

A Tradesman's Journey Back from a Cerebral Incident

by

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Part I – Rushed to the ER

Ever since he was young, Paul had always had a passion for mending broken objects. As a teenager, he was known as the neighborhood “fixer.” Whether it was a loose door hinge or a flooding toilet, Paul had the ability to fix it.

At 22 years old, Paul became a licensed electrician and began working with his father and uncle who had their own electrician business. Unfortunately, two years ago his father died from a massive heart attack, and shortly thereafter his uncle decided it was time to retire.

Paul was now 57 years old and under immense pressure to find two new passionate and gifted employees to join his business. He had been gaining weight by eating poorly and not exercising frequently. Paul had been diagnosed with hypertension as his blood pressure was elevated, and he had high cholesterol. His cardiologist prescribed 10 mg of a lipid-lowering statin drug (Lipitor®, atorvastatin) once daily and discussed lifestyle changes to his exercise and eating habits.

Today Paul was experiencing a severe headache, and he had decided not to go to work. Theresa, Paul's dedicated and loving wife of 30 years, advised him to take two tablets of ibuprofen. When Theresa asked Paul how he was feeling shortly after taking the ibuprofen, Paul insisted that his headache was not a big deal since he had been suffering from them regularly and they usually subsided. Although he said he was fine, it was the muffled and slightly slurred tone in which Paul responded that caused Theresa concern. When the washing machine beeped indicating that the laundry was finished, Theresa reluctantly started for the staircase to tend to the wash.

Following her departure, the pain Paul was experiencing increased. He innately knew something was wrong. Paul tried to call for his wife, but no words were produced. He was speechless and scared. Paul's speechlessness was accompanied by numbness on one side of his body, severe dizziness, and confusion. Panicked, Paul tried once more to shout for Theresa, but again, little speech was formed. He realized he must immediately call emergency services. Paul's phone was on the coffee table in front of him; he attempted to walk toward the phone but his legs were unable to perform this simple task and he fell to the floor.

Minutes later, Theresa shouted from the laundry room asking how Paul was feeling. When she did not hear a response, she hurried to Paul and found him on the floor. She immediately called 911.

The ambulance arrived and the emergency medical technicians took Paul's vitals. His blood pressure was 158/102 and his responses were limited. They asked Theresa what medications Paul was taking. Theresa removed a sheet of paper posted on the refrigerator that listed Paul's medications and handed it to the technicians.

Questions

1. What should Theresa tell the emergency medical technicians about her husband's medical history?
2. What is the mechanism of action of statin drugs?

3. While taking Paul's vitals, the emergency technicians took his blood pressure. How is blood pressure taken, and what is typically considered normal blood pressure? How would you correlate the blood pressure results with Paul's symptoms?
4. What part of the brain controls muscle contraction (movement) on each side of the body? Within that region, what part of the brain controls muscle contraction (movement) of the leg?
5. After reviewing Paul's history of high blood pressure and high cholesterol, how would you correlate such symptoms with a heart attack or cerebral stroke?

Part II – Confounding Signs in Examination

When the ambulance arrived at the hospital, Paul was taken to the emergency room. Dr. Elizabeth Vasquez, a neurologist, ordered a brain computed tomography (CT) scan and electroencephalogram (EEG) as well as an echocardiogram. A few hours later, Dr. Vasquez visited Paul in the intensive care unit (ICU) to share the results of the tests.

Dr. Vasquez stated that the CT scan showed Paul had suffered an ischemic infarction of the left anterior cerebral artery. In other words, a blood clot in one of the major arteries of the brain caused Paul to suffer a severe stroke. She continued to explain that since the blood clot that caused the stroke did not originate from the brain, it was said to be an embolism. An embolism is a clot that originates from a part of the body, travels in the blood through the circulatory system and eventually lodges in a different part of the body, in this case, the anterior cerebral artery. Dr. Vasquez also explained that while an anterior cerebral artery stroke is less common, the symptoms Paul suffered such as slurred speech, numbness, dizziness, confusion and hemiparesis (muscle weakness on one side of the body) were commonly experienced by individuals who suffer from a stroke.

Dr. Vasquez then conducted a physical neurological exam to determine the severity of the damage. She began by checking Paul's quadriceps reflex. This simple reflex is the knee jerk and involves the quadriceps muscle at the front of the thigh contracting when the hammer hits the patella tendon just below the knee cap. She positioned herself so that she was not directly facing Paul. When she tapped Paul's right knee, she noted hyporeflexia (a decrease in muscle reflexes) and signs of flaccidity (loss of muscle tone). When she evaluated Paul's left leg, it responded appropriately to the quadriceps reflex with no signs of hyporeflexia nor flaccidity. Dr. Vasquez continued with the physical neurological exam. She examined both upper limbs, which responded appropriately to the biceps and triceps reflexes.

Dr. Vasquez asked, "Paul, can you understand what I'm saying to you?"

Paul smiled and nodded his head in acknowledgment, but he had difficulty in verbally replying. Dr. Vasquez immediately suspected left side cerebral damage and motor dysphasia, which results in difficulty expressing speech.

Dr. Vasquez and her accompanying medical student exited Paul's room after conducting their examination. The medical student was puzzled by the flaccidity in Paul's right leg and asked, "Why are we observing hyporeflexia and flaccidity since the CT scan revealed upper motor neuron damage? Shouldn't he be showing hyperreflexia and spasticity?"

Dr. Vasquez replied, "Excellent question; how about you research that and see if you can tell me why tomorrow?"

Questions

1. Why would Dr. Vasquez order a brain CT scan, an electroencephalogram (EEG), and an echocardiogram for Paul?
2. Explain the difference between an embolic stroke and a thrombotic stroke.
3. Where does the anterior cerebral artery (ACA) originate? What structures in the brain does the ACA supply?
4. Why is an embolic ACA stroke less common than a middle cerebral artery stroke? (*Hint*: refer to the circle of Willis.)
5. If a blood clot was located in the left ventricle of the heart, describe a probable pathway the blood clot would travel to the left ACA. Name all the arteries and vessels involved starting with the aorta.
6. Why was Paul able to comprehend Dr. Vasquez's question, but had difficulty in verbally responding?
7. What do you think the medical student will report back to Dr. Vasquez? (*Hint*: consider the difference between an upper motor neuron lesion and a lower motor neuron lesion.)

Part III – Journey to Recovery

Paul was moved from ICU to the hospital's inpatient rehabilitation floor three days after his embolic stroke. His stroke rehab program involved multiple hours daily of active therapy with the goal of helping him gain as much functional independence as possible. Specifically, he attended speech therapy for his motor dysphasia, and physical and occupational therapy for his right leg hemiparesis. His physical therapist addressed isolated movements and rehearsed complex movements such as transferring from bed to chair. Sensory stimulation was used to encourage use of the stroke-impaired limb. The speech language pathologist had Paul in language rehab where he practiced word repetitions and reading exercises.

A couple weeks later, Dr. Vasquez performed another neurological reflex examination to assess Paul's muscle strength and check for signs of neurological return. She began by checking Paul's quadriceps reflex. When she tapped Paul's right knee, she noted hyperreflexia and signs of spasticity. In other words, Paul now displayed an exaggerated knee jerk and tight, stiff muscle tone in his right leg. She evaluated the left leg, which responded appropriately to the test.

Paul's meals in the hospital were loaded with fruits, vegetables and high fiber while low in salt and fat. During his meals, Theresa noticed her husband performing ritual-like tasks with his fork in his right hand. While noting this curiosity, she was unfazed.

After lunch one afternoon, the couple decided to watch television. Theresa purposely asked Paul for the remote despite the fact she could easily reach it herself. As she grabbed the remote from Paul's right hand, he did not let go.

"What are you doing?" Theresa asked.

In a halting, slurred speech, Paul had a hard time replying but managed to say, "I...don't...didn't...mean...to...happen."

"Are you not letting go on purpose?" she asked. Paul shook his head no.

Theresa expressed her concern to Dr. Vasquez. She was immediately intrigued to learn that Paul's right hand seemed to no longer be in his control and seemed to have a mind of its own. She asked how long his right hand had become "bothersome" and Theresa reported that it had been happening since the stroke. She proceeded to tell Dr. Vasquez that the actions his right hand performed appear to be unwanted.

Dr. Vasquez examined Paul and it was clear his right hand had no sign of injury. In her 25 years of practicing medicine, this was the first patient Dr. Vasquez had seen with "alien hand syndrome," having only read about it in the literature. Treatment for alien hand syndrome was limited since it was extremely rare. The occupational therapist began to work with Paul to keep his foreign hand "distracted" when necessary by holding an object to help decrease unwanted movements and gestures the hand performed.

After a few weeks in the hospital, Paul was transferred to a rehabilitation nursing facility where his post-stroke recovery program continued for several weeks before he could return home for outpatient rehabilitation. Over the course of his therapy, Paul's right leg paresis improved to where he could use a walker to move around despite the damage that was done to his upper primary motor cortex by the stroke. His physical therapists continued to work on his gait speed and any dysfunctional gait deviations that could cause orthopedic issues in the future. The occupational therapist continued to work with Paul to learn skills for self-directed activities. Although Paul was speaking slower and in incomplete sentences, he had made progress in improving his dysphasia. His speech therapist worked to help him develop problem-solving and social skills to cope with the after effects of stroke.

Questions

1. What is alien hand syndrome (AHS)? Can only the left hand be termed "alien" or can the right hand be "alien" as well? Explain why or why not.
2. What is the reason behind the change in Paul's quadriceps reflex during the first couple of weeks after his stroke?
3. If you were Paul's neurologist, what would you tell him about the long range outlook for his recovery?