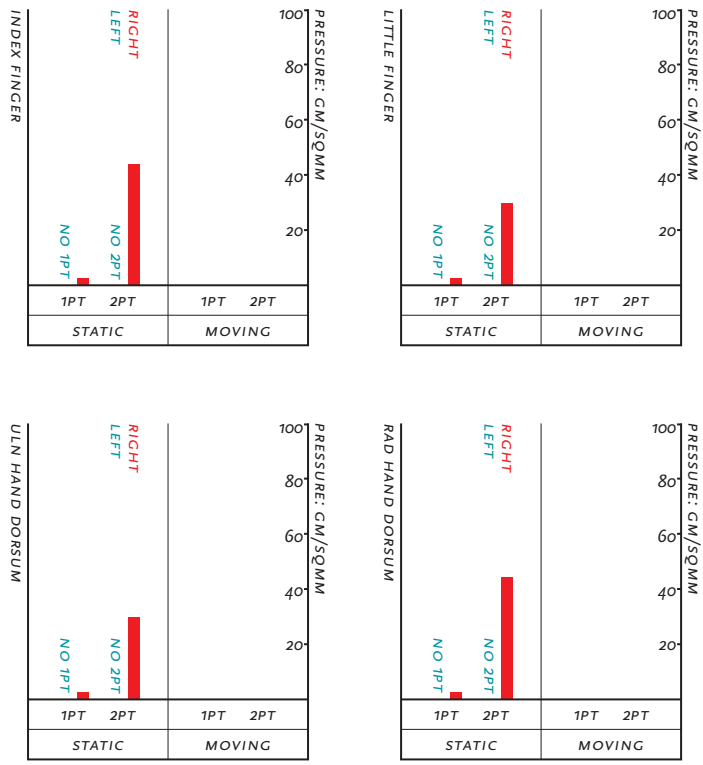

Figure 7-10. The results of her painless neurosensory testing with the Pressure-Specified Sensory Device™. The red bars represent the right hand measurements, her non-injured hand. These are slightly elevated, due to her overusing her right hand for the past four years. The blues bars represent the left , injured hand measurements. Note there are no blue bars. This means that she could not feel either one or two points touching her fingertips or the back of her hand, no matter how hard they were pressed on the left hand. This is consistent with three different compressed nerves in her arm from the crush injury. It also means pressure on all nerves as they go from the neck, beneath the collar bone, to enter the arm (see Chapter 5, Thoracic Outlet Syndrome).

"Beverly. Your shoulder had lots of x-rays, and nothing was broken or torn. But your shoulder pain is where a small nerve enters the front of the shoulder joint. I can remove that nerve and you will be able to start therapy to move your shoulder again (See chapter 3). It got stiff because you wore your sling for so long. This used to be called *Shoulder-Hand Syndrome*."

"Beverly, the reason that the scar on your palm hurts is because a small nerve to the palmar skin is stuck in that scar. You have a neuroma of the palmar cutaneous branch of the median nerve. I can remove this at the same time as we remove the scar tissue from that median nerve again. That would be the first operation (See chapter 1)."

"Beverly, 6 weeks later, I can fuse your wrist so you do not have to wear the splint anymore, and at the same time remove the two nerves that send the wrist joint pain message to your brain (See chapter 3 again)."

"Finally, Beverly, 8 weeks later, when the bone has healed in your wrist, I will move the nerve from behind your elbow to the front of your elbow, and release the radial nerve in your forearm. The rest of your fingers will wake back up, and you will recover your strength."

"Doctor Dellon," Beverly replied, "When can we begin."

Her grandmother smiled, and cried. Beverly gave me a hug. (Beverly's smiling face and happy result can be seen in Figure 11-19.)

"Don't Amputate My Leg!"

Nurse Johnson, the Case Management person accompanying Mr. Ed to see me, was concerned. "Doctor Dellon," she explained, " I am going to speak for Mr. Ed (not his real name) as he is on so much medication it is hard for him to express himself. Mr. Ed just wants to get rid of his pain. He fell 6 years ago at work, and tore his Achilles tendon, behind his heel. He had surgery to reconstruct the torn tendon. He developed a severe pain problem. He has had 16 operations, has had two peripheral nerve stimulators. His Pain Management doctor and his Orthopedic Surgeon have recommended that he have his leg amputated. Can you help him?"

"Yes, I can help him, and save his leg too," I said.

[redacted] **Synopsis of Medical History**

Background: Mr. [redacted] was injured on October 10, 1996, when after a surgical procedure his crutch became stuck in a lift plate, causing him to fall. He was diagnosed with an Incomplete Achilles Tear of the Right Posterior Calcaneous. He subsequently underwent multiple orthopedic and nerve surgeries, under the direction of Dr. [redacted] Orthopedic Foot/Ankle Specialist. He also remained under the care of Dr. [redacted] Physiatrist, for treatment of: Intractable Neuralgia and Reflex Sympathetic Dystrophy of the right foot, involving: severe neuropathic pain and intractable neuralgia of the right distal Tibial and Sural nerves, S.P. Achilles tendon rupture and failed peripheral nerve stimulator.

undergoing additional surgery to repair the device. Drs. [redacted] concurred that Mr. [redacted] would be a good candidate for a below the knee amputation; however, he declined to consider this option.

Figure 7-11. Referral note from Worker's Compensation Case Management to the Dellon Institute for my evaluation. Note recommendation by previous doctors for amputation.

Figure 7-12. Blue lines on legs are scars from Mr. Ed's previous surgeries.

"He should not have an amputation," I said. "He has individual nerves that have been stuck in these scars causing painful neuromas. I like to begin by doing an operation that he will see immediately has helped him. The most predictable approach is to remove the damaged nerves to the outside and top of his foot and leg. Based on my examination today, the three nerves that are the source of his pain in these areas are, the sural nerve, the deep and superficial peroneal nerves. I can use two of his existing incisions to remove these three sensory nerves that are sending the pain signal. The surgery will take two hours, and he will know immediately that this pain is

gone. Then, four weeks later, I can operate on the inside of his ankle to restore sensation to the bottom of his foot, and remove the nerve that is giving him heel pain. He will then need to go to detox, and to rehab. But he does not need an amputation. There is hope for him," I said.

And that is just what happened. (See Figure 11-7 to see Mr Ed's smiling face and his leg.)

Crossing Home Plate Again

Tammy liked home plate. Tammy was catcher on the state championship soft ball team. And she could hit. She could throw a runner out at second from home. She was a great base runner too.

She was just a sophomore in high school.

Being a catcher is a tough job. She had been spiked to her left foot more than once. Her legs used to go numb from squatting. Her hands had taken a pounding from the fast balls. She had sprained both ankles. Then there was the day, when she slid, trying to steal second base. Sharp shooting pain went from her ankle up her leg. She knew she had broken her ankle.

Figure 7-13. Tammy's left ankle was fractured. Note the scar used by the Orthopedic Surgeon to fix the fracture. Note the blue mark at the site of her worst pain when her foot is touched. She also has pain in her ankle when she walks. She uses a cane now or crutches. It is four years since she her injury. She is 19 years old. There is still hope for Tammy, by denervating her ankle joint and removing the painful scar neuroma.

"Doctor Dellon, I hope you can help my daughter," said Tammy's father. He had traveled from New York with his daughter to see me. "She is only 19. Here is the bag of medicines she is taking."

The bag contained the following prescriptions:

Oxycontin, 240 milligrams, three times a day

Roxycodone, 30 milligrams, eight times a day

Neurotonitn, 600 milligrams, four times a day

Topramax, 15 milligrams, once a day

Senna Max twice a day (constipation from the narcotics)

"Who referred you to see me?" I asked.

Tammy answered this time; "Doctor White in Philadelphia. (not his real name or city) He is famous for treating RSD. He has given me so many shots, and blocks in my back. I can hardly think straight from these drugs. I have typed a five page history for you because I have trouble remembering. Can you help me?" the former softball star catcher asked?

Figure 7-14. Tammy's left foot is noticeably swollen, and a slightly different color than the right foot. She has been told she has RSD. It is four years since her injury. She is addicted to drugs, and has dropped out of high school. Where is home plate?

"Yes Tammy, I can help you," I said. "What would you like to do if the pain in your left ankle were gone?"

"I would like to play catch with my father again. I would like to cross home plate again," she said, as a tear crossed her eye. Clearly depressed. "I would like my brain to work again. I want to finish high school. I want a life that is not seeing doctors and taking drugs all the time."

"Tammy, tell me where your pain is and what makes it worse?"

"Doctor Dellon, see this scar (see Figure 7-13)? Don't touch it! It is where they put in the metal screws to fix the fracture. They have even gone back and taken out the screws and it still kills me when it is touched."

"Tammy, and does it hurt when you walk? I see your still use crutches?"

"Yes, Doctor Dellon, the outside of my ankle, deep in the bones hurts every time I take a step."

"Doctor Dellon" her father, a Harvard-trained lawyer, commented, "She has three-dimensional CAT scan reconstruction of her ankle, and there are no bone chips there. She has had her ankle scoped and it still hurts. The Orthopedic Surgeon wants to fuse her ankle. She is only 19, it is too soon to decide that she will never flex her ankle again. And they cannot even assure us this will stop her pain!"

"I hear and understand the frustration you both share. Here is what we can do today to figure this out," I said.

For many years I had been working on the concept that joint pain came from the nerves to that joint. The same injury that tears the ligament from the bone also tears the small nerves. Then, even after the fracture or sprain has healed, the torn nerve, which has now healed into the scar, sends pain messages whenever that joint is moved. The difficult part of this concept is that traditional medical teaching and anatomy books do not show any nerves to joints. (See Chapter 3 for more discussion about particular joints.)

In the year 2001,* I published the first description of the nerves to the joint that was hurting Tammy, the sinus tarsi, the lateral ankle joint. In 2002,** I published the first reported patient who was relieved of this pain by removing that hurt nerve.

"Tammy, I am going to put a local anesthetic into your leg in two places. One will put the nerve to that painful ankle joint to sleep, and the other will put the nerve that is stuck in your scar to sleep. I do not have to inject the painful place itself, but up higher on your leg. If I have the correct nerves put to sleep, you will be able to stand up and walk without your crutches, right away, today. This is not a treatment. It is the way to make the correct diagnosis of which nerves are hurt. Then at surgery we remove those nerves. Do I have your permission to do the two nerve blocks?"

"Sure, go ahead," Tammy said. "Doctor White in Philadelphia has done so many blocks in my back, that I am immune to them."

I did the two blocks. Tammy got up and walked without her crutches. She walked without pain for the first time in four years!

"Doctor Dellon," Tammy said, "Can you do the surgery today?"

"Tammy, the top of your foot is now numb. It will always be numb if I take out those nerves."

"Doctor Dellon, in professional baseball, the teams are always trading players. I will trade numbness for pain any day! Let's go!"

Now it was the lawyer's turn. Cross examination began: "Doctor Dellon, we have been told that people with RSD should not have surgery. That surgery does not work. And that you should not cut a nerve. The pain will only get worse."

"Tammy, could you be in any worse pain?" I asked.

"No she replied. I am totally drugged. I don't go out . I use crutches. I have no life … I guess I could be worse if I were paralyzed. Is there a chance your surgery will make me paralyzed?"

*Rab M, Ebmer J, Dellon AL: Innervation of the Sinus Tarsi: Implications for treating anterolateral ankle pain. Annals Plastic Surg, 47: 500-504, 2001.

**Dellon AL: Denervation of the sinus tarsi for chronic post-traumatic lateral ankle pain. Orthopedics, 25: 849-851, 2002.

"No Tammy, I am only cutting two sensory nerves. So there is no risk of motor paralysis. Let me answer the couple of questions your dad asked, and tell you a special technique we use when we operate on someone with RSD."

"In the past," I continued, "surgeons who operated on patients with RSD did not have the understanding of nerves that we have now. The surgery that was done in the 1970's for patients with RSD did not help. The approach that I have developed, identifying the source of the pain with nerve blocks, identifying the nerves that innervate the joints, identifying where nerves can become entrapped, developing operations to denervate joints and decompress nerves have proven effective in stopping the pain input to the spinal cord in patients with RSD."

"Tammy, an approach developed for operating on the arm in patients with RSD can be applied to the surgery for the leg. You will come into the hospital the day before your surgery, and the Anesthesiologist will put a tiny catheter into your back, called an epidural, just like they do for women having a baby. This little catheter will stay in place the night before surgery, and put your sympathetic nerves and sensory nerves to sleep. You can still move your legs. The catheter will stay in the day of surgery and the day after surgery, protecting your spinal cord from feeling pain. It is removed the day after surgery, you will be able to touch your ankle without it hurting, and you will be able to walk without pain just like today."

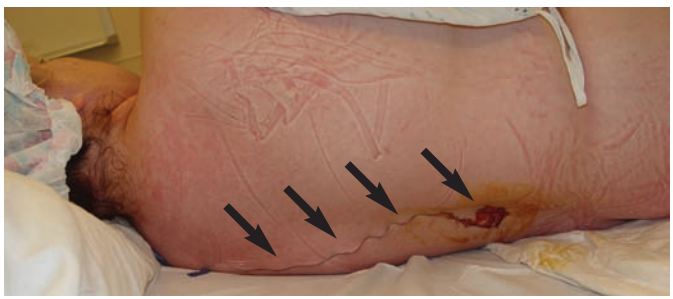

Figure 7-15. Tammy in the hospital the day before surgery. Note the epidural catheter (arrows) in place prior to surgery. The brown stain is from the iodine solution to sterilize the skin. The local anesthetic given through this catheter puts the sympathetic nerves to sleep, shielding the spine from pain messages that occur during surgery. It is a technique used when operating on someone with RSD in the legs. A catheter can be put in the armpit to do similar surgery on the hand for someone with RSD in the upper extremity.

Tammy agreed to have surgery. She came into the hospital the day before her surgery. The Anesthesiologist put in the epidural catheter. The local anesthetic, marcaine, began to put the thin sympathetic and pain nerve fibers to sleep. Her foot and leg pain went away. The swelling came out of her foot. The next morning, Tammy came to the operating room, was placed under general anesthesia, with the epidural still in place. Then I began to operate.

At surgery, just one new incision was necessary (see Figure 7-16). First the superficial peroneal nerve was found (see Figure 7-17).

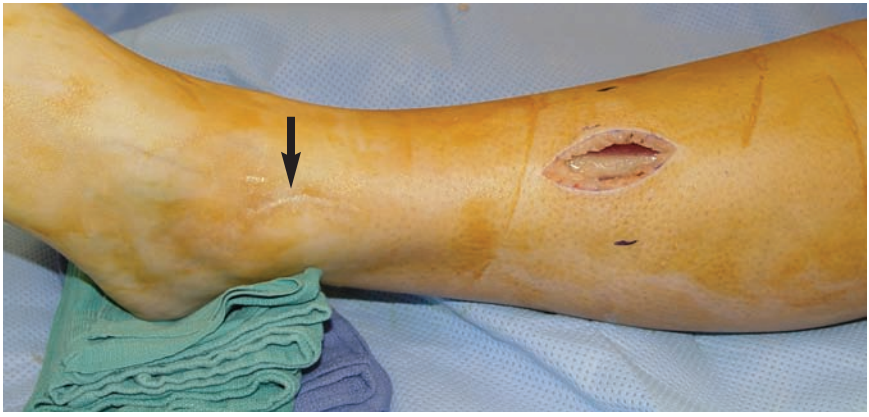

Figure 7-16. Tammy's leg in surgery. Original Orthopedic painful incision (arrow). New single incision I used to correct problems with the superficial and deep peroneal nerves.

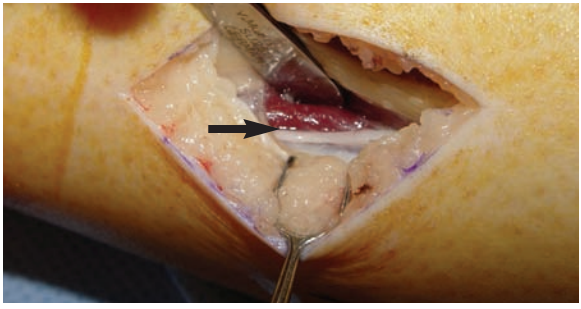

Figure 7-17. The superficial peroneal nerve is exposed in the lateral compartment of the leg (arrow). This is the nerve causing pain in the original scar used to fix the broken ankle. The red muscle within the compartment can be seen. This nerve will later be divided and buried in a nearby muscle so it cannot grow back into the painful scar.

Although anatomy books teach that this nerve is found in a compartment called the lateral compartment, it can actually be located in another compartment next to the lateral compartment, and in some people there can be a branch in each compartment. And so both compartments were opened. Tammy had the traditional pattern (75% of people do have this pattern). At the end of the surgery, this nerve was divided and implanted into a muscle to prevent a painful new neuroma from growing. (I first reported this technique for the leg in 1998.*) After identifying the superficial peroneal nerve, I continued the dissection between the muscles, working between the two leg bones, the fibula and tibia (see Figure 7-18). This is the location for the deep peroneal nerve, the nerve transmitting the pain message from the ankle joint.

I removed a section of the deep peroneal nerve so it would no longer send pain messages from the sinus tarsi when Tammy walked. I opened the

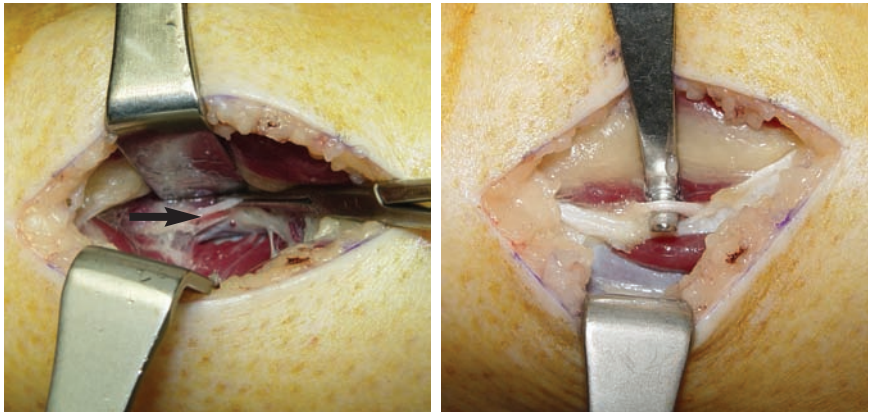

Figure 7-18. Left: The deep peroneal nerve (arrow) is located between the two bones (tibia and fibula) of the leg, and next to an artery and vein. Right: The deep peroneal nerve is elevated prior to cutting out a one inch long section. This is the nerve that sends the pain message from the sinus tarsi part of the ankle joint. Removing this nerve removes the pain message for the part of the ankle joint that was torn during Tammy's injury.

*Dellon AL, Aszmann OC: Treatment of dorsal foot neuromas by translocation of nerves into anterolateral compartment. Foot and Ankle 19:300-303, 1998.

covering of the two compartments so the muscles, shrunken from disuse and pain, could grow, bulk up, again when she began to exercise. Note there is no bleeding during the surgery because it is done with a tourniquet. The absence of bleeding allows me to find the small nerves. Tammy's surgery went smoothly and without any complications.

In the hospital, slowly the marcaine going into the epidural catheter was reduced until Tammy could feel her foot normally again. Then the Anesthesiologist removed the epidural catheter from her back.

The day following removal of the epidural catheter, tammy had no more pain when her ankle scar (see Figure 7-19) was touched. There was no pain in her ankle when she walked for the first time in her hospital room.

Figure 7-19. Tammy is shown here in the hospital the second day following her surgery. The epidural catheter has been removed. Note she is smiling as the previously painful ankle is being touched. Her previously painful, RSD foot is no longer painful.

As I wrote the order to discharge her from the hospital, I felt like Tammy's softball coach, standing at third base, waving her on to home.

At home, Tammy had to take the long trip to drug rehab, to detox. I began her on water walking to build her confidence in her ankle.

At three months after surgery, when Tammy came back to the office, she was walking well, and without crutches. She was almost off her narcotics. I

told her she could begin to play catch with her Dad again. She could begin to use the treadmill at the gym, and jog a little, if she wanted.

"Doctor Dellon," Tammy said, when she came back to the office for her 6 month post-op visit, "I am off all my drugs. I feel like a human being again. I am my old self. Doctor Dellon, I have enrolled in a GED course to get my high school diploma. I can concentrate on studies again. Doctor Dellon, its like you and I were on the same baseball team. You were the designated hitter. I was the base runner. You hit the home run, and I crossed home plate again. Thank you Doctor Dellon."

Pain Solutions Summary

Reflex Sympathetic Dystrophy, pain out of proportion to the injury mechanism, or a single nerve, does exist. It is the same pain regardless of whether you adopt a new name for it, like Complex Regional Pain Syndrome, or not.

The reflex concept is important to me in guiding surgical treatment for those patients who do not respond to medicines and nerve blocks.

I find the peripheral nerve that is the source of the pain. It may be a nerve cut by the original injury, or by the first surgeon. It might be a nerve compression or pain for the torn ligaments of a joint.

By using nerve blocks of peripheral nerves, the nerve sending the pain message to the spinal cord can be found. The nerve problem can be corrected either by removing the damaged nerve or decompressing it.

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