BroadcastMed | std_webex_example_bodman-bcm-1080p.mp4

ALEXA BODMAN: Today I'm going to talk about mass lesions-- tumors and infections, vascular conditions, sequelae of trauma, ventriculomegaly, and some congenital anomalies.

Mass lesions of the brain have a large differential diagnosis. They can be malignant neoplasms, such as gliomas, lymphomas, metastases; benign neoplasms, like meningiomas, vestibular schwannomas, pituitary adenomas; infections, which can be bacterial, fungal, tuberculomas, toxoplasmosis, or even parasites, which is more common here in Texas, like neurocystercosis; autoimmune diseases, such as tumefactive MS or sarcoidosis; and then, of course, intraparenchymal hematomas, which usually present in the emergency department.

The first mass lesion I'm going to talk about is gliomas. Here is an MRI of a glioblastoma. You can tell it's a glioblastoma. It's a ring-enhancing intraparenchymal lesion.

Gliomas are a rare tumor. There's about 16,000 new cases in the US every year. Over half of these are glioblastoma, which is the worst kind, the grade 4.

They commonly present with headaches or seizures. They often present as a neurologic deficit only. Sometimes patients have a loss of a visual field. It's occipital lobe glioblastoma. Sometimes they only have focal weakness.

And sometimes they don't really have a lot of symptoms at all. They just present as they don't feel quite themselves. Their memory is a little bit different. They're having personality changes. The MRI here is of a patient who presented with several months of headaches and then eventually had a seizure. He has a grade 2 glioma.

There are several different types of glioma, and this is the newest classification, which is highly dependent on molecular subtypes, which is why biopsy is necessary-- the most common being glioblastoma. Then you have your astrocytomas and your oligodendrogliomas being the most common found.

Gliomas are highly dependent on their molecular subtyping for diagnosis and also prognosis. So if it's IDH wild-type grade 2 or 3 glioma, it acts like a GBM. It it's IDH-mutant, and 1p/19q is present, it is, by definition now, an oliogodendroglioma. And if it's absent, it's an astrocytoma.

So the reason neurosurgeons are involved with glioblastoma is there's been a lot of literature showing that the amount of tumor we get out improves prognosis. In 2001, this was shown at roughly 98% has a survival benefit. And that's the surgery itself, without-- independent of other treatment, has a survival benefit if you can get greater than 98%.

A study later on, in 2011 out of UCSF, showed the minimum amount you need to get in order to have that surviva benefit is 78%. The more you get, the better the prognosis. Again, though, surgery is not curing this.

There's lots of tools we have nowadays to optimize our chances of getting gross total resection. The MRI here is a patient I did the other day presenting with headaches and personality changes with this glioblastoma. One of the oldest tools we have right now is navigation. So we use tractography, called DTI imaging, to map out the neural pathways. And this can kind of help us figure out where the functional cortex is so we can avoid it during surgery and get the most tumor out in the safest way possible.

Another tool we have is 5-ALA. It's a dye that the patients drink about three hours before surgery, and then it is metabolized by the tumor. And then under blue lights, it shows up as an orange color.

Other tools that we have are things like intraoperative MRI, which we don't have at this facility at this point. But that can be quite burdensome because you have to actually bring the patient to an MRI while they are still open. Another tool is awake craniotomy in eloquent language areas or in patients who are artists or musicians as you don't want to decrease any function. So you can actually have them awake to try to get out as much tumor as you can without causing any neurologic deficits. Another reason is neurologic deficits are associated with [INAUDIBLE].

With tractography and functional MRI, along with navigation, awake craniiotomies are less and less necessary because our imaging is getting so good. And if we don't think we can get gross total resection, we still need a biopsy just to get the diagnosis because otherwise-- that's the only way to obtain the molecular markers.

So here is an intraoperative photo. So on the left, I am resecting a glioblastoma. That suction tip I have actually stimulates. So this was in a motor cortex. So while the patient is asleep, I can map out their motor, while resecting the tumor. It's an interesting new tool we have, and I use it here at St. David's as well.

And then over on the right side, this is what that 5-ALA dye looks like. So under blue light, as you can see, the glioblastoma lights up this bright orange color. This really helps aid in getting a gross total resection, especially in areas where you can be very aggressive, like the frontal lobe or the temporal lobe on the right side. Of course, it's the brain, so we can't take any margins. And the glioblastoma can infiltrate into functional tissue, and you have to leave anything that's functional behind.

One of the things that can look like glioblastoma is primary CNS lymphoma. There's a few things on the MRI that look different. It's usually more multifocal. It can be more solid, and then it usually goes into the corpus callosum, like this image here.

One of the big things is if we think it might be CNS lymphoma, you cannot give steroids prior to biopsy because it will result in false negative results because it responds so quickly to the steroids, though the steroids is not curative. It just causes it to shrink, and cytoreductive surgery is not useful in this case. We just do biopsies.

CNS metastases are also commonly found. It's been known for over 30 years that resection of solitary metastatic lesions, followed by radiation, improves both local recurrence and overall survival alone. And these are the original charts showing with resection radiation the decrease in recurrence, as well as the improved survival. And then multiple studies after this have shown that resection benefited solitary and oligometastatic lesions followed by radiation.

Here's one of my patients. She's a 59-year-old who had no known history of cancer. And she had about one month of vertigo and gait instability, and she got an outpatient CT scan that showed something was going on. Then she got an MRI which showed this. I went in to resect it.

It actually turned out it was metastatic lung cancer. She had complete relief of her symptoms after surgery. She no longer needed to use a cane, and her vertigo was gone. She felt-- all of her headaches were gone. She felt significantly better. And then she got radiosurgery to the surgical bed after.

Infectious processes also show up as mass lesions, and these are more neurosurgical emergencies. They're often associated with recent infections extracranially, like a dental procedure or sepsis, IV drug users, sinus infections, ear infections, endocarditis. A lot of times, these patients don't have fevers. They don't always look sick. This does require urgent surgery for both diagnosis, cultures, and treatment because you want to decrease that mass effect.

This is a patient I actually wrote a case report on when I was in residency because it was a very interesting case. He was a 45-year-old male who presented with hiccups to his doctor, and they couldn't figure out why he had hiccups, couldn't figure it out. He had a recent camping trip where he drank some contaminated water, and eventually, they got an MRI of the brain which showed this abscess. You can tell it's an abscess because on the DWI imaging it has restricted diffusion, which is different from tumors in the brain. Unfortunately, even after surgery, it took about six weeks for his hiccups to get better.

Another thing frequently found are benign neoplasms, most common being meningioma. Everyone sees patients with meningioma as it's the most common benign brain tumor. We always call it benign, but actually, only 92% are benign. They can be atypical or anaplastic, and the atypical and anaplastic tend to grow faster and be more symptomatic.

These are traditionally thought to arise from the arachnoid cap cells, and they can be found anywhere in your CNS, brain or spine. They're often found incidentally on MRI, but even though they are an incidental finding, they need to be followed and sent to a neurosurgeon.

If they do become symptomatic, they often present with headaches, sometimes seizures, a focal neurologic deficit. They can have unilateral blindness depending on the location. Patients can lose their sense of smell if it's an olfactory meningioma. And then sometimes patients just present with changes in cognition. They'll say, I feel like I'm getting demented, or they're just not quite themselves.

They're small and asymptomatic. We typically observe these with serial imaging. I usually get an MRI every two months to make sure it's not one of the rapid-growing meningiomas, and then about a yearly MRI for 5 to 10 years.

If it is growing, and the patient-- it usually requires treatment, especially in younger patients because if it's growing 1 or 2 millimeters a year, and you're 30 years old, when you're 60, that's going to be a very large meningioma. Radiosurgery can treat some of these smaller lesions or craniotomy for larger ones or symptomatic ones because one of the only-- if it has a significant amount of edema associated with it, surgically resecting it really helps with that. It can also help with symptom relief because you immediately get rid of that mass effect.

And then, obviously, symptomatic and large lesions require surgical resection. I have several examples of these because patients with meningiomas-- they are quite vascular tumors, and you can lose a lot of blood. And sometimes you can get strokes related to it. But when these surgeries go well, they go very well. You treat a patient, and they're typically very happy.

Here's an example. This patient, she was a 40-year-old who underwent MRI of the brain due to hormonal changes. And this was a completely incidental finding-- this huge 5-centimeter meningioma. I took it out. And she was asymptomatic, but she was only 40 years old.

This thing was just going to keep growing, and eventually she'd present with stroke-like symptoms, changes in her language. And once you have that, it's not always reversible. She did really well. She had a great cosmetic outcome and no complaints, and now she's cured. They do have a slight recurrence rate, so I do follow them for several years.

Here's a 70-year-old male who presented with right-sided weakness, and he felt like he had dementia for the last two years. And you can see here, he had very large, 6-centimeter left frontal subdural hematoma. All of this is edema and mass effect around it. And his wife was concerned about his dementia. They had just retired, and he wasn't going to be able to do his usual activities.

So we surgically resected this, and he had complete return of strength in his legs, and then after several weeks, complete return of his mental faculties. He was so surprised. He was so happy that he wasn't getting dementia. It was just a tumor. Take it out, he and he felt a lot better.

Here is a picture of me and my fellowship director at Emory, Dr. Jeff Olson, and these are matching mugs that one of our meningioma patients made us. She presented because she was getting a deformity in the side of her head from the meningioma growing through her bone and actually growing through her temporalis muscle. And so we surgically resected the whole thing, and we also reconstructed her bone. And she had a perfect cosmetic outcome, as well as total resection, so she was very happy with us.

Another benign tumor that can cause a lot of pesky problems because of where it's located is vestibular schwannoma. These grow in your posterior fossa, which is a very small amount of space, so any sort of lesion back there can cause a lot of problems because there's just no space for it to grow, even though it's completely benign.

It's about 8% to 10% of brain tumors-- often presents with unilateral hearing loss. And that's typically how these are found, the patient's complaining like, I can't hear as well on this side. And then they need a further audiogram which shows that they have unilateral hearing loss, and then they end up with the MRI.

They also can present with dysequilibrium, vertigo, vestibular symptoms. And even though it's benign, when it does grow, it causes significant problems. It can cause severe neurologic deficits, and eventually, it'll grow large enough to get hydrocephalus. And before we had surgery to get into this area of the brain, patients used to die from these.

The treatment of these is very variable. It all depends on what it looks like. So this is why they always need to be sent to a neurosurgeon. If it's very small, a lot of times, I just observe them because sometimes they're only 4 millimeters. It'd be even hard to find surgically.

Those really small ones sometimes don't grow too, so you just watch them for several years. A lot of them-- most of them show a slow growth pattern of roughly 2 millimeters a year. And then occasionally, there are rapid-growing tumors, and they can grow up to a centimeter a year. So I always do a short-term follow-up MRI, followed by annual ones.

In the small ones that are growing, radiosurgery is considered. So if a patient comes in-- if they're, like, middle-aged and they have a 1 - 1 and 1/2-centimeter tumor with no brainstem compression, radiosurgery is a great option for them. You're in and out, and there's no postop recovery and none of the risks of surgery. But if you're only 50, and you have this 1 centimeter tumor, by the time you're 80, that thing is going to be 4 centimeters.

Craniotomy is indicated for growing lesions or ones with brainstem compression. And facial nerve dysfunction is extremely common postoperatively. As long as the nerve is intact at the end of surgery, that will recover. It just takes 6 to 12 weeks.

You're probably wondering why I have a picture of the Hulk, Mark Ruffalo, over there. So he actually had a vestibular schwannoma. And he had it resected. And he had facial nerve dysfunction, and he thought his career was going to be over. But it recovered. It just takes some time. So whenever you think of vestibular schwannoma, think of the Hulk.

So here's one of my patients with a vestibular schwannoma. He presented with actual hypertensive urgency. And he was just complaining of headaches, and then as I'm probing-- and then he got a CT scan because of his headaches. I wanted to make sure he didn't have a hematoma. And they found this. And so then he got the MRI.

And it's kind of interesting because on further history, he's like, well, actually, I've had left-sided hearing loss, and I've had trouble walking for several months. And I get really nauseous a lot, and I just-- the room is spinning. And it's this vestibular schwannoma. We'll be taking that out later this month.

Another very common benign tumor is a pituitary adenoma. We see these all the time, very common. There was a pathology study where they sectioned just 100 people, and they found 8% just had an incidental pituitary adenoma. So if enough people get scanned, like MRIs happen nowadays, you're going to find a lot of these.

And the treatment is variable. It depends on the size and the type. They all require evaluation by endocrinology, ophthamology, and us, neurosurgery. This is because they can be functional versus nonfunctional, and even if they're nonfunctional, they can have a tendency to grow.

The sella is a very small space, so as it grows, it can cause things like compression of the optic chiasm with that classic bitemporal hemianopsia, but can also cause other things. And you want to get to it before it gets too big because eventually it can grow over your carotid arteries, and it's much harder to surgically resect. If you can get this thing out, you can cure these patients.

So everyone always orders the hormone labs, and elevated prolactin is very common. But that does not mean it's prolactinoma. A lot of times in macroadenomas, they're large enough they actually put pressure on the infundibulum, and It interferes with the transmission of dopamine, which suppresses the prolactin. And so without that, you have an elevated prolactin.

Now if the prolactin is very elevated, over 250, that's definitely a prolactinoma, but small elevations in prolactin are just typically stalk effect. If it is a prolactinoma, these are managed medically first. Surgical resection is indicated in patients who don't tolerate the side effects of cabergoline or those who just show growth despite therapy. Another time is also women who want to get pregnant.

Any tumors that secrete growth hormone and cause agromegaly or cortisol, causing Cushing's-- they require surgical resection because that's the only chance of a cure. A lot of times, these are macroadenomas, and sometimes patients need more than one surgery to get it out. And I've actually-- my fellowship, I did a significant amount of gliomas and pituitary adenomas since I worked with Nelson Oyesiku as well.

And we actually had some patients who would have two macroadenomas, and one was a growth and one was a cortisol. Those were always interesting cases. Nonfunctional macroadenomas that are over a centimeter and grow on imaging or cause compression to adjacent structures, obviously, require surgical resection.

Here is a case I did a week or two ago. So this is actually how we do it. So we do it all through endoscopic endonasal-- that's the common way of doing it. now. We used to have to-- way back when, they used to go up through the lip, but this is a lot more humane. There's almost no pain with these. You go in through the nose. You get this beautiful imaging.

So it's hard to tell unless you've looked at a lot of these, but this is actually looking up into your sinoid sinus. And so here is your sella. And this is your clivus. And the carotid arteries are right here. They're covered with a thin layer of bone. And then this is more up close view. So the carotid arteries are right there.

And so we go right between it-- in bigger tumors, actually I actually off all of this bone from carotid to carotid. And then that's the dura. And then you open it up and get in and get this tumor out.

There's a high rate of cure if you can get gross total resection. All the patients need endocrinology evaluation before and after because panhypopituitarism is a risk, particularly if you have to go into the infundibulum. Diabetes insipidus is extremely common. It's like a craniopharyngioma. Almost all craniopharyngiomas get some aspect of diabetes insipidus after surgery.

And then they all need to be watched for CSF leaks. And here it is in one of the recent pituitary tumors. That one's big enough that it's going to require surgery.

There are several other benign tumors that all require neurosurgical consultation. Hemangioblastomas-- these can present with polycythemia as the tumor cells can produce erythropoietin. They all need von Hippel-Lindau evaluation, so they need to be sent to ophthamology, neurology. And surgical resection is how you treat these. Epidermoids, as well-- if they're small, you can observe them. But surgical resection's the only treatment, and same with hemangiopericytoma.

So totally changing topics, another thing people find on outpatient MRIs is vascular problems. So unruptured aneurysms are often found incidentally on CT angios or MRIs. They usually require further evaluation, but not always. They should always see a vascular neurosurgeon, someone who specializes in this, like my partner, Dr. Cooper, because neurosurgeons are the only ones who can evaluate for observation versus coiling versus an open craniotomy for clipping.

And coiling is very popular now. It's very nice, but it really depends on the aneurysm's size, morphology, and patient's age. Clipping for young patients is a more durable solution. It's got a lower rate of recurrence, and then it is also-- for certain morphologies, it is more ideal.

And here's an example of an MRI. This is actually an aneurysm right there that they found. And then here's the aneurysm on angio. My partner clipped this one.

Arteriovenous malformations are often found, and we have a whole grading system for these. Treatment by the neurosurgeon often involves microsurgical removal, radiosurgery, or endovascular embolization. But honestly, it's usually a combination of these. One of the problems with radiosurgery, it just takes several years to shut down that ADM.

Another common thing found in the outpatient setting is chronic subdural hematomas. And this is usually in our older population. It can occur after very minor trauma. Most patients don't even remember any falls or any events, and the reason is as you age, your brain shrinks, and those bridging veins become more vulnerable. So a very minor trauma can cause these.

Patients who have very severe symptoms, they have to go to the ER-- things like hemiparesis or lethargy. If very mild or asymptomatic, they can see us as an outpatient, and then we kind of watch them. If they become symptomatic or they grow on imaging, we can do burr holes to wash these out.

These can recur. They can be very pesky and need to be watched for that. But once a patient has one, they're kind of prone to getting more in the future. It's just the anatomy of their brain. And there's no age limit to evacuate these, either. Definitely do them even in over 90-year-old patients.

Here's an example of an 85-year-old lady who-- she came in, no history of trauma, and she had bilateral lower extremity weakness. So she initially got MRI of her lumbar spine, which was negative. And so then, on more questioning, they found out that she has been having trouble with her left hand, and she hasn't been able to sew as well as she usually did. And so that prompted MRI of the brain.

As you can see here, she has two very large chronic subdural hematomas, particularly on that right side, which is why her left hand was so affected. So I did burr hole washouts, and she was very happy after surgery. She could walk again, and she can go back to sewing. And it's pretty minimally invasive surgery that can make these patients feel a lot better.

Another thing is very common, normal pressure hydrocephalus, as everyone remembers in medical school, wet, wacky and wobbly. Ventriculomegaly is extremely common on MRI as people get older. It does not necessarily mean they have hydrocephalus or normal pressure hydrocephalus. It really depends on the patient's symptoms.

I always send these patients to a neurologist for a full evaluation that they can usually perform as an outpatient. It usually involves a lumbar puncture or lumbar drainage to see if the symptoms improve. If they do, they usually send them to us. Then we can put a shunt in.

And then there's also-- adults can get acquired hydrocephalus, things like pineal tumors, posterior fossa tumors-- sometimes patients have aqueductal stenosis from childhood. They just present late-- after meningitis, and after any sort of head trauma. And some of these, as well as normal pressure hydrocephalus, if we're trying to avoid putting a shunt in, we can also do an endoscopic third ventriculostomy. I had to borrow these pictures from someone else because the pictures I took of ours were a little too grainy.

So actually, we entered the ventricle, and here's the choroid plexus. Here's the [INAUDIBLE], the foramen of Monro. They'd actually passed this little camera through here. And then we actually see the floor of the third ventricle. And you'll have the pituitary infundibulum. You have your mammillary bodies, and then this is the floor that we actually use to burn a hole through.

We have to make sure the patient's anatomy is correct for this because your basilar artery is right there. And if it's in the wrong position, we can't do this because it would kill you. But when it goes well, you go home the next day, and it takes about 15 minutes.

And then there are some congenital anomalies that are commonly seen. One of the most common ones is Chiari malformation. There was one study that basically showed that 1% of the population has this. If you just scanned everybody, about 1% would have this.

So when do we get involved? So when they have significant tonsillar descent, over 5 millimeters below the foramen magnum. And then all these patients, they need both MRI of the brain and the cervical spine because 30% to 70% can be associated with syringomyelia. That number is widely variable because it's common, but no one knows the exact number.

And these can be asymptomatic. If they're asymptomatic, we don't usually do anything, Symptomatic, such as headache-- they can actually get spinal cord injury-type symptoms because of the syringomyelia.

Things like spasticity of their lower extremities should prompt an MRI of the cervical spine, grip weakness, bilateral or extremity numbness, that loss of sensation, all that should prompt MRI of the cervical spine. So we go in and do surgical decompression. The syringomyelia typically improves after that.

Another thing very commonly seen is arachnoid cysts. These are not typically surgical. We always get an MRI because on CT scan, an epidermoid can look exactly like an arachnoid cyst. So the only way to really rule that out is an MRI. Surgery can be indicated in young patients who are very active and have large arachnoid cysts that cause mass effect, or if the patient gets bleeding in that area.

And here is my two little fur babies. Any questions? All right, well, if there's no questions, I'd like to thank everyone and say you can contact me anytime. I have my email up there. And then this is Juliet saying to stay safe, wear your masks, and hand sanitize.