"Beautiful, haunting, powerful..."
—Daniel G. Amen, MD

I've Seen the End of You

A Neurosurgeon's Look at Faith, Doubt, and the Things We Think We Know

W. Lee Warren, MD

I've Seen *the* End *of* You

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I've Seen the End of You

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Dedicated to

Elmer, the first friend to become my patient
Mike, the first patient to become my friend
Mitch, for teaching me how to grieve and still laugh
Philip, for encouraging me to write this
Patty, for a life well lived
Lisa, for showing me the way forward,
no matter how dark the path sometimes is

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Author's Note

The stories in this book are true. I've changed the names and some details of all the patients and most of the physicians I discuss. In addition, some of the patients are composites of several real people in order to illustrate aspects of their care without risk of identifying them. Conversations are reproduced from my memory, and the dialogue is true to the spirit of the conversations, even if the actual words I use have been changed. Pastor Jon is an amalgam of numerous hospital chaplains, and Drs. Stinson, Grossman, Grimes, and Jackson are wholly fictitious representatives of colleagues.

Prologue

Life Gets Messy

> After all they had endured, they remembered that God,
> the Most High,
> was their Rock, their Redeemer.
>
> —Psalm 78:35, Voice

The most difficult and dangerous surgery I've ever performed, I wasn't trained for. I had to do something no surgeon would ever do in the operating room.

I had to learn on the job.

In the story that follows, you will learn that the title of this book refers to a kind of brain tumor—glioblastoma multiforme—that is almost 100 percent fatal. My experience with this tumor made me ask questions about how I could honestly pray for my patients or give them news with any credibility or integrity when I already knew they would die. This moral dilemma put me in touch with my spiritual mentor, Philip Yancey, who encouraged me to write about it.

I did, but I wrote a different book.

I thought when I wrote my story of being a combat surgeon at Balad Air Base, Iraq, operating on soldiers, civilians, and terrorists alike while coming to terms with the end of one life and the beginning of another, *that* was the story. But often the things we think we know are just that—things we only *think* we know.

I have been a person of faith for all my life. But I learned early on, in the

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trenches of a crumbling first marriage and the bunkers of the Iraq War, that dogmatic belief is not life sustaining. Only grace is worth believing in. Then, with my patients and in my own story, I thought I saw grace disappear under the onslaught of brutal reality, a reality that could never be changed and that time would never heal.

I used to look at my patients' brain scans, see the glioblastoma I knew would ravage their minds and destroy their lives in the coming months, and say to myself, *I've seen the end of you.* But in the aftermath of war, divorce, rebuilding, and then unimaginable loss in my personal life, I realized I was standing at the deathbed of my shattered faith.

I'd seen the end of me too.

So I faced the greatest surgical challenge of my life: stitching together fatal cancers, dying children, and Christian clichés to heal the faith I'd lost and hoped to resurrect in some unforeseen new form.

What happens when our messy lives mess with what we think we believe?

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Part One

Before

Hope, in its stronger forms, is a great deal more powerful *stimulans* to life than any sort of realized joy can ever be.

—Friedrich Nietzsche, *The Antichrist*

1

Riptide

> If you have questions, ask away. Just be prepared when God answers.
>
> —Craig Groeschel, *Hope in the Dark*

Rosemary Beach, Florida
Summer 2007

"Don't get so far out!" I yelled over the wind and the crashing surf. The kids were playing in the waves, laughing and grinning and dunking one another, their heads popping out of the water and going back under like fishermen's bobbers.

The day had been almost magical. For a blended family like ours, getting everyone together in the same place at the same time was something of a miracle in itself. Lisa and I sat on the beach, soaking in the sun and the love and the togetherness we so needed.

Our older son, Josh, was twenty-two and about to move from Alabama back to San Antonio to work for his dad. Caity was eighteen and head over heels for my scrub tech and Iraq War colleague, Nate, who had come to work for us after the war and had tried for years to resist falling for his employers' daughter, to no avail.

Kimber was fifteen and lived in a nearby town with her mother, along with thirteen-year-old Mitch and our youngest daughter, Kalyn, who was ten.

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Our family was a beautiful blended mess, but it was *our family,* and having everyone at the beach together meant the world to us.

When God brought Lisa into my life, "her" kids (Josh and Caity) and "my" kids (Kimber, Mitch, and Kalyn) instantly became "our" kids—they even said vows to one another at our wedding. But as the years went by and everyone got older, we knew schedules and jobs and weddings would make days like these even rarer and more special.

An hour earlier Lisa's dad, Dennis, had baptized Nate in the ocean. All of us stood in the waist-deep water and held hands while Dennis led us in prayer and thanked God for the day and the sun and the love swirling in the waves around us. Nate had never been baptized, and he'd asked Dennis, whom the kids have all called Tata since Josh's first attempt as a baby to say "Grandpa," whether he would do it.

Nate confessed his belief in Jesus, Tata dunked him under the water, and we sang hymns in the Gulf of Mexico.

A few miles offshore a storm was pushing bigger and bigger waves to the beach. It made the bodysurfing a lot of fun, but at the same time the rough water brought seaweed and countless jellyfish with it. Josh and Mitch were the first to realize this, and they both came screaming out of the water with jellies in their shorts. We all laughed and cringed simultaneously.

And now, as the sun began its brilliant dive into the western sky and our memory-filled day was drawing to a close, I noticed that Mitch was getting farther and farther from where the other kids still splashed.

"Come back in!" I called as loudly as I could. Mitch didn't seem to hear. He just waved and dove back under the surf.

I stepped out into the water and felt the undercurrent picking up with each departing surge.

Mitch wasn't a strong swimmer, and I knew he was too far out to be safe. I waded into the surf to get him, but when Josh heard me call, he noticed his little brother and swam out and brought Mitch in.

Josh and Mitch came bounding out of the ocean together, laughing and smiling with their arms around each other. Lisa snapped a couple of pictures of them, which are still in a frame on Josh's desk to this day.

I can see that scene in my mind's eye now, a decade later. That's what our family does: we swim out to help one another. From the moment Lisa and I decided to

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blend our two families into one, it's been all in for all of us. The kids never called one another "step" siblings. It's been a beautiful, healing experience to see God turn two hurting groups into one whole tribe.

The rest of the family went back up the hill to the house we were renting, and Lisa and I stayed on the beach for a while to enjoy the sunset. We held hands and talked about how faith and family and days like this were so important.

As darkness sneaked over the horizon, marking the end of a day I was thankful for even as I mourned its conclusion, we walked back to the house together.

In my mind that night, I replayed the pictures of our five kids in the same frame. I could see their smiles, hear their voices, and feel the love and emotion during Nate's baptism and our special time together. The next morning we would be returning to Auburn, Alabama, and I knew that within a few days our vacation would slip into memory as we got back to work. Lisa ran our practice, and the business of solo-practice neurosurgery gave both of us more work to do than we'd ever imagined.

My last thoughts before I slept that night took me back to the kids in the surf. I could see them playing, see the waves getting rougher and the hidden dangers like jellyfish and riptides lurking around them, see Mitch getting pulled away by the tide and Josh going to help him. Lisa and I talked about how hard it was to not have all of them with us every day and how much we wished it could be different.

When they were younger, I could wrap my arms around all of them, pull them out of trouble, keep them safe. Now they were moving and growing and spreading out all over the place: Josh heading to San Antonio, Caity going back home with us, and Kimber, Mitch, and Kalyn leaving for their mom's house an hour from Auburn. It would be a while before we were all together again.

How was I supposed to keep them all safe from the riptides of time, growth, and change?

While I was growing up, my parents gave me a simple faith. They taught me to trust that God would take care of us and make everything work out all right. We weren't naive to the troubles of the world, but we believed that they were all part of a plan and that we could trust in God's provision in the future because he'd never failed us in the past. I'd applied that same philosophy to raising my own kids, trying to give each of them the peace of mind that comes when faith becomes real in your life.

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But teaching your kids something is one thing. When you turn off the lights at night and it's just you and your thoughts, how real is it?

We were about to spread across the country, go back to our daily lives, be distant from one another. Josh wouldn't be close by to swim out for Mitch anymore, Caity and Kimber would no longer share a room, and Kalyn wouldn't be right down the hall every night as she'd been all week in the beach house.

But God had always been there before, no matter how stormy life had been through times of war, divorce, and stress.

In the darkness I reached over and took Lisa's hand. "Everything's gonna be okay."

"Yes, it will," she said.

I believed it—then.

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2

Not-So-Happy Birthday

> To ask people to be brave is to expect them to think of their lives in a new way.
>
> —Gordon Livingston, *Too Soon Old, Too Late Smart*

East Alabama Medical Center
Opelika, Alabama, 2008

I'd just finished my first operation of the day when my cell phone buzzed. I looked at the screen.

Call Dr. Stinson in ED. 35 yo male, S/P MVA, probable brain tumor.

A thirty-five-year-old man, status: post a motor-vehicle accident, probable brain tumor? That got my attention. So instead of calling Dr. Stinson, I decided to walk down to the emergency department (ED) and check it out.

"Morning, Doc," Claudette said when I entered. She's been the unit secretary of our hospital's ED for at least three hundred years, and I've never seen her out of the chair she was sitting in.

"Good morning. What's the story?" I said.

"Guy had a seizure or something. Wrecked his car on the way to work. Scan shows something wrong. Dr. Stinson's got his chart."

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I turned toward the doctors' workstation to find Stinson. "Oh, and Doc?" Claudette called. "Today's his birthday."

I shook my head and shoved my hands into my lab coat pockets. If Stinson's text message was correct, the patient was not going to have a very happy birthday.

I found Stinson sitting in front of a computer, a pile of charts next to it. He was looking at a chest X-ray on the monitor; half a doughnut sat on the keyboard. This guy has been eating every waking moment since 1988, but he seems to be thinner every time I see him. He travels to developing countries with Doctors Without Borders, and I sometimes wonder whether he's got a tapeworm or something. He's almost a foot taller than me and razor thin; if you ran into the side of him, it might cut you in half. He wears a yarmulke over wavy black hair, and he has a sloped forehead that leads your eye right down to an extreme nose. You can't look away the first time you meet him, because he looks like a Jewish Abraham Lincoln.

"Hey, Stinson," I said. "Emancipated many patients today?"

He sniffed and wiped a little powdered sugar off the corner of his keyboard. "About fourscore and seven. It's been crazy down here."

At least he has a sense of humor. You'd lose your mind working the ED if you didn't.

Stinson was a sight with all six foot six of him stuffed into his office chair, his knees above his thighs. He handed me a patient's chart. "Sad situation, if it's what it appears to be."

"Yeah," I said. "Pull up the scan."

He clicked his mouse a few times and brought up an MRI scan of the patient's brain. I leaned over and assumed control of the computer to work my way through the scan.

The label read "Martin, Samuel. Thirty-five." Three years younger than me. It was his birthday, just as Claudette had said.

I started at the skull base, and as the images flipped by, I saw the organ that made Samuel who he was. Inside that skull sat the six hundred billion or so cells that somehow harbored *him*—his mind, memory, personality, beliefs, intellect, everything. When I got up to the temporal lobes, the problem jumped right off the screen.

"Nasty," I said.

Stinson squinted at the screen. "What do you think it is?"

I adjusted my glasses. “Can’t know for sure without a biopsy, but I’d bet it’s a GBM.”

Glioblastoma multiforme. Grade IV astrocytoma, malignant glioma. This tumor goes by a lot of names, but they’re just aliases, a.k.a.’s for what ought to be called the brain assassin. A stone-cold killer. Takes your mind long before it takes you. GBM is pretty much the most malignant, mutated, destructive form of human cancer.

Stinson’s long nose flared, and he looked a little nauseated. “Man, I hate those. My sister-in-law had one, died in thirteen months. Left my brother with three little kids. That thing’s a nightmare.”

“I’m sorry,” I said.

I watched as the memory crossed his mind: the subtle softening of his eyes, the momentary slump of his shoulders. Her life in toto, the loss, the pain.

Then he doctored up. Back to work. He waved a hand. “Circle of life, brother. See similar stories in here every day. Have they made any progress in that disease? When my sister-in-law was sick, the doctors said it was almost always fatal.”

I shook my head. “No real advances in forty years. Most everybody dies. I hope for his sake it’s something else. I’ll go see him and biopsy it later today.”

“Thanks.” Stinson straightened himself and sighed. “Good luck,” he said, looking more rabbinical than presidential, “and God bless.”

On October 7, 1939, my father was born in Idabel, Oklahoma. As if unwilling to be blamed for a population explosion, Harvey Williams Cushing died on the same day in New Haven, Connecticut, to balance things out. Harvey Cushing was not related to my family, but he is the intellectual father, or at least grandfather, of neurosurgeons everywhere.

Cushing’s impact on neurosurgery and all of medicine cannot be overstated. He was world famous for his contributions to the basic science and clinical practice of neurosurgery, anesthesia, neurology, physiology, endocrinology, and other fields. He was a decorated World War I combat surgeon and even won a Pulitzer for his biography of Sir William Osler.

Thirteen years before his death, Cushing and his protégé, the young polymath

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Dr. Percival Bailey, published a book with the exhaustive title *A Classification of the Tumors of the Glioma Group on a Histogenetic Basis with a Correlated Study of Prognosis.* This book presented the world with the first coherent understanding of tumors of the glioma family and their cellular structure and behavior; it formed the foundation of the modern discipline of neuro-oncology. They delineated the tumor we now call glioblastoma multiforme and set it apart from all other brain tumors as its own entity.

While Cushing and Bailey gave us seminal knowledge of what these tumors are and the cells from which they arise, by the time Cushing died, this understanding had left no meaningful impact on the survival or quality of life of the people afflicted by them. In Cushing's era surgical treatment was likely to kill the patients, and radiation treatment was in its infancy. Chemotherapy was still a fantasy in chemists' minds, and even years later when it became available, gliomas would scoff at it, hide behind the blood-brain barrier, and continue their death march through people's brains.

Cushing died, my father grew up, and thirty years later I was born. I've dealt with dozens of patients with GBM, and although I understand their disease more completely because of Cushing's work, my patients' long-term outcome is not significantly better than the outcome of his. Our diagnostic technologies and treatment strategies are superior, and our surgeries are safer and much better tolerated. Yet for the eighteen thousand or so people diagnosed with it in the United States every year, GBM still carries a ten-year survival rate of basically 0 percent.

It's a family legacy, common to all neurosurgeons, of becoming better and better technically with each passing generation—yet with each generation equally frustrated by the seeming futility of treating this disease. Eighty years after Harvey Cushing's death, sometimes it feels as if the best thing we can do for our GBM patients is pray the diagnosis is incorrect.

You know that old question about what happens when an unstoppable force hits an immovable object?

That's close to how this situation feels to me.

I'm a brain surgeon. I'm a Christian. A man of science and a man of faith.

Years of training and experience have filled me with knowledge, facts, things that are always true. Things I *know.*

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And I'm a firm believer in God's desire and ability to heal, to repair, to make things right when all the doctors believe there's no hope. I've seen far too many inexplicable turnarounds, impossible saves, people who beat the odds and defied the textbooks.

There are some cases in which my knowledge as a surgeon doesn't determine the outcome, because God's out there doing his thing.

I *believe.*

So what happens when the things you know and the things you believe smash into one another like the object and force in the question above?

I was about to find out.

I pulled back the curtain in slot 11 after walking past the guy in the adjacent bed who had just vomited all over the place. EDs are always an amalgam of sounds and smells. Moans, tears, urine, sweat, and desperation hang in the air, competing like pheromones, trying to lure the doctor and win the battle of who gets seen first.

Samuel was lying on the bed, his wife, Christy, sitting next to him on a plastic chair. He had an IV in his arm, an oxygen tube in his nose, and a wary look I've seen a thousand times, as if thinking, *Are you here to help me or tell me something awful?*

He was solidly built, square jawed, with crew-cut brown hair. He had a University of Alabama Crimson Tide tattoo on his left bicep. In any other context I would have teased him about the fact that Auburn had beaten them in football that year. But on that day—really any day in the ED—scores and rivalries didn't seem as important. Because if he had a GBM, the only score that would matter to him would be GBM 1, Samuel 0.

"I'm Dr. Warren," I said. Every time I meet a patient like this, I have a decision to make: Do I go with *distant, emotionally detached surgeon* or with *compassionate, approachable guy who happens to be a surgeon*? It has to happen instantly because you really can't change it later. How will I play it?

"Hey, Doc," he said, "is the man next to me okay? He seems like he's really sick."

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His gentleness disarmed me. Here he was, lying in an ED bed in a gown, surrounded by the smells and sounds of misery and fear, and having just crashed his car after having a seizure, but he was concerned about another patient.

"I don't know. I'm sure Dr. Stinson will take good care of him."

Samuel smiled. "Has anyone ever told Doc Stinson he looks just like Abraham Lincoln?"

I laughed. This guy was something else.

"What happened to you today?" I logged on to the computer next to his bed and loaded his MRI scan while he replied.

"I was driving to work, going in two hours early because we're having a get-together tonight for my birthday." He pinched the bridge of his nose. "I'm so glad it wasn't later in the morning. If there had been other cars on the road . . ."

Christy reached over and took his hand. Samuel let out a long breath. "I've had a weird headache behind my right eye for a couple of months now, but today it was worse."

"You never told me you've been having headaches!" Christy stood and cupped his face in her hands. "You have to tell me these things," she said. Her green eyes pooled with tears, but there were other emotions too: Anger at not knowing something that might have made a difference. Fear of the unknown medical bogeymen hiding in a headache.

He looked at her and nodded. "I know. I didn't think it was a big deal. Anyway, the last thing I remember is seeing flashing lights. Then I woke up in the ambulance."

The next part was identical to a thousand other conversations I've had with patients: "Here's your scan. This looks like a tumor, but we can't know for sure what it is until we do a biopsy. Don't worry; we're going to find out what you're dealing with and then make the best plan for getting you better."

I suspect patients don't hear a word after I say "tumor."

Samuel looked up at me, grabbed my arm, and said, "Let's do this, Doc. I trust you. I'm gonna be okay."

I nodded slowly. "All right. We'll go to surgery this afternoon."

But when I turned to walk away, my eyes crossed the computer screen again, and I saw the white-and-black image of the tumor nestled deep inside his right temporal lobe. Samuel's assertion that he would be okay echoed in my mind, and

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even as my words were leaving my mouth, I had a very different thought. Thousands of patients the world over, including Stinson's sister-in-law, had met the tumor Cushing and Bailey called glioblastoma multiforme. All of them, except perhaps a few whose diagnoses were inaccurate, had succumbed to its power.

In a few hours I would know, but I already *knew.* I kept the thought to myself and left the ED. As much as I wanted to smile and agree with Samuel—"Of course you'll be okay!"—I instead said to myself, *I've seen the end of you.*

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3

The Devil, Magnified

> With that, the future I had imagined, the one just about to be realized, the culmination of decades of striving, evaporated.
>
> -—Paul Kalanithi, *When Breath Becomes Air*

Two hours later I stood in the operating room with Samuel's head in my hands. There's a moment before every brain surgery in which I hold the patient's head and apply the Mayfield head holder, a big U-shaped metal device with three sharp pins. I squeeze it onto the scalp until the pins break the skin and press into the skull with sixty pounds per square inch of pressure. This clamps the patient's head to the table so it doesn't move while I'm drilling a hole in it.

Once I've got the head secured, I always place my hands on the scalp for a second and look down at the patient. It's my moment of silence, of acknowledging that the thing I'm about to do is bigger than I am. The place I'm going is holy, and the job I'm doing is sacred and dangerous and beautiful and delicately violent. I don't want to cross into that world without reminding myself there are things I can't control in there. I need help.

God, direct my hands to accomplish this task safely. Let me enter his brain but not his mind, diagnose and treat his disease but leave no trace of my trespass. Let Samuel wake and still be Samuel. And let the answers be good, the scans be wrong, the problem be manageable. Above all, let me take care of him in a way that honors you.

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Fifteen minutes into the surgery, a hand-sized piece of Samuel's skull was sitting in a sterile basin on the back table, and I looked down at his brain. It was ugly, gray instead of pink, and not pulsing with his heartbeat as it should.

Nate, my scrub tech, leaned down and squinted. "That vein's pretty swollen, Doc," he said. Nate and I have been to war together, literally. (In fact, I wrote about him in my first book, *No Place to Hide: A Brain Surgeon's Long Journey Home from the Iraq War.*) We've been in bunkers in Iraq together while mortars landed around us, and we've saved and lost a lot of lives side by side. There's no one I trust more than Nate in the operating room. He came to work for me after the war, and along the way he became my son-in-law and the father of my first two grandchildren.

I've learned over the years to listen to Nate's comments in surgery. He's got this way of seeming to be off in space, thinking about or discussing something irrelevant like fantasy football or who the Red Wings have in the playoffs next, and then he'll drop a Socrates-like bit of wisdom on you.

At the front end of the hole I'd cut in Samuel's head was a vein the size of my little finger—the vein of Labbé. It was blue and bulging, and when I saw it, icy fingers crawled up the back of my neck. The clotted Labbé vein could stop the blood flow out of Samuel's head. If I couldn't fix it, the pressure would rise until he died of a massive intracranial hemorrhage when the blood vessels finally ruptured.

Nate and I looked at each other for a second and passed the thought between us without words: *Samuel's in trouble.* We'd lost a sergeant in Iraq from a thrombosed Labbé vein, and I wasn't ready to watch another young man die from the same problem. If I could relieve some pressure, the blood flow in his vein of Labbé might not clot off and he might not have a stroke.

That's when I remembered another patient.

Wilford Hall Air Force Medical Center
San Antonio, Texas, 2001

The colonel stared straight ahead, blinking every few seconds. I flashed my penlight into his eyes and watched his pupils constrict. He smelled like death. His skin was

pasty, green, and cold. He wore a stocking cap because his wife worried about his head being cold. He'd lost all his hair after the fifth radiation treatment, his appetite after the twelfth, and his mind after the thirtieth.

But his tumor kept growing.

I sat down next to his bed that day, held his wife's hand, and looked at the skeleton in development who used to command warriors and shoot down MiGs. Now he looked as if he'd spent five years in a POW camp. But he kept blinking. And breathing.

I remembered the last time I'd heard his voice—the last words he ever spoke. It had been a couple of weeks before, when the MRI showed that his GBM had doubled in size despite surgery, chemotherapy, and radiation. I gave him the news, and he cleared his throat. He set his jaw, no doubt choking down his fears and ordering his thoughts as he must have in war, and looked directly into my eyes.

"If you knew this was going to happen, you should have let me die in surgery. Why'd you do this to me?"

As that memory flashed through my mind, I looked into Nate's eyes, and he nodded as if he knew what I was thinking.

From the head of the bed, the anesthetist, Gary, leaned over the drapes. "Doc, his pressure's up a bit. Heart rate's slowing too."

The enlarged Labbé vein, increased blood pressure, and slow heart rate could mean only one thing: Samuel's brain was swelling. Left unchecked, it would cause the brain to bulge into the opening I'd made in his skull and eventually kill him. All I had to do was nothing, and Samuel would be spared what I knew was coming for him if his tumor turned out to be a GBM.

I thought of the colonel's accusing eyes, his desperate and angry final words, and wondered what Samuel might choose if he were given the choice.

Glioblastoma kills everybody.

One hundred percent fatal. The old adage in neurosurgery is that if you've got a ten-year survivor of GBM, you made the wrong diagnosis.[1]

And it's an ugly death.

You see, brain tumors don't just steal your life. They let you know they're eating

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up bits of who you are, taking away your ability to engage in the few and precious remaining moments you have on this planet. They hurt you, maim you, wipe out your command and control centers like enemy missiles before the ground invasion. Shock and awe on your nervous system. And in the early months, you're fully aware of their attack.

Brain tumors steal pieces of your mind—and your peace of mind.

"Doc," Nate said. His eyes met mine and then looked down at Samuel.

I had to act.

I wasn't here to discern what Samuel would want. I was here to take out this tumor, identify the enemy, and form a treatment plan. Glioblastoma would eventually kill him, I was sure.

But not today.

"Fukushima suction, bipolar," I said. Nate handed me the instruments, and I quickly removed most of Samuel's right temporal lobe, the one with the tumor buried inside it. Years ago Dr. Jack Wilberger in Pittsburgh taught me epilepsy surgery. The most frequent procedure we performed together was a temporal lobectomy because that area of the brain is a common culprit in seizure development. Dr. Wilberger's skill and speed prepared me well for days like this one, in which a clean temporal lobe resection not only removes the tumor but also quickly relieves brain pressure and saves the patient's life.

I put the tumor-filled, fist-sized portion of Samuel's brain into a plastic jar and sent it off to the pathology lab with an orderly, who handled it as if it were a vial of Ebola or anthrax. She held it away from her body, a sickly look on her face. The OR staff has seen enough of these cases to know when they're in the presence of death.

Samuel's Labbé vein relaxed; his pressure normalized; his heart rate returned to normal.

I'd saved him.

But had I helped him?

Once Samuel was in the recovery room, I walked down the hall to the pathology lab. Dr. Grossman was working frozen sections that day, so I stepped into his office and found him sitting at his microscope.

"Hey, Grossman," I said.

He looked up, a surgical glove on his right hand and a turkey sandwich in his left. "Suppose you're here to see the tumor," he said after swallowing. He had a dab of mustard in the right corner of his mouth and a pink stain on his shirt, presumably from the bottle of solution sitting on his desk next to the microscope. Pathology is the only medical specialty in which a practitioner can have lunch and treat a patient at the same time without anyone protesting.

"Yeah, tough case. The patient had a seizure and crashed his car. Turned out he had a brain tumor."

"A nasty one at that." Grossman motioned with his sandwich for me to sit across the scope from him.

I moved a stack of papers from the chair on the observer side of the microscope and sat. I leaned forward and looked into the eyepieces, using my left hand to adjust their width to fit my eyes.

When Grossman moved the slide into position, I saw a cellular nightmare.

"Trifecta of terminality, we call it," he said. "Hypercellularity, highly mitotic, necrosis. Lots of blood vessels too. Everything you need to make the call."

"GBM," I said.

Grossman moved the slide around and showed me all the tumor's features. Too many cells, most of them dividing. When cells divide, it means the organism is growing. But brain cells don't divide in adults.

Cancer cells do.

In the middle of the slide was a lake of deadness. Cells had grown so quickly that this portion of the tumor outpaced its own blood supply. Whole regions of the tumor starving for oxygen and dying off so the edges could continue their invasion of Samuel's brain. This is called necrosis, and it is the sine qua non of glioblastoma.

GBM got its name because of the variety of things going on inside itself. When a pathologist looks at the whole tumor, there are multiple regions that can look stunningly different. *Multiforme* means what it says—there are multiple forms (types of cellular activity) in each one. We always take several biopsy specimens in these cases because if you move the biopsy needle a few millimeters inside a GBM, you can go from a highly malignant, obviously cancerous sample to a region where all the cells look more normal.

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But once you find necrosis, you know it's a GBM.

Samuel's tumor was highly necrotic.

Slide after slide showed the malignant freak show happening in Samuel's head. The leading edge of the tumor was composed of cells lined up like Satan's legion, heading out to steal, kill, and destroy. It was the devil, magnified for me to see. Taunting me: "You can't stop me, Doc. I'll take this guy out but on my timeline."

I pushed back from the table and stood. "I hate looking at those things."

He motioned with his sandwich again—*Hang on a second*—swallowed the bite in his mouth, and said, "At least it looks like you've got a clean margin behind the tumor. I think you got it all."

I looked up at Grossman and shook my head. "You know as well as I do that margins don't matter in this disease. He's done for. Thanks, buddy. I have to go talk to his wife."

"Good luck." He gave me a look that said *Glad it's you and not me* and slid his stare back into the microscope.

I'd seen enough.

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