FUNCTIONAL ENDOSCOPIC SINUS SURGERY
WAKE FOREST UNIVERSITY BAPTIST MEDICAL CENTER
WINSTON-SALEM, NORTH CAROLINA
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NARRATOR

For most of her adult life, Betty Keeney lived with the debilitating symptoms of chronic sinusitis, an inflammation within the sinuses. A year ago, Dr. Brian Matthews at Wake Forest University Baptist Medical Center used endoscopic sinus surgery to remove the diseased tissue and open Ms. Keeney’s sinus passages.

BETTY KEENEY

This is the first time in my adult life that I know what normal sinuses feel like. I’m not stuffed up. My nose doesn’t run. I don’t have this sound in my nose. It’s hard to explain. It just feels dry and I’ve never experienced that until after the surgery.

NARRATOR

Because the sinuses are dangerously close to vital structures, such as the eye, optic nerve, internal carotid artery, and skull base, Dr. Matthews uses the latest generation of computer-assisted navigation to precisely operate his surgical instruments.

BRIAN L. MATTHEWS, M.D.

By using the computer-assisted navigation or image guidance, we are able to pinpoint where we are within the sinuses to within just several mm. What this allows us to do is more thoroughly remove disease and at the same time provide added safety to the patient.

NARRATOR

During the next hour, you will see Dr. Matthews perform the image-guided surgery that is helping patients with chronic sinusitis.

BRIAN L. MATTHEWS, M.D.

Many of our patients have significant relief almost immediately. Most of our patients have significant relief within the first two weeks after surgery. Then there certainly is another group that improves over several months afterwards.
NARRATOR

You may email questions to the physicians in the OR by clicking the MDirectAccess button at any time. This program represents the Medical Center’s ongoing efforts to bring the latest developments in healthcare to the public and healthcare professionals.

J. WHIT MIMS, M.D.

Hello. My name is Dr. Whit Mims and welcome to Wake Forest University Baptist Medical Center. We’re in the outpatient surgical center, OR room #23, where we’re getting ready to perform live endoscopic sinus surgery using computer image guidance. First I’d like to introduce you to our surgeon, Dr. Brian Matthews. We’ll introduce you to the rest of the surgical team in just a second. He’s the Director for the Center of Nasal and Sinus Disorders here. Both Dr. Matthews and myself are otolaryngologists, which is a long word that patients have trouble with, but we are surgical subspecialists to deal with problems of the head and neck. Dr. Matthews and myself both have an interest in sinus and allergy disorders of the nose. We spend a lot of our time dealing with those problems.

I’m going to try to orient you to the different technologies we have here and to the room. We’ll be switching back and forth from different looks to help clarify everything for you, but we hope that’s not confusing. We have Dr. Matthews and his team operating up there. This is endoscopic sinus surgery, so everything that they see is done through a telescope. That looks inside the nose at the structures that they’re doing and we have a myriad of small instruments that we use to perform a surgery like this. We also have a presentation made to kind of go along with that, which is not of this patient, but of similar cases and information so that we can explain to you what we’re doing, and we have the image guidance system itself. This is not a picture of the patient but a computer reconstruction and the computer helps us match up where we are. We’ll talk about the details of that and how this new technology helps us do the surgery better and safer.

First I’d like to introduce the surgical team. To my right, there’s Dr. Brian Matthews in the middle, who is holding a sinus endoscope and suction. To his left is Dr. Matt Bolinger, who is one of the otolaryngology residents who will be assisting him with this surgery. To his right is one of the scrub nurses, Billy Holiday, who is about to be relieved briefly by Donna Holder, who is putting on her sterile garment as we speak. The patient is oriented so that the head is away from the anesthesiologist, which is unusual in operating room settings, but we need to work on the nose, so the anesthesiologists are gracious enough to turn the table for us. Sitting at the patient’s feet but monitoring the patient while he is asleep is Dr. Chit Mims, and Ann Weiss is the nurse anesthetist. I believe that concludes our OR tour. When we get started, we’re going to let Dr. Matthews just show you a brief look in the nose and why we’re here today and then we’ll go into some of the reasons about the technology and why we do this surgery in the first place.

BRIAN L. MATTHEWS, M.D.
Thank you very much, Whit. The gentleman we’re operating on today has a long history of many years of chronic sinusitis. We’re going to take a look in his nose right now. We have previously, before this telecast started, we have already performed a septoplasty. That is, we have straightened the middle part of the nose because his nose was deviated so far to the right side that we could not access his sinuses, so we have already done that portion of the procedure and that’s the reason why there’s already a little bit of blood in his nose. I’m going to take you through. We’re on the right side of the nose. I’m going to take you through what we see here.

This structure right here is the inferior turbinate and this is a normal part of nasal anatomy. This, however, is a large polyp that is actually extruding from the sinus cavities and this large polyp essentially fills the entire nose. Of course, it would be very difficult or impossible to breathe. Up above the polyp, we see the middle turbinate, which is this structure which comes off right here, and this polyp is extruding from underneath the middle turbinate. What we’re going to do first here is start by removing this polyp and then we’re going to follow that polyp back up into the sinus cavities. While I’m going to use a microdebrider to do this, I have actually already biopsied this polyp in the office so we know that this is an inflammatory polyp and not some type of tumor, so while I remove this polyp, we’ll turn things back over to Dr. Mims for a few minutes.

J. WHIT MIMS, M.D.

Two more pieces of information I’d like to share with you. #1, Dr. Matthews and I will go back and forth with information. This is live and we are not scripted. If there are email questions from the viewers, please feel free to send those in and we will address those as they come up. Secondly, you’ll notice that we seem to be operating in a green environment. Do not alter your monitor. It’s not your TV. Because we do this all on the screen, it helps us to turn the lights down in the room and give it this green look. We can tell better what’s going on on the monitors without the glare and that helps us see. It’s actually the vision of the screen that lets him know how to move his hands to do the surgery that he needs to do, so that perception is very important and the lights help us with that, but it might make it a little strange on your computer, look like we’re operating under water or something.

I’m going to take you through part of our presentation now. You can also see on the screen he’s using the microdebrider. That’s a suction that pulls the polyp into that instrument and it has a little blade on the end which is guarded, so we don’t cut things we don’t want to cut, but it pulls it in and then it divides that into little pieces which are brought up by the suction and lets us remove that in a very controlled way while working kind of through the keyhole of the front of the nose with small instruments. You can see it is very efficient.

First I’m going to describe what is functional endoscopic sinus surgery. It’s called endoscopic, again, because we do it completely through scopes. It’s all done through the front of the nose. There’s not any incisions on the face or up underneath the lip when we do this. People often have questions about that, especially when we describe that we’re
going to take out large things, but we can take those out in pieces and we do it all through
the scopes. The scopes are not all straight. Some of them have little angles on them so
that we can see around corners and we can see 30° or 45° or 90° so we can see where we
are working. We have instruments of all different configurations which help us when
things aren’t right in front of us there.

The main goal is that sinusitis is inflammation caused by blockage where the sinuses
open. If we can get those places where it’s very narrow open wider, then the sinuses are
less likely to get infected and inflammation and sinusitis is less likely to develop. It’s
called functional because we want to do it in the natural way that the sinuses function.
We don’t want to put holes where they’re not supposed to be or have the sinuses trying to
drain through openings which they were not naturally programmed to get mucus out of,
so we try to do this sort of in the context of the natural flow of mucus out of the nose.
We’ll be going through some ways in which we try to preserve that. That helps patients a
lot.

There’s more than one exact reason why we do sinus surgery like this. Sometimes it’s
because they have a large polyp and they can’t breathe through their nose, but many
people have chronic inflammation of their sinuses with pain and post nasal drip, difficulty
breathing through their nose. We usually try to manage this medically with antibiotics
and other medical therapy, but some people are refractory to this and, even despite our
best medications, aren’t able to get better or back to normal. That would be the majority
of people that we operate on. Sometimes the sinuses are permanently obstructed, for
reasons that we don’t understand. Especially in the back of the head, they can cause
problems because it’s next to the carotid artery and we’ll relieve it for that reason. Some
people just have recurrent infections because it’s next to the carotid artery and we’ll relieve it for that reason. Occasionally patients have tumors, cancers or benign tumors in their sinuses which cause problems and we can remove those
endoscopically as well, depending upon the exact nature and type of the tumor. Just like
Dr. Matthew biopsied this. We’re always very careful to biopsy things that we perceive
as polyps to make sure that’s not, in fact, a tumor because they can look very similar
inside the nose.

If people have unilateral nasal obstruction and they don’t know the reason why for
several months or long periods of time, or bleeding that they can’t explain, we really do
recommend that they have somebody look at that or get an x-ray or put a scope in their
sinuses so we can make sure that’s not caused by a cancer, and that certainly can happen.

Image-guided navigation is relatively new. That’s part of this procedure, to introduce
you to what that does for us and how that works. It’s certainly with the computer age.
Basically what we’re doing is using a camera, which I’ll show you here in just a second,
to coordinate where we are inside the patient’s nose with the CT scan, which is an x-ray
divided up into very detailed images of the inside of the nose so that we can tell exactly
where we are on those x-rays during the surgery. There are several parts to that and we’ll
go through that in just a second.
BRIAN L. MATTHEWS, M.D.

You can see that we have taken out this large polyp, the mass that was filling the nasal cavity. Now the nasal cavity is open all the way to the nasopharynx back here. I am a bit concerned here because, as I was taking this out, this polyp, even though we had biopsied it previously and our biopsy specimen was only inflammation, as we started to take this out, this began to look more and more papillomatous. I have taken another big piece of this mass and we are sending it off to pathology right now because it does look like it has some characteristics that suggest that this might be, in fact, what we call an inverting papilloma, which is a benign tumor which grows in this area. This is what’s left of that mass right now and this is coming out of the maxillary sinus.

What we’re going to do next is take off this little ridge of bone and tissue right here in front, called the uncinate process, and then we’re going to go into the maxillary sinus and take this out. If this is, indeed, an inverting papilloma, we may need to perform a little bit more extensive surgery than we would for just sinusitis.

J. WHIT MIMS, M.D.

As is often the case with surgery, it sometimes gets more interesting once you get started. Sinus surgery, along with many other surgeries, sometimes the diagnostic portions and the curative portions often overlap when you’re doing the surgery and you need ways to evaluate that as you go along. Inverting papillomas are notorious for showing up in a field of polyps or causing other inflammation around them, so certainly one biopsy doesn’t always guarantee that you don’t have tumor elsewhere. If you see other suspicious tissue, it’s always the right thing to do to take additional biopsies to get that straightened out. The therapies between a polyp and inverting papilloma are different and it’s important to have the right diagnosis. It’s also important to send most of the tissue for pathologic specimen so that you don’t get fooled and make a mistake.

The image guidance system that we’re using works a lot like GPS. It uses more than one endpoint to make a 3-point map of where the head is. It uses a stereoscopic camera to get that in 3 dimensions and then it can link that to the CT scan. Then, as long as what it has linked to, which can be different things, but today we’re using a 3-point reference frame, doesn’t change, we can be fairly accurate about where instruments, which also have some little fiduciary balls on them that the computer can see or recognize, and we’ll show you how this works, can tell you exactly where you are and it’s accurate to just a few mm.

This is just a picture of sinus surgery as contrasted and we can use this with either CT or MRI, but we tend to use CT scans in sinus surgery because the bony anatomy is very important to us and shows up better. The reason we do this, why we go to all this effort with the image guidance, is really, there’s more than one, but the main reason is to reduce complications. We’re operating very close to the base of the skull and very close to the eye. We don’t want to get into those structures while we’re trying to remove bone and blockage within the sinus cavity. It’s very helpful when there’s lots of polyps, which
sometimes distort where you are, and it’s very helpful in revision surgery, where some of the landmarks that tell us where we are in the sinuses have already been removed and we don’t have our reference when we go in there with the endoscope.

Again, just talking about the potential complications, things that we worry about every time we do sinus surgery, the newer technology and the experience of surgeons makes these complications very rare, but they’re only rare because we’re worried about them constantly. Ocular injury is one of them. The barrier between the eye and the sinuses is called the lamina paprecia, which means a layer of paper, some of the thinnest bone in the body and if you don’t know where you are, it’s very easy to go through. Especially in diseased patients, it can help us differentiate where the ethmoid cells are very close to the eye and where the eye is so we can try to keep out of there.

Sometimes the optic nerve, or the nerve that takes sight from the eyeball or the globe back, runs right through the sinuses in a very thin bony canal and it can sort of be suspended in air back there. Obviously if you took a piece of that, then the person would be blind, so it’s very important for us to review the films and look for that possibility and know where that would be so that’s not violated. Those kind of cells that wrap around the eye like that are called oneida cells. That’s one of the things I usually scan for and I’m sure also does Brian, anytime before we do surgery, to see what the relationship between the optic nerve and the sinuses is, especially if that’s part of the diseased area.

BRIAN L. MATTHEWS, M.D.

I’m going to interrupt Dr. Mims from time to time when we get to kind of interesting parts of this surgery. What we’ve done is we have changed to an angled scope, which allows us to see partially sideways. We’re looking into this cavity right here, which is the maxillary sinus. That is the sinus that’s below the eye. You can see that there is fluid in here and purulent-looking material in the sinus. What we’re going to do now is remove some of this tissue that should not be in the sinus. As you could see, we had what earlier looked like an inverting papilloma. This tissue right here doesn’t look much like a papilloma. Instead, it looks like polyps and perhaps cysts, so we’re going to use a curved debrider to remove some of this tissue from the maxillary sinus. After we get this removed, we should be able to see in here much clearer.

J. WHIT MIMS, M.D.

Again, this is part of the case, where he’s working in the maxillary sinus, which is the sinuses people commonly think about in their cheek or right underneath their eyes, so it’s very important not to go through the roof of that or the tissues just above that. He’s really just a few mm away from the bottom of the orbit there and the image guidance helps with that.

Two of the reasons that we talked about were traumatizing the eye or the orbit and back near the optic nerve. Another reason we use image guidance is that the top of the sinuses are the same as the base of the skull in the middle. Your brain comes down to about the
bridge of your nose, as far as depth, and that bone also is extremely thin, so if you’re trying to open up the sinuses or the ethmoid sinuses or the frontal sinuses, which are up on the top portion, and we’ll show some CT scans explaining where those are, if someone were not to be careful, you could easily break the bone above that and that can cause a leak of fluid that normally surrounds the brain, down into the nose. That’s called cerebrospinal fluid. It’s not like blood. It doesn’t clot. It runs like water. Unless you patch that, there’s no guarantee that that would stop doing that, and that potentially exposes the brain to bacteria in the nose, which could lead to meningitis and other problems that we try very hard and seriously to avoid. Again, these injuries are extremely rare because of the careful techniques and modern technology that we have, but there’s a reason that we use these.

Additionally, the internal carotid artery, which is the largest supply of blood to your brain, sits just behind the sphenoid sinus and in some people there is no bony covering and the artery is sitting just behind a very thin layer, kind of like a very thin layer of skin, but it’s mucus covering that. Obviously, if you were to take a piece of that rather than taking a piece of bone, they could have bad bleeding or stroke, which would be a very serious problem.

This is a CT scan which shows one of these complications. I do not believe that this patient was operated on at our institution when he developed this problem, he or she, but we do have the benefit of having the x-rays. We use CT scan so we can see the bone better. That’s basically very thin slices of the face and sinuses. This is a sagittal view here on the left side of your screen, which is like looking at a person in profile, so this would be the nose here. On CT scans, we can window them different ways or make different tissues show up as different densities or white or black or gray, so here we have the bone in white. This would be the forehead right here. This is the frontal sinus right here, which looks very healthy and it’s got air in it, which is black. You don’t really see any gray or lining. The skull base should be right here. You can see there’s some thickening along the skull base and you can’t really follow that white bone all the way around. Part of that has been removed and there’s air up in the brain tissue here. That is not normally supposed to be there and indicates that there’s a connection through the skull base here that is required to be repaired.

This is what’s called a coronal view, I assume of the same patient. Again, the brain is up here, above where the eyes are. Here’s the orbits and there’s air up there which is not supposed to be there and this is a complication we would like to avoid 100% of the time.

BRIAN L. MATTHEWS, M.D.

We have now cleaned out the maxillary sinus. This is the opening of the maxillary sinus. The opening to the maxillary sinus is not usually this large, but this polyp has eroded the opening to the point that it’s very large. This portion of the sinus looks relatively normal, the upper portion, but there is some tissue down in the bottom portion of this sinus, down here, which you can see that the suction is on right now. This tissue does not really look normal. I have a strong suspicion that this represents an inverting
papilloma. We have tissue being looked at right now which will determine if that is indeed what it is. What we’re going to do is to go on with the rest of the sinus operation, since this is an inverting papilloma that has arisen in a background of chronic sinusitis. We’re going to go on with the rest of the procedure right now, but if this indeed is inverting papilloma, we will come back a little bit later and remove more extensively the tissue in the lower portion of this sinus and the lower portion of the nose so that this will not recur.

J. WHIT MIMS, M.D.

I’m going to show you these last injuries that we try to avoid, then I’m going to take some email questions and then we’ll go over the image guidance system in the room. The next slide shows an MRI scan and there’s a yellow area you should be able to see that points to a dark area. Again, this is like we’re looking straight at the patient. The eyes are on both sides and this would be the sinus area here, where they’ve had some surgical changes. This dark area of the brain right above the top of the sinuses indicates an area of damage to the brain following surgery where the roof of this was violated. Again, these are relatively rare complications and rare pictures.

We’ll take the email questions now and then we’ll show the setup for this. One viewer asks, do you believe that tonsils play a part in chronic sinusitis? Should you remove them for optimal relief? My personal opinion on that is that generally tonsils do not block drainage of the sinuses and that tonsil problems and sinus problems tend to be slightly separate. I do believe that sometimes you can get throat irritation from the drainage of your sinuses, but the tonsils are down low enough and away from the back of your nose that I don’t believe they are a large player in chronic sinusitis or rhinosinusitis in adults. Having said that, adenoid tissue, which we sometimes remove in an adult and often remove in children, I believe does contribute to nasal symptoms and rhinosinusitis, and sometimes removing the adenoid tissue, especially in children, plays a very helpful role in controlling recurrent rhinosinusitis disease.

I have three questions here. Another viewer writes, I will be having similar surgery in May and I am wondering about the possible risks. Could there be a possible vision problem or chance of brain infection due to a crack in the skull and, if so, are these risks something that can be treated or can the vision problem be permanent? There are risks to any kind of surgery that you have performed. In some cases with severe sinusitis, there is certainly a risk of getting meningitis or ocular problems without surgery. Having said that, there are risks to the eye and to the base of the skull, almost of any nasal or sinus surgery. Those risks are small and certain precautions should be taken to minimize those. I think having a well trained surgeon and having appropriate technology are probably the two most important things to doing that. If there is a crack in the skull and the leak of fluid, that can be repaired. It requires additional fluid and sometimes that will stop on its own. A brief period of observation is sometimes observed, but more surgery, generally done endoscopically, is often needed and a patch can be placed over that that will seal and stop that leak. With trauma to the eye, it really varies about how much trauma was done to the eye, what kind of complications they had as to whether vision can be restored.
It is possible to lose permanent vision from sinus surgery and that has happened in the past, but very infrequently. It is also possible to interfere with the muscles that control the eye, which could result in double vision or not being able to move the eye normally. If you can’t move one eye the same amount you can move the other, then you’ll get two different images and see double and that is a rare complication. It’s also possible to have a small amount of bleeding or swelling which causes a temporary problem which can be treated and things will go back to normal, and that is probably much more common.

The third email question is what else can be done without surgery? I’ve never been able to smell. Could chronic sinusitis be the cause for this? I can smell ammonia, but not perfumes, food burned or otherwise, or most odors. Loss of smell is a problem that can have more than one cause. Being evaluated for that, I think, is very practical. This gentleman with a large polyp or possible inverting papilloma in the right side of his nose probably couldn’t smell very well through that side. Removing that polyp may return his smell to that. However, there are other people who cannot smell who don’t have any sinus disease. They probably have more of a neurologic problem and we believe that can happen sometimes after viruses or infection, and sometimes those viruses or infections aren’t even very severe but sometimes tend to eliminate the sense of smell. In those cases, research is still going on to try to figure out what can be done for that. One of the professors in our department, Dr. Pataski, runs a Smell Center here for smell and taste disorders and he routinely evaluates people for smell and taste problems. Sometimes that has to do with sinus or allergy problems and sometimes that’s more neurologic in origin. He’s making great progress, along with other people around the country, trying to find better answers to that.

BRIAN L. MATTHEWS, M.D.

I have a little bit of packing in here right now because we were having a little bit of bleeding and bleeding makes it difficult to see during surgery. This type of surgery is always accompanied by some bleeding, usually not terribly severe, though. We have opened up the maxillary sinus, which you see here, and now we are getting ready to start removing part of the ethmoid sinuses. A lot of the tissue up high is very, very inflamed and that’s the reason that we’re having some bleeding from that area. If you look at our image guidance system now, we can tell where we are and where we want to go. On our image guidance system, the end of our instrument is indicated there, so right now you can see where we’re right beside the eye. We’re going to start opening these little air cells that go back in the ethmoid sinuses. Actually, a lot of the ethmoid sinus cells have been compressed or made smaller by this polyp that we removed already. We’re going to start here and we’re going to start removing some of that tissue to work our way posteriorly within the ethmoid sinuses.

J. WHIT MIMS, M.D.

I’m going to stand up and show some of the instrumentation that we use with this. We’ll start with just pointing to this. This is the screen or the image guidance system and that’s what he was just showing you a second ago. It has a lot of information on it, which can
be a little difficult to process all at once. The patient has been through a special CT scan protocol that allows it to coordinate with this system. Then, when he is put to sleep, we put a head band on and put this reference frame or fiduciary system of three balls. That’s attached to a head band so that even if we turn his head a little bit, that will turn with that. Then there’s a stereotactic camera right here which would seize these two balls and also seize these little reflector balls that are on instruments. They’re configured in different ways on the instruments so that it knows which instrument we’re using. We’ve synched all that in and scanned this patient before that. So once we get this set up, we have to register the patient to the machine, so the machine knows how his face is sitting in relationship to those reference balls so that it can coordinate that. There are many different systems to do that, but if you look at the panel or display for the image guidance system in the upper left hand corner, it gives a skin overview. That’s not a photograph; it’s a computer regeneration of the surface of his face, based upon the CT scan, and then we use this light. The light will reflect back and it will follow that over the curvatures of the face. The camera will do that and then it can register in there and it will give us a number of how close that registration matches to the CT scan and usually it’s within a few mm.

It then has divided the CT scan up into three different views. I’ll come over here and show you that. We have 4 windows on this. The upper left window, again, gives you kind of a surface anatomy. They color it to look a little bit like skin, but again, it’s just made from these images and the computer has re-formed the shape of the face. You can see how accurate that looks. For something not being a photograph, that’s pretty amazing. We can turn that different directions and look at that if we need to and that’s what the registration uses to match this up. He’s using the instruments right now. The CT scan looks at it in different ways and this is what we call...we recheck periodically through the case to make sure we’re still accurate. This is called an axial view and is as if he were laying on his back and were taking a cut across or just right across here, so this is the nose sticking up in the air, with the gray being soft tissue and the black being air going through either side. Here is bone and the maxillary sinuses right underneath the cheek. You can’t see the eyes in this one because it would be above it in this direction.

This is the sagittal view here, which is looking as if in profile with the nose, and right here is what’s called a coronal view and that’s just as if you were looking straight at the patient, so this would be the triangle of the nose right here as if I had just made a cut across here, like a bread knife and you were looking just at one thickness going back. This would be the nose right there. That changes, depending upon where they’re looking in sinus surgery and when they put the probe in.

They all change in real time so we can tell exactly where they are. Here they are very close to the optic nerve, right on the lateral part of the posterior ethmoid. If you go to this bone right here, then the patient would be blinded, but he is not going to do that.

This little screen up here is actually what the computer sees. It sees these 3 red balls on the instrument. You can see it lights up the reference frame on the head in red and the
instrument in yellow and it uses that to be able to generate this. It’s really very amazing technology and we find it very useful.

I’m going to go to an email question. It says what causes polyps in the nose? The short answer to that is that we don’t really know. Despite a lot of research being done on it, we know that polyps are a reaction, an inflammatory reaction to irritation that can be relatively nonspecific. We can see them in chronic infection. We can see it if you put an eraser in your nose and leave it there for a long time. It can cause polypoid change. You can see polyps because of fungal infection in the nose. You can see polyps sometimes in association with allergies. So there seems to be many different ways to develop polyps. Even though they look the same, they can have different causes and trying to figure that out is one of the difficulties that we sometimes have. Sometimes we can’t get polyps to regress with medication and we will treat those. Sometimes surgery is appropriate. Some people can have polyps which are not blocking the sinuses and not blocking the nose and don’t really need surgical therapy for it, but when we have patients who have unilateral polyps, we always want to make sure that it’s not a tumor because that can look very similar, even to a very experienced guy, like Dr. Matthews.

This again shows not of this patient, live, but another patient, looking at the skull base and how you can identify both on the bottom two frames, the sagittal frame and the coronal frame, the patient has a lot of polyps and it would be difficult to tell exactly how high you were. The image guidance system can help you know that you’re very close to the base of the skull so you don’t continue to dissect or remove tissue in that direction.

This is a patient that has an encephalocele, which is an area where you have a defect in the top portion of the sinuses or the roof of the sinuses, where part of the brain and sometimes some of the lining around the dura come down into the nose. That can be caused iatrogenically or caused by surgery. If somebody were to remove part of that during sinus surgery, then the brain can kind of fall down in that hole and end up in the nose, but they are also seen idiopathically or for reasons that we don’t know. There could be a congenital defect or weakness there. It could also be caused after trauma. You could traumatize that area and get weakness and then an encephalocele could form. We want to really make sure, when we’re looking at polyps, that they’re not really encephaloceles. They look a lot alike, but as Dr. Matthews biopsied this in the office and we saw it coming down from the top, we might be a little nervous that we were biopsying part of the brain, which would cause a cerebrospinal fluid leak. Depending on where the polyps originate from, we would be very cautious about biopsying anything until we looked at the CT scans and made sure. I’m sure Dr. Matthews would agree with that.

BRIAN L. MATTHEWS, M.D.

Very much. What we have done at this point is we have, of course, opened our maxillary sinus and taken out this polyp. Now we have opened this cavity, which are our ethmoid sinuses. The ethmoid sinuses are made up of a number of different air cells that are like a honeycomb. Now we have taken these sinuses and made them where they are just one large cavity. This area at the back, right here, is the posterior ethmoid sinus and
this portion, where my suction is now, is the anterior ethmoid sinus. We are all the way up to the skull base and we know that because we can use the image tracker and we can go all the way right to the skull base and of course we know we don’t want to go any further than this because if we went any further than this, then we would be into either the orbit, where the eye is, or into the brain area.

There is another sinus more posterior too. It’s called the sphenoid sinus, which is a very large sinus cavity, but this gentleman doesn’t have really any problem back in the sphenoid, to speak of, so we’re today not going to open that sinus, although in many patients we do. We’re going to now put an angled scope on and look up and we’re going to try to open up the area that goes up into the frontal sinus.

J. WHIT MIMS, M.D.

Going back to the presentation slides, this is just an example of using image guidance to locate a mass within the frontal sinus and help us know where that is. Sometimes if things are very high up above the eyebrows, we can’t approach that very well through the nose and we’ll have to approach that through different ways. Knowing its exact location helps us plan our surgery in a very detailed way.

Now we’re just going to go through a little bit of functional sinus surgery, which is what Brian is performing right now, and we will watch up with him shortly. We kind of go through in a pattern. We use the same order each time here at Wake Forest. We resect the uncinate, which was that first hole that he showed you in front of the sinus. We try to open the maxillary sinus, if that’s where disease exists, and the opening on this gentleman was already very large because that large polyp had come through there. Then we tend to do the anterior ethmoids, which he showed you, and then work anteriorly to posteriorly down low, then identify the skull base in the back and kind of work back to front, back up to the frontal recesses. If the sphenoid is involved, we’ll do that when we’re doing the posterior ethmoids.

We have sort of covered some of this, but again, these are a few rules that we try to teach our residents here. We try not to operate on places that don’t have disease. We try to open things up within the natural drainage of the sinuses. We want to make sure that we don’t strip all the lining out of there. We want to open things up and leave as much lining as we can. If there’s a lot of inflammation and bleeding and tissue and it’s difficult to know where you are, we always encourage people to stop operating. I think it’s when people are not certain of their whereabouts when eye trauma and skull base trauma can occur. We try to stress this to our patients and also to the doctors we teach here that surgery doesn’t change the underlying mucosal disease. It doesn’t really change why they got the polyp or if they’re allergic in the first place. It just opens things up so they can tolerate some swelling which may be caused by those processes and hopefully it won’t get into the sequela of being blocked off and things will drain easier and be blocked off less.
This is an example of a patient before and after surgery, on the left side of the screen. You can see this better. It’s the same patient. On the right side, you can see there’s thickening in the maxillary sinus, a lot of gray tissue, and in the left side that’s all opened back up and aerated and there’s less bone there, so there’s not a lot of little spaces to trap infection, but rather a big open space with large openings for drainage and that works better for the patient.

Brian has already been through part of this surgery and we injected this patient before we started the webcast to try to minimize the bleeding and use our time efficiently. We are operating on the right side of the nose. These pictures are to the left. The picture on the left has 2 dots on it. That’s right in front of the middle turbinate and that’s where we tend to inject the local to try to decrease the amount of pain postoperatively, but more importantly, there’s epinephrine in there, which decreases the amount of bleeding. It may not look in the pictures that we’ve done anything to decrease the bleeding, but in fact, Brian has taken great care to minimize bleeding in the nose. The nose is a very vascular space. Also, toward the back of the middle turbinate, in the picture to the right, we inject there. The uncinate is seen, again this is the left side of the nose. It’s coming off the lateral wall. It’s like a little flap of tissue. We take that down from the back to the front. The tear duct to the eye sits right in front of that. We try not to damage that. The beginning of the ethmoids is just behind it, with the maxillary sinus sort of sitting in the crease between those two, which may be hard for you to imagine if you’re not used to looking at these.

I’m going to take a few email questions and then we will go back to the anatomy. What are the criteria for candidates for this kind of surgery? Who should have it and who shouldn’t? There’s actually a great deal of debate about that, but I think, having significant enough disease, the sinuses are not controlled well by medicine.

BRIAN L. MATTHEWS, M.D.

What we’re doing right now is trying to open up the frontal sinus, which is the sinus which is above the eyes. This is usually the most difficult area to get to endoscopically. We’re using an angled scope that looks up at a 45° angle. This is where image guidance is so terribly helpful. We can see that this area right here is indeed the skull base and the area where I have my probe on is just immediately behind the opening to the frontal sinus. This right here, which was very difficult to see because it was swollen, is the entrance to the frontal sinus, right here. When I first went into this area, I got a large amount of thick mucus which came out, so what we’re going to do is start right here and enlarge this opening a little bit by moving it anteriorly and that should open this up to where it will be a much larger opening for us. You can see that my probe is actually in the frontal sinus right now.

J. WHIT MIMS, M.D.

That was an excellent demonstration of that. You can see by looking at those endoscopic pictures that the tissue of the skull base and the inflamed tissue below it, they
look very similar. Again, that’s why it’s very important for us to really know our landmarks and exactly where we are and that’s why the image guidance system helps, because you’re making determinations of only just a few mm between opening up the sinus and opening into an area where you’re not supposed to be.

I’ll take one more email question here. What is the recovery time for this surgery? Do people ever have it done again. The recovery time from the surgery varies a little bit upon how extensive the disease was that was there beforehand, but I generally tell, I think the majority of the recovery is within the first 10 days to 2 weeks. There still is some healing and crusting that can exist after that. It really varies for different people. We generally do this as an outpatient surgery. People often go home on the same day or very frequently the next day after the surgery. It’s not as painful as patients often expect. It does make their nose sore afterwards, but there’s no muscle in this area and it doesn’t move. Once these areas are opened up, it’s not like other surgeries, where every time you swallow or every time you breathe, it’s difficult. By contrast, I would consider tonsillectomy to be much more painful than sinus surgery.

Another question we frequently get is whether they will have black and blue and look like they’re beat up after sinus surgery. You can get a little bit of bruising, but that is extremely rare in modern times. There may be a little swelling around the eyes or the side of the nose, but a large amount of bruising is generally not expected and is uncommon to see in the postoperative period.

I’ll take you just through a little more of the anatomy on our presentation. Dr. Matthews is a little in front of where we are in the presentation, so we’ll try to catch up. Again, this is the left side of the nose and the opening to the maxillary sinus. You can see where part of the uncinate is still left there. It doesn’t have to be completely resected, depending upon where all the disease is, but sometimes residual uncinate is problematic. This is an example where that’s been completely resected and is very open and you’re looking, again, in the left side of the nose and you can see the opening to the right, which is the maxillary antrotomy and the ethmoid bulla, which is the beginning of the ethmoid sinuses, starting just behind this. This would be surgery for someone who was having mostly problems under their eyes, but not so much problems back in the ethmoid and the posterior portions.

This is an endoscopic picture. We’ve switched to the right side of the nose. That’s the middle turbinates you see occupying the middle portion of the screen. You can see what this is is something that is the reason why we do revision surgery sometimes. Sometimes in the initial surgery, the uncinate is still intact and the natural opening to the sinus is either scarred separately or was not included in the initial opening and there’s a larger opening probably made through surgery below that. What you can see is a very thick band of mucus recirculating between those. That’s because your sinus is programmed to send the mucus out a certain way and if you don’t incorporate that natural opening, often the mucus will go around and around or they’ll have an inefficient drainage pattern of their sinus.
I think Dr. Matthews is trying to highlight there that we teach other doctors who do this surgery that it’s very important to remove most of the uncinate and incorporate the natural ostia of the maxillary sinus into your resection. This is another example of mucus going around and around, out one and in the other. This is another example of accessory ostia, where the uncinate is still intact. This is on the right side of the nose. There’s an opening that probably was not created by sinus surgery, that just existed there. I don’t see much evidence of operation on this picture, but that can cause a problem with inefficient drainage of that sinus and sometimes lead to thick mucus draining down the back of the nose.

BRIAN L. MATTHEWS, M.D.

We have now opened the frontal sinus. I just wanted to show everybody the opening. We now have a very nice sized opening up into the frontal sinus. We’re actually looking directly into the frontal right here. We want to emphasize here that we have opened this opening up into the frontal sinus without stripping any of the lining around this area. It is extremely important to preserve the lining around the frontal sinus opening to prevent scar formation. If you strip this lining, then this opening can close, but we have a very good sized opening and also we have been able to protect the lining around here. It is inflamed somewhat, but this inflammation should resolve over the next few weeks.

In this patient, as far as our pathology, so far, our pathologists have not been able to decide whether this is only inflammation or whether there could be some inverting papilloma in the specimen, so what we will try to do is completely remove all of the polyp tissue. We are now looking in the maxillary sinus. We’re going to do a little bit more here to try to make sure that we have completely removed this. Our pathologists will have to study some of this tissue longer and it’s possible, if this is an inverting papilloma, it is possible that we might have to come back and do a little more extensive procedure as a second procedure, but I don’t want to do that today because we don’t want to do anything more than the patient needs. If we needed to come back and do that, it would not be a major thing. We’re going to get a little more of that as a sample and then try to remove all of that.

J. WHIT MIMS, M.D.

We’re coming to the close of our webcast. I’m going to quickly go through some additional information about how we do sinus surgery. This is a sagittal view on the presentation, from the side profile. We divide up the different ethmoid sinuses into different zones so that we can discuss them and know what we’re talking and know their particular relation to the skull base. We tend to work from back to front here. These are endoscopic pictures of patients after they have healed, in the office. On your right side of the screen is the patient’s left nose. It shows the ethmoid bulla, the antrotomy, or what goes into the maxillary sinus and that the uncinate has been removed. This is another picture looking at the left side of the nose that shows all those ethmoid shells are removed and you can see way up to the skull base. You still see the maxillary antrotomy over on your right side. This is opened up even further into the posterior ethmoids, which is the
very back. You can see that both on the CT scan and on the endoscopic picture. Again, this is on the right side of the screen, the patient’s left side of their nose. Anteriorly, there are some cells right below the frontal sinus and this is just what Dr. Matthews was removing. Here’s an endoscopic picture where all the frontal cells have not been removed but there is not disease necessarily there and it’s really the relationship to disease that determines whether you need to alter that or not. Our general philosophy here is not to alter things that seem to be working well.

On this slide, you can see on the CT scan and on the endoscopic view the opening way up into the frontal, which is maintained open, which is very similar to what Brian performed. That dark hole on the right image would be looking up into this direction. That’s the recess up into the frontal sinus, which is nicely healed and widely open.

This is the very back of the nose. It’s called the sphenoid sinus, the most posterior of all of the sinus cells. This is the one that can be very close to the optic nerve and carotid artery. We have to remove part of the superior turbinate, which we’re showing some, and then find the opening that naturally goes into that and enlarge that. It’s kind of difficult to see on that picture, but here that superior turbinate has been removed and you can see that opening in the back, which is the opening to the sphenoid sinus and that’s a very nicely well healed, very open nose and sinus passage.

This is a very similar picture to that. The opening to the sphenoid is a little larger and right in the middle of the screen. The ethmoids are widely open and the superior turbinate has been largely resected. The middle turbinate is nearly gone.

We thank you very much for joining us for this hour. I hope it’s been informative. I know this anatomy is tricky to understand and difficult to get your orientation, looking through the scopes, when you’re not familiar with it. If there are any additional questions, I’m going to let Dr. Matthews, if he has any final remarks, conclude the session.

BRIAN L. MATTHEWS, M.D.

Whit, thank you very much for serving as narrator for us today. I want to say thanks to all our operative team here. I think we have one of the best operative teams in the country here and I hope that this has been helpful for people. Thank you.

J. WHIT MIMS, M.D.

Thank you for joining us at Wake Forest University Baptist Medical Center.

NARRATOR

01:02:14.000  This has been a functional endoscopic sinus surgery from Wake Forest University Baptist Medical Center in Winston-Salem, North Carolina. The presentation is a continuing medical education program. For those viewers who registered for CME, click on the slide in the window to your right to take the post-test. Physicians who would
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