The Swimmer

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Growing up in the high Sonoran desert of New Mexico afforded my brother and I plenty of opportunities to run, play games and sports with friends, and bicycle across the mesas and arroyos around Albuquerque. Riding our banana-seat bicycles on the sun baked trails through creosote bush and piñon trees, struggling to pedal through the sandy bottoms of the usually dry arroyos, and pushing up into the foothills of the Sandia Mountains to then coast down at high speed was excellent aerobic exercise, particularly considering we were at an altitude of almost one mile. I continued to love running and cycling as an adult, and even competed for a couple of years in duathlon events that combined bicycling and running.

I have never competed in a triathlon. There is a very simple reason, swimming is a not a forte of mine. New Mexico has an arid to semi-arid climate depending on where you are in the state and your location near the mountains. Until I was a teenager, the largest body of water I had ever seen was that great strip of mud known as the mighty Rio Grande River, originating in Colorado and coursing north to south through New Mexico before becoming the border between Mexico and Texas as it flows into the Gulf of Mexico. There were times when water flowed freely in the river, particularly during springtime after a heavy winter of snow in the mountains, but for most of the year there was little water in the river as it was diverted for the many irrigation needs for farmers along the river valley.

This is not to say I was not exposed to swimming as a child. My parents placed my brother and me in swim lessons when we were very young and we were adequate swimmers. Four or five times every summer we would be treated to a trip to the local community pool, called the A pool. The pool was constructed in the shape of a large, 100 yard long capital A. The flattened top of the A was the deep end of the pool and featured a spring board and a high dive platform. At the end of one of the legs of the A was the "kiddie" pool, which we fastidiously avoided. The most interesting feature of the A pool to my brother, friends, and me was the center concrete island that was situated perfectly in the middle of the pool. This was an area to swim to, climb on, and dive or cannon ball off in an attempt to splash one's neighbors. It was also a source of unending aggravation for the lifeguards at the pool. It was popular to play "Capture the island" when two or more spontaneously assembled teams of kids would gather on either side of the pool, dive or jump in, and swim to the center and tussle to climb onto the island and claim ownership. This inevitably produced angry whistle blowing from the lifeguards and shouts of, "Hey, you kids on the island, knock off the pushing and shoving!" Those clinging on to the side of the island would sullenly slide back into the water, while those on top would cannon ball back into the pool as a wordless protest. There would be ten or fifteen minutes of relative peace as the groups of children would quietly reorganize, only to again launch an assault for dominance of the island. The angry whistleblowing and threats from the lifeguards would recur numerous times every day. I don't know how the lifeguards tolerated it, we were relentless nuisances.

In contrast to my inefficient swimming, or water thrashing technique, I had a patient who was an excellent swimmer. He swam competitively in college for a top-ranked swim team at a major midwestern American university. He wasn't offered a scholarship, he walked on (or swam on to be correct) and showed enough talent and drive to earn a place on the team. After completing his university swimming career, he went on to complete graduate degrees and worked in the medical field. He was married, had children, and was building a career when he developed stage IV colorectal cancer.

This gentleman was in his thirty's when he was diagnosed with an unexpected malignant disease. Another surprisingly young patient on the left side of the somewhat asymptotic curve of age distribution at the time cancer is detected. There was no family history of cancer, and no genetic abnormalities were observed during testing of his cancer or his normal cells to explain this early age diagnosis. Nonetheless, he was faced with a colon cancer and liver metastases. As is often the case in patients referred to me, he had already undergone surgical removal of his primary colorectal cancer and was receiving systemic intravenous chemotherapy. He had several metastatic tumors in his liver, including one unfortunately situated abutting all three of the hepatic veins draining blood out of the liver.

This patient was active and athletic, so I proceeded with an operation removing part of the tumor-bearing right lobe of the liver, and then performing radiofrequency ablation of the central tumor near the hepatic veins. This grossly treated all of the cancer we could detect. He recovered and received additional chemotherapy. His cancer did not

cooperate with our plans and recurred. Within a year he had new liver metastases, including some at the edge of his radiofrequency ablation zone indicating tumor at this site had not been completely destroyed.

I performed a second liver operation. Once again, some tumors were removed and others were destroyed with the heat generated during radiofrequency ablation. Based on the ultrasound I used to examine his liver during the operation, all of the detectable cancer was removed or destroyed. I'll evoke a "Jaws" analogy since swimming is part of this tale, cancer is like the ocean, what's hidden beneath the surface can be dangerous. The potentially deadly aspect of cancer is centered on the microscopic areas of malignant cells that remain, and respond to the evolutionary pressure cancer clinicians apply with chemotherapy and other drugs to develop resistance to our treatments.

The swimmer had these hidden clusters of cancer cells in his liver, and after lurking undetected for a few months, they grew to a size sufficient to be detected on CT scans. Bad words were muttered in clinic. My colleagues and I responded with another barrage of chemotherapy, after which I performed a third liver operation. For the third time, I successfully removed or destroyed every tumor I could find in his liver. He had no malignant lymph nodes or tumor nodules in his entire belly cavity. I should have been buoyant and hopeful, but I admit I was guarded and worried because three major liver operations and months of chemotherapy had not eradicated the swimmer's cancer.

A former NCAA division I athlete, skilled and self-motivated enough to compete at the collegiate level, intelligent and driven to complete graduate level degrees and begin a career in a high functioning environment, diagnosed at a relatively young age with stage IV colorectal cancer; wouldn't it be nice if this story had a happy ending? Cancer causes many unanticipated, unplanned, unwanted, unhappy endings. This is a story about diligence, endurance, and persistence.

The fourth time metastatic colorectal cancer reared its ugly head in the swimmer was more complicated. He had recurrent liver tumors that were in difficult locations near blood vessels or bile ducts. Some could be removed, and others could have been treated cautiously with thermal ablation. However, more liver surgery was contraindicated because he had several small metastases in both of his lungs. As surgical oncologists, we have data and know we improve a patient's chance of long-term survival when we are able to remove completely all primary and, for some cancers, all metastatic disease. My aquatic patient had too many lung tumors to remove, so he and I had several long conversations explaining why liver-directed surgery was not the optimal treatment option. The swimmer was healthy and fit and received aggressive systemic chemotherapy. He searched and read extensively about novel treatment approaches and different ways to treat cancer. He and I had numerous discussions about some of the research in my laboratory regarding use of electromagnetic fields to treat cancer. These studies were all in the very basic stage of investigation using cancer cells or animals with malignant tumors. Nonetheless, he was very interested in this and other treatment approaches and was motivated to find alternative methods to treat cancer.

It had been well over a decade since his career as a competitive swimmer. The swimmer and his family initiated a swim-a-thon called "Drown Out Cancer" to raise money and awareness to fund cancer research. He did this of his own volition because he believed better approaches were needed to treat cancer and reduce the side effects and toxicities of standard therapies. My patient and other swimmers in his Great Plains community held a one-day swim event and raised thousands of dollars by swimming lap after lap to earn the money people had pledged. The first year my patient swam to "Drown Out Cancer" was about four years after his initial cancer diagnosis. He completed 10 miles. I was speechless, an exceedingly rare state for me, when informed of this distance. I would have drowned myself after a few hundred yards had I attempted this feat.

The swimmer spent more time on rather than off chemotherapy after developing colorectal cancer. He resumed and received a variety of intravenous chemotherapy drugs, and realized the side effects were making it impossible for him to function in his medical career. Rather than despairing and decrying his bad fortune, he reinvented himself in an entirely different career. He not only succeeded, he excelled while being treated with toxic chemotherapy agents. He had a clear set of priorities and made sure he spent time with family, friends, and others important to him. He was one of the most sanguine and focused individuals I have encountered.

Intravenous systemic chemotherapy was not working. The tumors continued to grow, particularly in his liver. The majority of his cancer was in his liver so he entered an intensive experimental treatment program. This required him to be hospitalized for 3-4 days every six weeks. A catheter was placed in the femoral artery in his groin and snaked by an Interventional Radiologist all the way up to the hepatic artery supplying blood to his liver. As I have mentioned

previously, the liver is unusual as it has a dual blood supply, receiving oxygenated arterial blood from the hepatic artery, and venous blood from the portal vein draining the entire intestinal system through the liver for processing of nutrients and other ingested substances. Malignant tumors in the liver are no different from cancer at other sites. To survive and grow they derive their blood supply from the arterial flow coming into the organ. These malignant tumors are like parasites surviving off of the oxygen and nutrients in the arterial blood supply. In the liver, because of the dual blood supply, drugs can be delivered through the hepatic artery directly into the vessels going to the tumors, increasing the dosage of drug delivered to the tumors while theoretically reducing the exposure of normal liver cells. The downside of this treatment approach to the swimmer and other patients in similar clinical trials; for three or four days every six weeks he was confined to a hospital bed, unable to move to prevent the catheter placed in his artery from moving or being displaced and causing bleeding or infusion of drug to organs other than the liver.

Imagine yourself prohibited from moving, sitting up, walking, or getting out of bed for any function for three or four consecutive days. The prospect would be maddening. For a former high level athlete it was difficult, but he managed and endured to receive the treatments. I would visit him in his hospital room and we would talk about options, progress in my research, and other novel approaches on the horizon. I knew he was frustrated, but to me he always presented a stoic and calm manner.

Like most patients undergoing chemotherapy and other cancer treatments, this man suffered from significant fatigue and deconditioning. Thus, I was mildly surprised when he called and told me he was swimming in the annual "Drown Out Cancer" event. He invited me to speak at the dinner held the evening after the pool activities. He knew my history as a kid from the desert and thankfully did not invite me to flail in the pool. That did not stop him from swimming only weeks after receiving high-dose hepatic arterial infusion chemotherapy. He had not been training or exercising regularly because of his ongoing therapy, yet he swam 10.5 miles! He swam farther than the first time he organized this fundraiser without training for the swim. Talk about an Iron Man, talk about endurance! The night I spoke at the swim-a-thon event he was clearly exhausted, but exuberant. He swam much farther than even he had predicted he could complete. I asked him how he had accomplished this feat. He thought a moment and replied, "This disease devastates too many lives. That thought kept pushing me to swim."

After several years of almost continuous treatment with systemic or liver-directed chemotherapy infusions, the swimmer's cancer became resistant to everything available and he succumbed. His brother sent me a note thanking me for my efforts and for the time I spent talking with him in his hospital room or during phone conversations. He also reported the swimmer believed better treatments for cancer would be found, and he asked me to keep working on new approaches to treat this dreadful disease.

I can't swim more than a few hundred yards before hauling myself dripping and breathless out of the water. The swimmer, in the middle of tough chemotherapy treatments, got into a pool with no training and swam for miles. The spirit and endurance of cancer patients is an inspiration and testament to the willpower, resolve, and toughness of some people. And I do not forget the family members, friends, and co-workers of patients afflicted with cancer. They step up to support patients and endure watching the rigorous challenges, painful surgical procedures, side effects of medical and radiation therapies, fear, uncertainty, and depression accompanying the shocking diagnosis and treatment of cancer. Everyone associated with a cancer patient is drawn into the process of treatment, living in the shadow of the disease, and, for too many, dying; all are affected and must cope with a range of emotions and problems.

There are several new treatments reported in the last few years making a big splash in cancer therapy. Immunotherapies, drugs targeted to specific proteins or aberrant pathways in cancer cells, and personalized genetic testing to identify abnormalities that can be treated with new or available agents promise to improve the outcomes of more cancer patients. Everybody; patients, family members, cancer clinicians and care-givers, and researchers hope better approaches are found to improve the survival and quality of life for those afflicted with cancer. We must continue to fund and investigate novel approaches to understand, prevent, and treat malignant disease, and allow more patients to survive and thrive. The swimmer knew that clearly, and he and his family and friends did something about it. They swam to fund cancer research and "Drown Out Cancer." "Some days there won't be a song in your heart. Sing anyway."
—Emory Austin

Endure.