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Treating Glioblastoma Multiforme

Tim Hansberger, CST

Glioblastoma Multiforme (GBM), nicknamed "The Terminator," is a disease that many still know little about. Some public attention came in recent years when Senator Ted Kennedy was diagnosed with this disease and, ultimately, died from it.

Arising from the glia cells in the central nervous system, gliomas make up 60% of the estimated 17,000 primary brain tumors diagnosed in the United States each year. These tumors primarily affect adults and are located in the cerebral hemispheres. Gliomas are also more prominent in whites and more often in men and women. GBM can affect people at any age though it is more prevalent between the ages of 50 and 50. Gliomas are divided into four stages with stage 1 being the least aggressive and stage 4 being the most aggressive. Unfortunately, GBM is classified as a stage 4 glioma. This is also the most common form of malignant brain tumor in people. GBMs are a primary brain tumor that affects only the brain and spinal cord, and does not metastasize to other parts of the body.

LEARNING OBJECTIVES

- ▲ Learn about the disease nicknamed "The Terminator"
- ▲ Examine the surgical procedure for combating GBM
- ▲ Discover why this brain disease is so aggressive and hard to treat
- ▲ Follow the step-by-step procedure used for treating a patient who had a GBM tumor on his right temporal lobe
- ▲ Identify which instruments and equipment is needed for these cases

THE CAUSE

The etiology of GBM in most cases remains unknown. Five percent of malignant gliomas are familia gliomas (pertaining to family or heredity), and less than one percent come from a known genetic syndrome, such as neurofibromatosis, Turcot syndrome or Li-Fraumeni syndrome). In 2009, scientists at Columbia University discovered two genes that appear to be responsible for GBMs. These genes were found to be active in 60% of all GBM patients. These two genes are C/EPD and Stat3, and when simultaneously activated, they activate other genes, which cause cells to become cancerous. Doctors also have confirmed that there are general risk factors for these types of brain tumors, including exposure to radiation, environment and pollutants. Recent studies also show that cell phone use may pose a significant risk.

SIGNS AND SYMPTOMS

The general signs and symptoms may include headaches, nausea and vomiting, personality changes and slowing of cognitive function. Headaches are usually more severe in the morning and can vary in quality and intensity. Individuals affected by GBM may see changes in mood, personality, concentration and mental capacity. Hemiparesis, sensory loss, visual loss and aphasia are some of the focal signs for GBM.

DIAGNOSIS

This disease can be diagnosed in several ways. The first test performed is a neurological exam. This exam includes checking eye movements, hearing, sensation, muscle movement, sense of smell, sense of balance and coordination. Doctors will also check the patient's memory. Equipment used in diagnosis is the MRI, CT scan and the PET scan. Doctors may choose to perform a lumbar puncture and a biopsy of the tumor. Unfortunately, there are currently no specific laboratory studies that have been helpful in making a diagnosis of glioblastoma. At this time, the study of choice is MRI with and without contrast. Contrast is a radiopaque substance is given intravenously that outlines the brain tumor to show its location.

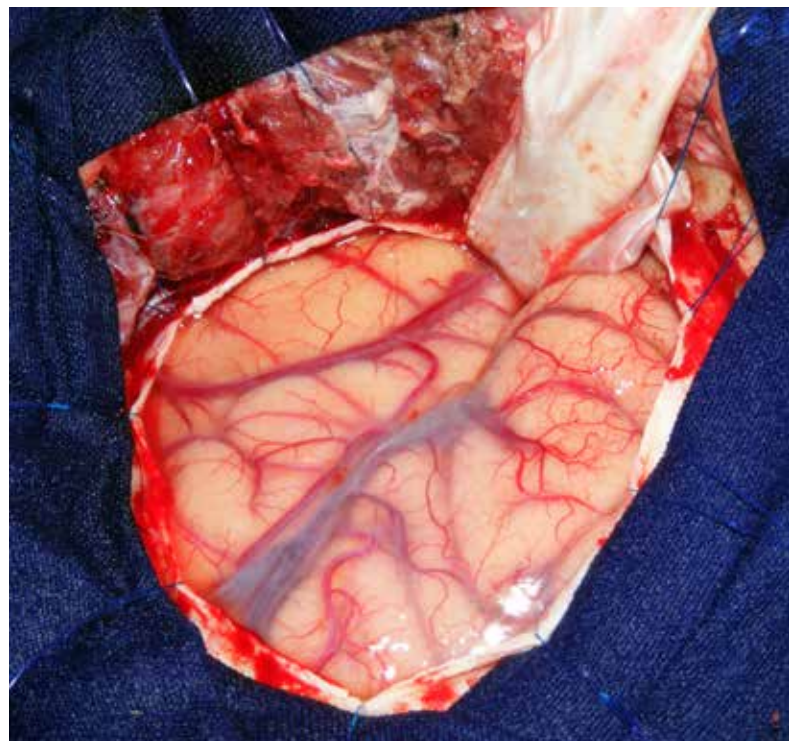
TREATMENT

After doctors identify the type and where the tumor is located, they will determine treatment. How far along the tumor has progressed and the location of the tumor dictates the order of treatment the patient will receive. Generally, if the tumor is in a good location and not too far advanced, surgery is the first step to treat GBM.

SURGICAL INTERVENTION

For this article, the surgical procedure reflects a case study based on a 72-year-old male diagnosed with a right temporal tumor. The patient was placed into the supine position and rolled slightly to the left with his left arm on a foam-padded arm board. Gel padding was placed under his left shoulder and his right arm was tucked at his side for comfort. Gel heel protectors and a gel mattress were applied as

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well. A pillow was placed under his knees, with the safety strap fastened below the hip over the anterior thigh. A sequential compression device was applied to his legs with a Bair Hugger applied to his lower body. His head was tilted slightly to the left, held in place with a three-pin Mayfield head clamp. After the patient was positioned correctly, a craniotomy drape was placed making sure that the anesthesiologist had access to his face to maintain hemostasis during the procedure. The surgeon then used a Brainlab frameless system to pinpoint the location of the tumor bed and used a skin marker to mark the incision path. (The Brainlab is like a GPS unit that can pinpoint the tumor location to within 2mm.)

The incision area was shaved, to ¼ to ½ inch on each side of the marked path. Time out was then called. All members of the surgical team agreed the information was correct and the procedure was allowed to begin.

THE INCISION

The surgeon asked for an injection of 1% lidocaine with epinephrine. This injection was to help prevent post-op pain and help control bleeding during the procedure. Two lap sponges were placed on the field to be used for absorbing blood as the surgeon made the incision. Suction was put onto the field and was utilized throughout the procedure to keep the operative site clear. The surgeon asked for the scalpel to begin the incision into the scalp. The incision should be kept inside the hair line, if possible. As the surgeon made the incision, Raney clips were placed around the edges of the incision and the myocutaneous flap to control bleeding. Having multiple Raney clips and applicators available on the Mayo stand will help to speed up the process when placing them. After all Raney clips were in place, the surgeon asked for two towel clips to retract the myocutaneous flap anteriorly. The towel clips held the flap in place as suction was used to keep the operative site clear. A small Cobb elevator was then used to dissect the temporalis muscle from the bone. At this point, the surgeon utilized the Brainlab again to remark the location of the tumor bed.

OPENING THE CRANIUM

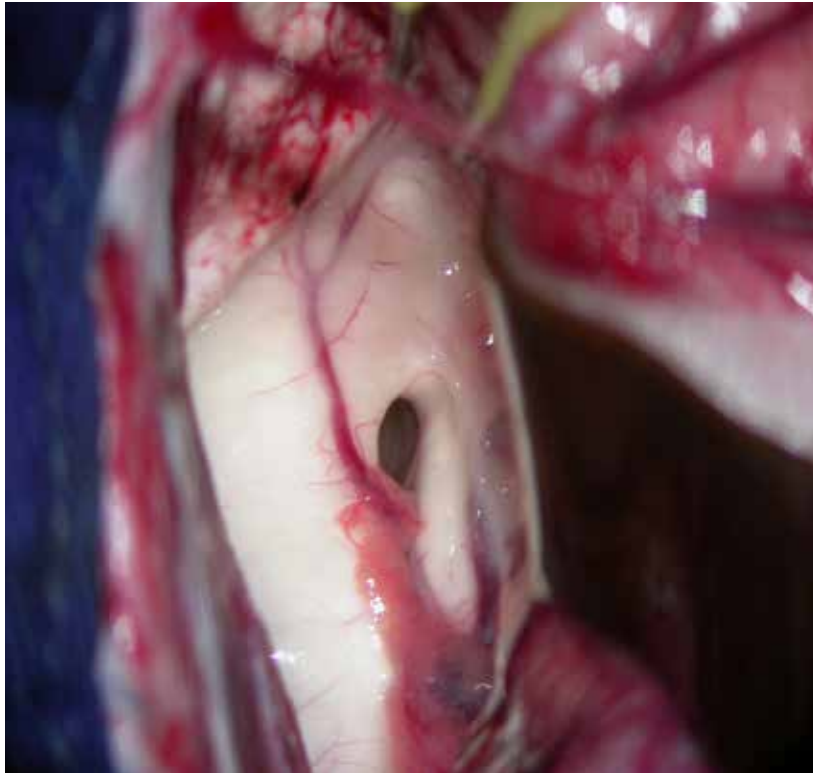
Since the tumor bed was marked on the bone, the surgeon was handed the craniotomy drill with the burr inserted. This was used to make two burr holes through the bone, and then a side-cutting craniotome was used to open the craniotomy flap. The craniotomy flap was turned and the dura

was dissected using a Woodson elevator and spatula. The craniotomy flap was placed into a sterile sponge soaked in an antibiotic irrigation and safely stored on the back table to be replaced later in the procedure. The surgeon asked for 3-0 monofilament for tack up sutures in the dura. After the sutures were in place, a pair of Taylor dural scissors were handed to the surgeon. Once the dura was opened, it was retracted using the tack up sutures to expose the temporal lobe and the most inferior portion of the frontal lobe and Sylvian fissure. The Sylvian fissure was greatly displaced superiorly so 5,000 units of thrombin was applied topically to help control bleeding. Using the Brainlab to again mark the edges of the tumor, the surgeon asked for Cushing brain forceps. The forceps were used to enter the tumor centrally where the surgeon removed a sample that was sent for intraoperative pathological evaluation. The tumor continued being gutted from the center and then laterally. A cavity was made, which reflected the edges of the tumor exposing normal brain tissue. Once all the edges had been reflected inward, the surgeon draped patties over the vessels and retracted them. In this case, the vessels were draped over the tumor instead of through the body of the tumor. Suction was used to keep the tumor bed free of fluids. The Brainlab was again used to locate the margins of the tumor bed and then the surgeon removed a large portion of the tumor en-bloc. The bipolar electrocautery was passed to help obtain hemostasis and hemostatic agent was placed in the tumor bed. At this point, results from the lab came back and pathology determined it was a high-grade glioma.

Since there was confirmation of a high-grade cancerous tumor, chemo wafers were placed in the tumor bed. The surgeon placed them only in place he felt a recurrence was most likely to occur, carefully avoiding the Sylvian vessels. All instruments used for placement of the wafers were set aside and disposed of in the chemotherapy hazardous waste bin. The patties were removed from around the Sylvian vessels using a DeBakey forcep.

CLOSING THE DURA

The surgeon asked for a piece of artificial dura, which was handed to him using a DeBakey forcep. He placed it over the wafers and in place by 5-0 PDS II. The entire cavity was filled with an antibiotic irrigation. While the surgeon was tacking the dural graft in place using the circulator, the first closing soft count of laps, raytecs, patties, sutures, blades, suction tips, hypos, scratch pad and Bovie tips were



performed by the surgical technologist. The surgeon then closed the dura layer with a 4-0 PDS II, which was handed to him on a medium needle holder. The dural onlay graft was handed next, which was sutured in place with S-0 PDS II on a small needle holder. The graft was attached using interrupted sutures. The surgeon chose to use a dural graft above and below the dura was to create a water-tight closure. The wound was irrigated with an antibiotic irrigation. Then the surgeon was ready to replace the craniotomy flap. He re-approximated it using three titanium plates and six small titanium screws, which were self-tapping and screwed in using a handheld hexagonal screwdriver. The screws were loaded one at a time and handed to the surgeon with the tip up. The plates were attached to the bone flap first and then screwed to the skull.

CLOSING THE SKIN

Underneath the myocutaneous flap was irrigated with an antibiotic solution to prevent infection. The surgeon closed the temporalis fascia using 3-0 PDS II sutures on a small needle holder. A number 15 blade was used to make a small stab wound at the apex of the myocutaneous flap to insert a small hemovac drain. The surgical technologist handed the surgeon the Raney clip removers and a small basin to place them in, and fresh sponges were placed on the field for

controlling any bleeding that occurred while removing the Raney clips. As the Raney clips were removed, the skin was closed. The surgeon used two Adson tissue forceps and a skin stapler to approximate the skin edges and achieve good hemostasis. The final count was performed and the surgeon asked for sec more of 1% Marcaine with epinephrine. All counts were correct and there were no complications were this case. Post-op diagnosis agreed with pre-op diagnosis. A total of 10cc of 1% Marcaine with epinephrine was used, 1,000 cc of irrigation with antibiotic solution was used and 1240 cc of suction was collected.

APPLYING THE DRESSING

The wound was cleaned, dried and one tube of antibiotic ointment was applied under a sterile dressing. The dressing consisted of 3x4 nonadherent sterile pads, 12 ply 4x4 sponge gauze and the patient's head was

lightly wrapped with 4x84 wide soft bandage rolls, held in place with silk tape. The patient was extubated and sent to the PACU in stable condition. At that point, the sterile field was broken down and the room prepped for the next case.

COMPLICATIONS AND POST OP

Common complications from this procedure include bleeding, infections, reactions to anesthesia, loss of brain function and swelling. Following surgery, a check-up will be scheduled to get the patient started on chemotherapy and radiation treatments. Common side effects of chemo include hair loss, mouth sores, loss of appetite, nausea and vomiting, infection, bruising and tiredness. Radiation is used in conjunction with chemo when treating most patients with GBM tumors. This is a treatment that is focused on destroying or shrinking tumors only in the affected parts of the body. Side effects of radiation include irritability, fatigue, nausea, vomiting, headaches and partial loss of brain function. Another therapy that can be used is tumor starvation. This therapy works by blocking a protein called VEGF, which is produced by normal cells and overproduced by cancerous cells. Common side effects to tumor starvation includes infection, tiredness, high blood pressure, nose bleeds and diarrhea.

PROGNOSIS

Unfortunately, the prognosis of this disease is not good. The tumor will return. Without any treatment, the average patient will live for an average of three months after diagnosis. With surgery, chemo and radiation, the average patient's life expectancy is still only six months from initial diagnosis; however, some patients have lived for long as three to five years after the operation.



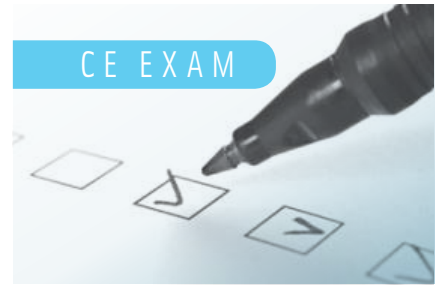
ABOUT THE AUTHOR

Tim Hansberger, CST, lives in Bradenton, Florida. He graduated the Surgical Technology Program at National College in Harrisonburg, Virginia, with high honors on May 21, 2012. He also earned a spot in AST's Honor Society. He works at Manatee Memorial Hospital, where he is part of the neurological team.

This article is dedicated in loving memory of my mom and dad who passed away from cancer; my dad in August 2006 and my mom, from GBM, in April of 2008. They are and will always be dearly loved and missed.

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