

Case in Point

Diabetic Peripheral Neuropathy: The Learning Curve

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Living with diabetes mellitus and its complications can be challenging, but treatment by a specialized wound care staff adept in treating diabetic foot ulcers and educating patients about care can ensure favorable outcomes.

When R was a 19-year-old sailor heading out to sea, he had no idea of the forthcoming medical diagnosis that would change his life. R was like any other young seaman: ready to do his assigned tasks and ready to serve his country. He was stationed on a Los Angeles class, nuclear-powered, fast attack submarine. R was living his lifelong dream of serving in the U.S. Navy. The submarine was conducting sound trials and tactical readiness exams off the southeast U.S. coast near Bermuda. The days were long, but he loved what he was doing, so he ignored his symptoms of fatigue, attributing it to his busy schedule. He was enjoying his time in the navy and looking forward to a long career.

DIAGNOSIS

R was assigned watch duty during the day, but he couldn't understand why he felt so fatigued during his watch or his ability to

fall asleep while standing. R didn't complain because he knew everyone was working hard, long hours. He knew he was not sleeping well, mainly due to the frequent trips to the bathroom to urinate, and at first attributed it to drinking large amounts of coffee and sugar to stay awake during the drills. He also knew he was constantly hungry, thirsty, and tired. After falling asleep while on duty during the exercise, R found himself facing possible disciplinary action. He had no idea what was happening but realized it was not in his nature to fail at a task and certainly not to fall asleep on duty. Having a chronic disease that would affect him for the rest of his life was certainly not on his mind. He recalled, "At the time I didn't even know what diabetes was."

R finally admitted his array of symptoms to one of the corpsman. He often urinated every 20 minutes and at times did not make it to the bathroom. His vision was blurred to the point he could not make out faces just a few feet away from him, and the lethargy was overwhelming.

The corpsman immediately knew something was wrong with R and in-

structed R to report to the boat's sick bay. Fortunately for R, the classic symptoms of hunger, thirst, frequent urination, and fatigue struck a chord with the corpsman who also noticed that R had lost a great amount of weight, a fact R had not noticed. Labs were drawn, and a urine specimen was obtained. R had a blood glucose level of > 1,000 mg/dL, was in severe ketoacidosis, and was diagnosed with type 1 diabetes mellitus (T1DM). The corpsman was surprised he was even coherent at this point. He was given IV infusions in both arms.

The boat's mission was halted. The immediate thought was to send for a medical evacuation helicopter. The weather conditions were too severe at the time to arrange for air evacuation, so the captain decided to head back to port and transfer R to the Portsmouth Naval Medical Center. R will never forget that day; however, the days and weeks following became somewhat of a blur. R recalls, "Time seemed to standstill some days, then others were on fast forward." He was hospitalized for the next 2 weeks. His condition was stabilized, and he learned how to care for himself.

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LEARNING ABOUT DIABETES

The following weeks and months while on medical hold and being processed for discharge, R was assigned a variety of duties. He felt well prepared to manage his disease on a daily basis and at first had hopes of continuing his navy career. He recalls now, he had no clue what the diagnosis would mean in the years to come. R learned he would eventually be medically retired from the navy and rejoined civilian life.

Initial Complications

After leaving the navy, R decided to become a law enforcement officer. He joined a local police department and quickly rose through the ranks. He began to settle into a routine, learning to manage his insulin, control his diet, and enjoy his new career. For the next several years, he experienced few complications, although he never regained the 50 pounds he had lost when he was first diagnosed. Around 25 years old, he began to notice pain in the bottom of his feet. He was still able to run, had great balance, and didn't think his symptoms of sore feet were attributable to his diabetes. He did notice that without shoes on, his feet were extremely sensitive to any texture.

Over the next year, R experienced worsening pain and increased sensitivity in his feet. He started to spend more time in his patrol car instead of on foot patrol because of the pain. He was no longer able to enjoy one of his favorite pastimes, walking barefoot on the beach. During the next several years, R would gradually begin to realize he had no sensation in his feet. He noted this affected his balance and gait. He loved his career in law enforcement, but often the complications of his disease would impact his daily work. He felt he was no longer fulfilling his responsibilities

as an officer because of his inability to complete daily assignments due to the neuropathy in his feet. He left his law enforcement career and spent most of his time in an office, which was much less taxing on his body.

Foot Ulcers

In 2011, 15 years after the T1DM diagnosis, R experienced his first foot wound. After a day of hiking and walking in creek beds, he realized he had essentially rubbed off the skin on the ball of his foot. He cleaned it like he normally would; however, the area failed to heal. He developed a hard callus around the wound, but the center remained open. At the time, he did not realize the significance of this type of wound for a diabetic patient.

The foot ulcer was discovered while in the emergency department for an unrelated issue. It was then he was referred to the Greenville VA Outpatient Clinic wound healing center in South Carolina for further treatment. At 36 years old, he was far younger than most of the veterans being treated for diabetic foot ulcers. Per the CDC Report Card, about 90% to 95% of patients with diabetes have type 2 diabetes mellitus (T2DM).^{1,2} Most persons diagnosed with diabetes are in the fifth and sixth decades of life.^{1,2} For R, patient education had consisted of learning to manage his diet and insulin therapy. He has no recollection of education about future complications and reported feeling "clueless" about the potential complications of foot ulcerations.

During the patient's first visit to the wound healing center, R was educated about diabetic foot health, complications, the healing process, and the importance of diabetes management. The center is staffed by a nurse practitioner (NP) certified in

wound care with extensive experience in diabetic foot ulcers and by several wound care nurses. Each staff member incorporates patient education and positive reinforcement into every patient visit. According to Jeffrey Frenchman, DPM, director of limb preservation at the Atlanta VAMC in Georgia, "Patient education and positive reinforcement cost nothing to provide and offer great return on patient adherence." (Jeffrey Frenchman, April 12, 2014, oral interview).

R visited the center once or twice weekly, depending on the appearance of the wound and the type of treatment he was receiving. He noted that having frequent contact with the wound center staff made him feel as though he was making progress. For the staff, ensuring R could adhere to the treatment regimen was paramount. If a patient is unable to follow home care instructions or lacks understanding of the importance of following wound care instructions, then the likelihood of adherence is less.

Continued Complications

R was unprepared for the months of healing. He learned about the importance of offloading (the reduction of pressure), noting that during the weeks he spent more time on his feet, ulcer healing failed to progress or worsened.³ Eventually, the ulcer healed, and he felt better prepared to prevent future problems as a result of having been educated about foot care. Unfortunately, he experienced his next complication a few months later after wearing new boots. When removing his boots at the end of the workday, he noticed blood on his sock. He realized the boots had caused blisters that had ruptured on the third, fourth, and fifth toes. Once again, having T1DM and totally insensate feet caused further

problems with delayed healing. Since his first foot ulcer in 2011, R continued to have problems with foot ulcers. Some ulcers were caused by shoe pressure, blisters from hot beach sand, or from a typical neuropathic foot ulcer, which first develops as a preulcerative callus and rapidly progresses to an ulcer. Despite his daily astute monitoring of his feet he noted, “Problems just seem to occur overnight.”

QUALITY OF LIFE

The greatest impact of diabetes for R was on his quality of life (QOL). He noted that the frustrations of dealing with foot wounds had a profound negative impact on QOL. As an avid outdoor enthusiast, the months he spent on crutches, wearing offloading shoes, attending numerous wound clinic visits, and being unable to take part in the activities he loved greatly impacted his mental and physical well-being. “Having to change my daily routine such as bathing, driving, and even going out to dinner is hard enough. Having to give up hiking, camping, and swimming changes my entire outlook on life.” R also noted the unintended isolation from friends had a profound impact on his feelings. “They want to include you, but know they can’t. You want to go, but know you can’t keep up. Sometimes being alone is the worst feeling.”

Receiving care from wound care professionals offered R hope that his wounds would heal and he would return to the activities he enjoyed. He noted that the education and support he received from the wound center staff made him feel more confident not only in caring for current wounds, but also in preventing wounds in the future. He also realized that prompt treatment for even the smallest of wounds was essential.

R was able to contact the wound center staff either by phone or by secure messaging e-mail anytime he had a concern or question. When he developed new foot wounds, he could contact the staff and be evaluated within 72 hours of notification. He noted that being able to talk with the staff as soon as a problem developed offered him reassurance that he was properly taking care of his feet.

During his treatment, R needed to wear offloading shoes to minimize the weight-bearing pressure.³ The wound center staff took care to ensure that R could ambulate safely with these shoes and avoid further injury. They also reinforced the importance of wearing these shoes, despite their unfashionable appearance.

Given the depth of some of R’s foot ulcers, the staff used negative pressure dressings to enhance healing. Negative pressure dressings provide a vacuum source to create continuous or intermittent negative pressure inside a wound to remove fluid, exudates, and infectious materials and prepare the wound for healing and closure. A mechanically powered, negative pressure dressing with a 125 mm Hg cartridge device was used during R’s treatment. This type of negative pressure dressing offered the benefit of dressing changes twice weekly vs 3 times weekly with other electric-powered negative pressure devices.⁴

Another important aspect of R’s care was the use of human amniotic tissue allografts. When R’s wounds did not show healing progression during the first 4 weeks of traditional treatment, amniotic tissue allografts were added to his plan of care. This type of product for the wound bed provides critical growth factors and collagen to promote effective, enhanced wound healing. Patient ed-

ucation again is critical when using human amniotic tissue allografts so that the patient learns to keep dressings intact and undisturbed.⁵

FUTURE IMPLICATIONS

Diabetic foot ulcers are a preventable complication of diabetic peripheral neuropathy. Patient education about foot health should not only be incorporated in diabetic education, but also reinforced by the health care staff at each visit. When a patient presents with a diabetic foot ulcer, early, prompt treatment is vital to ensure a favorable outcome.

For health care providers, cognizance of the impact that wounds have on patients’ QOL is an essential aspect of care. Identification of factors that promote expedient and effective wound healing is vital. Patient education that is focused on engaging the patient to actively participate in the healing process is paramount. Involving R in every aspect of his care was the focus of the wound center staff. Explaining the purpose of each product used and why it was chosen was not only interesting for R, but also allowed him to actively participate in his appointments and care. As the leader of the wound treatment team, the NP may order, guide, and direct care, but empowering patients to be active participants in their care enhances adherence to the plan of care.⁶

CONCLUSION

Focusing on these critical aspects of patient-centered wound healing must be at the forefront when treating patients with diabetic foot ulcers. Although a price cannot be placed on QOL, the cost of diabetic foot ulcers and its complications is astounding. In 2007, nearly \$116 billion was spent on diabetes treatment,

and more than one-third was for the care of diabetic foot ulcers and complications from those ulcers.⁷

Finally, the incidence of T2DM is rising: The average age of patients at the onset of T2DM is becoming younger, the development of T2DM in children is rising, and treatment costs are rising.¹ Given the alarming statistics of T2DM and its complications in the U.S., focusing on prevention, patient education, and effective treatment of diabetic foot ulcers is important.

Author disclosures

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