ANNOUNCER: This year, an estimated 37,000 new cases of pancreatic cancer will be diagnosed in this country. Since there is no screening test for pancreas cancer, it is rarely detected in the early stages.

H. RICHARD ALEXANDER, MD: In the list of cancers that cause death in this country, pancreas cancer is number four. It is not the fourth most common but it is the fourth leading cause of cancer death, principally because it is a very tough cancer to treat effectively. People who have the diagnosis are very commonly diagnosed late in the stage of the disease, when it's very difficult to cure it.

ANNOUNCER: If the cancer has not spread beyond the pancreas, a pancreaticoduodenectomy, more commonly known as a Whipple, could be an option.

H. RICHARD ALEXANDER, MD: It involves removing not only the cancer but the tissues in the immediate vicinity of the cancer that are at risk of harboring some cancerous cells. So this is an operation that is done with curative intent.

ANNOUNCER: During this webcast from the University of Maryland Medical Center, you'll be able to watch the many intricate steps Dr. Richard Alexander must accomplish to remove the cancer. OR-Live makes it easy for you to learn more. Just click on the "Request Information" button on your webcast screen and open the door to informed medical care. Now let's join Dr. Richard Alexander at the University of Maryland Medical Center.

ADRIAN PARK, MD: Hello, my name is Adrian Park. I'm the head of General Surgery here at the University of Maryland, where we have on our faculty some of the leading experts in the country in the fields of minimally invasive surgery, gastrointestinal surgery, endocrine surgery, bariatric surgery, and surgical oncology. You'll be meeting one of our surgical oncologists, Dr. Richard Alexander, in a few moments, as he describes a Whipple procedure for you. Right here we are in the mastery center, which is the University of Maryland Advanced Simulation Training Research and Innovation Center, where among other things, we're engaged in teaching students, teaching surgical residents, teaching surgeons in practice and other allied health professionals how best to look after patients of varying degrees of complexity in an entirely simulated environment as you can see here, where we actually have as one portion of the mastery center an entirely simulated forward army or military medical unit. And so from the mastery center here at the University of Maryland, we'll now go to the operating room, where Dr. Richard Alexander will take you through this case.
H. RICHARD ALEXANDER, MD: Good morning. I am Dr. Richard Alexander, and this morning, you are in operating room 23 at the University of Maryland Medical Center and the School of Medicine in Baltimore, Maryland. I'm being assisted in this operation this morning by our chief surgical resident, Dr. Didi Prostein, and a fourth-year medical student, Sarah Matthew. Also today I have a team of anesthesiologists assisting me in the care of my patient. Dr. Deshpande, who is the attending anesthesiologist, is at the head of the table here, and she's being assisted by Dr. Evering, who is an anesthesia resident. Most importantly, I have a team of terrific nurses in the operating room. You will see Maria, who will be walking around the room. She's responsible for really the conduct of this operation and making certain that everything proceeds efficiently this morning. And then to my left, I have Angela, who is my scrub tech for this procedure. This gentleman is an otherwise healthy and very pleasant 62-year-old who went to his local emergency room several weeks ago with a complaint of fatigue, weight loss, and painless jaundice. He underwent a series of diagnostic studies which indicated that he had a pancreatic head adenocarcinoma, or a cancer of the head of pancreas. Subsequent studies performed showed that he did not have any indication that this growth had spread outside of the region of the pancreas and he is undergoing operation today with a removal of this cancerous growth with curative intent. We're going to start by very carefully assessing whether or not there is any indication that this cancerous growth has spread to sites in the abdomen that we didn't actually see on our preoperative imaging studies. That is unusual, but it can happen. And of course, if that is the case, then it means that this operation we're planning to do for him this morning is not really of any value. And we would have to stop the operation and turn to other types of treatments for his condition. We hope that we won't find anything unexpected this morning as we get through the abdominal wall. Right now we're cutting through the skin and then the subcutaneous tissues. Let's just proceed straight through that. Good. And once we're inside of the abdominal cavity, we're going to check the usual sites that a pancreatic cancer can spread. That would include the liver, other sites in the abdominal cavity, and the lymph nodes around the pancreas. We normally perform a high-resolution contrast-enhanced CT scan of the chest, abdomen, and pelvic area, looking for any spread of the cancerous growth. These are very, very sensitive studies, but they don't give us entirely accurate information in every case, so that's why we also perform a very thorough surgical staging before we start the actual removal of this cancerous growth in the pancreatic head. Right now we're going through the subcutaneous, or fatty, tissues, which have this pale yellow color. And at the base of them is the fascia, which is the strong investing tissues that hold the intestinal contents in the abdominal cavity. And I think you want to be right about here. Why don't we just slide over to the left just a little bit. Once we get through this line of tissue here, we're going to divide a membrane which will then get us into the abdominal cavity. We start with a generally small incision, and we'll extend it once we're certain that the procedure that we're planning on doing this morning is one that we can in fact perform. So now that we've finished this, I'm going to just take a quick look inside here. Can I have a hand-held Richardson, please? Okay. Put this in here, and I'm going to simply just put my hand inside the abdominal cavity through this incision. It should be just big enough for me to do so. And I'm going to feel the liver first and see if there's any indication of any spread. The liver is a smooth, glistening organ sitting in the right upper portion of the abdominal cavity, and this one feels perfectly normal. I'm now going to slip my hands underneath the liver and feel for the lymph nodes around the region of the pancreas, and I don't feel any indication that the lymph nodes have cancerous tissue within them. We're obviously going to sample a lot of those lymph nodes to send to the pathologist during the operation. And lastly, I'm going to feel
around the abdominal cavity to make certain we don't feel any tumor seeds that might have spread from the pancreatic head itself, and I don't feel those. He definitely has a mass in the head of the pancreas, which I can feel. It's probably no bigger than a walnut, and that's the source of his problems. So at this point now we've extended the incision to expose the upper abdomen. And as we begin to do the Whipple procedure, the first thing we're doing now is to simply reassess the upper abdomen, which we did before through the smaller incision. 00:07:54

This is the colon here. The lining of the abdominal cavity is smooth and healthy. There's no indication of any spread of cancer we've been able to identify at any sites. The stomach is up here, and the pancreas is behind some tissues in this part of the abdomen, and we're going to spend a few minutes here just preparing the upper abdomen and exposing the pancreas before we begin with the pancreaticoduodenectomy. So at this point, I'm going to ask you, D, to go ahead and let's divide the transverse, or hepatic flexure mesentery, which would be -- now, here's the duodenum here, so you're going to make this line straight out to the lateral abdominal wall from right there, okay? Now if the view here is not good, then we'll have to readjust the boom a little bit. Okay, good. Okay. So right now we're just exposing the head of the pancreas, and this requires moving the colon, which sits on top of the pancreas and the duodenum, down from the upper part of the abdomen to the lower part of the abdomen, so we're dividing some of these tissues that sit between the colon and the liver, and that will help us just get exposure to the area where we need to be. During this part of the operation, we are simply exposing the duodenum and the head of the pancreas, which are in the upper part of the abdomen, and to do that, we have to reflect or move the large intestine, or colon, from its usual position in the upper part of the abdomen. And it's very easy to simply divide some of these tissues here that hold the two organs in proximity to get exposure to the duodenum. Now, at this point, if I push down here, this is actually the kidney back here in the back part of the abdominal cavity, and that's an indication that we've gotten the colon moved back over away from the duodenum and the head of the pancreas, which are in the upper part of the abdomen. So the tissues that Dr. Prostein right now is working around in fact are the duodenum and the head of the pancreas. My index finger here is rubbing over the duodenum. This is part of the tissue that we'll be removing during this operation this morning. So what Dr. Prostein is doing at this point is dividing the tissues right behind the duodenum. And that will help us move it out of the back part of the abdomen, which is one of the preliminary steps that we have to do here in order to get this tissue out cleanly. Immediately behind the duodenum is the vena cava, and that's obviously an important structure that we do not want to disturb. And sitting around this area are also some lymph nodes that we will remove as part of our specimen. So if I push down here, D, then you'll go ahead and come right around the duodenal sweep there and we'll have the retroperitoneum exposed nicely. If you're working in the correct area, then there should not be much bleeding from the tissues, because these are tissue plains that generally do not contain a lot of blood vessels, and that's one of the important parts of this operation is to do it with a minimum amount of blood loss, which is obviously best for the outcome of any individual undergoing this procedure. Typically, we like to avoid using a blood transfusion if we can. We're usually successful in doing that, but not always. At this point, I'm going to lift up on the duodenum. Now, the duodenum has been lifted up, so now I am holding it. And the cancerous growth is actually right here where my index finger is. And the good news is that we don't actually see it directly, which means that as best we can tell, it's confined to the tissues within the pancreas. Obviously, when this tissue is taken out -- I think we have a disconnect with the Bovie here. I may have pulled a cord
when I -- all right. The tissues, when they're taken out, are sent to the pathologist to do a very, very careful analysis of them. We look for a lot of different features to indicate whether or not there is a higher versus a lower risk of a recurrence from this cancer. And based upon that analysis, we very frequently will recommend that an individual will receive additional therapy to try and reduce the risk of recurrence.

This gentleman had to have a stent placed in his bile duct to open up the blockage at the time that he was initially evaluated. So now we've got the -- the pancre-- the duodenum and the pancreatic head pulled away from the retroperitoneum. This here is the -- can you just show them the vena cava, D? And then sitting above us right here is the gall bladder, if you can point to that. And the cancerous growth would be kind of in this region right here. We can feel a firmness right there. So at this point now, we've basically mobilized the duodenum from the back of the abdomen. We're going to do a little bit more of that kind of work right down here, and then we're going to switch our focus to a different part of the abdomen while we gain more exposure to the head of the pancreas. This may be not -- this may not be something that you can see very easily just because of the angle that we're working, but we'll be here for just a minute and then you'll see a lot more. That's good. And just head straight back towards the -- head straight back. Now you're in the greater sac there, you want to be right up there, that's exactly right.

00:13:34

Yeah. And then right back there on the duodenum, yeah. Very nice. So that's actually nicely done. All right, so at this point, I can feel the cancerous growth in my hand, and it does not feel to be attached to any of the tissues that would render it impossible to remove. There is one important step that we now have to take, which is to determine whether or not this cancerous growth is attached to the very important visceral blood vessels that lie right behind the head of the pancreas. And we're going to do that right now, because that's the last step that we'll need to do before we actually physically remove this. To get access to that area of the body, we're going to divide this fatty tissue between the colon and the stomach. And so if I pull up here, do you know to preserve the -- it's right here, we're going to have to use the LigaSure, maybe, for that if you want. We're going to use a device here that will seal the tissues and prevent any bleeding as we divide this fatty bridge between the -- yes, that's perfect -- between the colon, which I have in my left hand, and the stomach, which I'm holding in my right hand. This will give us access to the rest of the pancreas and we'll be able to assess the blood vessels and whether or not this cancerous growth has connected itself in a way that would make removing this difficult or impossible to do. Right now, basically, we are gaining access to the rest of the pancreas. And to do that, we've divided the fatty tissue between the colon and the stomach. This is the stomach and the upper abdomen right here. The colon is down here. And when we divide the tissues between the two -- Sarah, I'm going to ask you if you can grab the colon gently and pull it down this way. And if I pull the colon up this -- the stomach up this way, basically this gives us access to the upper abdomen and the pancreas. So the pancreas is not really clearly visible quite yet. We're getting close to it. It's this tissue right in this area right here. And the cancerous growth is right over here. And the blood vessels that are adjacent to the pancreas that we now are going to be evaluating are sitting right in this area right here. I'll take the Freddy Kreuger. That's an instrument that, as you'll all see, is very aptly named, once it comes onto the field here. This is a device that we use to hold the intestines back so that we can see the upper part of the abdomen cleanly. Once we do this and we establish that the blood vessels are free and not involved with the tumor, then I will review the next steps as we begin to divide the tissues in preparation for taking the cancerous growth out of the -- out of the body. Now, what we don't want to do under these circumstances is to simply try to shell this cancer
out. That's not really an appropriate operation. The cancer certainly has the capacity to spread little tentacles into the tissues in the vicinity where it's arising. It can also spread into the regional lymph nodes. And so what we do here is we want to remove not just the cancerous growth but the tissues immediately around it that are at risk of harboring invisible cancer cells. And so that's why the Whipple procedure is typically done under these circumstances. And people will say to me, "did you see the cancer?" And for me, it's always best if I don't see it, because the implication is that it was largely confined as best as we can tell to the tissues inside of the pancreas. So at this point, we've done some work here on trying to establish this tunnel between the mesenteric vein and the back of the pancreas. There's a little inflammation back here, either due to the cancer itself or potentially just from having the stent placed into the pancreas and the bile duct. And so what we're going to do is basically go to the top part of the pancreas now and work our way down. And so we've established the tunnel behind the neck of the pancreas here in part, and now we're going to switch to a different -- a different part of the procedure. So if we just review the anatomy up here a little bit, basically we're looking at the stomach here, we're looking at the pylorus, which is the muscular sphincter between the stomach and the duodenum. And up in this vicinity here are all the important structures that go between the intestines and the liver: the hepatic artery, portal vein, and the common bile duct. And we're now going to spend a few minutes to dissect those structures out, expose them, and -- and continue separating the pancreas from the blood vessels that are right behind the pancreatic neck.

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So if I could have a DeBakey, please. So, D, what I'd like you to do now is let's just divide this little opening right here to see segment one of the liver right back there, that's the usual -- just helps us with our orientation. Dividing this tissue here around the upper part of the abdomen, that's segment one of the liver. Now this is a lymph node here, and the hepatic artery should be right below it. So now that we see that, there's this little plane right here that we want to divide. There can be some blood vessels in here, so let's just go slowly. Obviously you know all this already. Good. Open up this tissue right here. And then this is a lymph node that we'll take out. What we're doing now is we're looking for the hepatic artery, which is right beneath us right here. And that's going to be our guide as we try and dissect the tissues along this area to take out the pancreas. So there you go, right there, you want to divide those tissues right there very slowly. Very nice. So there's the hepatic artery right there, right? So this lymph node will be taken out. Now, the way I like to do this is with some clips, if you can just touch it right there. Do you have medium clips for me, please? Touch me. Or just touch the lymph node. There's tissue here you can divide. There's another lymph node right there which we'll take out. So what we've done at this point now is removed a small packet of lymph nodes right over the hepatic artery, which is right here. This is a blood vessel that's going to the liver, and it gives some branches that are heading down to the pancreas, which we're going to now identify and divide, so go ahead, D, and do your dissection here. The right gastric artery will be right in here. So now we're going to come around the right gastric artery. Can you come from your side maybe? That might be a little bit better. Yep. I can just open that up for you there. Cautery, please. Now if you go up this way and open up this way, we just want to get away from the duodenum just a little bit. That's perfect. If you go straight up this way, we'll just open up the tissues between the common bile duct. We're now opening up the -- what we call the portal triad. These are the blood vessels and the bile duct that go to the liver from the intestines. That's perfect. There's a lot of inflammation here, again, from the stent that was put in when he came to the hospital with a bile duct obstruction. That's something that we're prepared to encounter. Now from here, if you just come
towards me... if you turn your hand around, maybe, and just kind of stay below the hepatic artery. Here's the hepatic artery here, so you want to make sure you don't get -- all right. D, try it this way. Turn your hand around and just -- yeah, yeah, that's better. That's better. That's great, good. 2-0 ties, please. So this is a blood vessel going down towards the stomach that we're going to ligate. We're now just encountering the gastro-duodenal artery. This is a large artery that's going to be coming down -- this is the right gastric -- right hepatic maybe down here, so we want to make sure we stay down below all that. That tissue I would leave because we're going to take that with our specimen, because that's over by the gall bladder. Just this stuff over by the -- all the -- right there, yes. That's where we want to be. In and out again for me, just do that one more time. Yep, very nice. Metzenbaum's please. And let's take some 3-0 ties. The artery's right behind you there. I always find that it's just better to be a little more patient in this part of the operation and do this very carefully as opposed to trying to go too fast, in which case you can get some unnecessary blood loss. It just makes identification of the tissues a little bit trickier. There you go. So at this point now, what we've done is to start the portal dissection. The hepatic artery is here. The branches to the pancreas have been divided. This is inflamed in this area, which is a little concerning. It's going to make the dissection a little bit tedious today. But what we're going to do next is go ahead and remove the gall bladder, which is a standard part of the Whipple operation, and then continue our dissection of the common bile duct up in this area right here. This is the gall bladder here. This is not a normal gall bladder; it's distended because it's been obstructed by the cancerous growth in the bile duct here. So these are the investing tissues around the gall bladder, which is this blue-colored organ back here. The function of the gall bladder is to store bile, which assists in digestion. And the body can accommodate to not having the gall bladder in very well, so people tend to be able to eat and digest perfectly normally without it. Many times people ask me about the impact on their ability to eat and digest normally after the Whipple operation, and the way the operation has been designed, I think that most people can really eat and digest essentially normally. We're going to do what's called a pylorus-preserving Whipple procedure today, which basically preserves the muscle sphincter between the stomach and the small intestine so that as food is digested in the stomach, it's emptied into the intestine in a kind of natural and physiologic way. And that's been a fairly recent -- can I just have a clip, please, can we just clip that on both sides? Fairly recent modification in the Whipple procedure, which I think has translated into an improved quality of life for individuals. I'm going to have you slide that into the liver. You're right in the middle now where I -- yeah, there you go, and then out towards me. come -- jump over. Yeah, yeah.

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Most people will be in the hospital for about seven days after this operation, and the convalescence tends to be somewhere between three to four weeks at home. If people need to have additional treatments based upon the analysis of the path report, those treatments tend to start sometime within the first eight to twelve weeks after surgery. So right in there. The operation has historically been associated with some complications. This is not a trivial undertaking for an individual to go through. Obviously, we very carefully evaluate somebody's general medical condition before they undergo this operation. If there's a question about the safety of the operation, we'll do further diagnostic studies on the lungs or the heart to make certain that they are in fact well enough to withstand the stresses of the operation. The operation itself requires dividing the -- now careful of that blood vessel, you'll need to clip that on both sides -- dividing the common bile duct, the duodenum adjacent -- yeah. Adjacent to the stomach. We're going to -- clip this vessel right there. It involves dividing the small intestine right at the end of the duodenum and
then the pancreas. And then go over towards the liver. So then we have to reestablish the continuity of the intestines, and that requires connecting the bile duct, the pancreas, the stomach all back to the small intestine, which is something we will get to a little bit later in the procedure. The connection between the pancreas -- may I have the suction, please? The pancreas -- go right through it, and then we'll just see what we have to do -- and the small intestine is really the one that demands the most attention here. The pancreas is a very potent digestive organ, and if those digestive -- can you just grab that little tissue right there. If those digestive juices leak into the abdominal cavity, they can cause a lot of difficulties with the recovery process. So now we're just taking the gall bladder off of the liver, and as we get down towards the common bile duct, we will then get the bile duct isolated and then see about this connection between the tumor and the blood vessels of the pancreas, which we're still working on establishing here. We've done a little bit of work here in the vicinity of what's called the porta hepatis, where the blood vessels and the common bile duct connecting the intestines to the liver are located. The gall bladder, which was originally attached to the liver, has been completely removed, and the gall bladder is now attached to what is called the common bile duct right here. DeBakeys, please. So the three major structures of the porta hepatis are the hepatic artery, with blood coming from the aorta, going into the liver. This is the portal vein and this is the common bile duct. What we have to do next is we have to create a tunnel between the portal vein and the neck of the pancreas. So there's the vein from below, and this is the pancreas right here. If you can just keep your head up a little bit there and just kind of feed it through. So she's now very carefully gone right across, right up to the top of the vein. There it is. Let me have the silastic vessel loop, please. And I know this is hard to see, but I'm going to show you -- do you have one? I'm going to -- I'm going to rob Peter to pay Paul here for just a second. We'll use this one and open, take that. So now right here is the neck of the pancreas, and the blood vessel, the superior mesenteric vein to the portal vein, is right back there, so now we've created this tunnel. We'll want to pass this one, actually, up this way so it's just around the neck of the pancreas. And that's a major step in preparing the tissues now to divide them. So one of the questions that is left now for me is the relationship of the mass to the side of the vein here. There appears to be some inflammation in here. So we're going to work for a few minutes on the side of the mesenteric vein to make certain that this will come away cleanly so that we can then go ahead and take these tissues out. The gall bladder will be just sitting in the abdomen here for a few minutes until we're prepared to remove it with the specimen. There's some major branches in this vicinity that we're obviously going to want to be very careful to control appropriately. This is not one. I think you can go ahead and just -- wait, hold on there. Could that be a vein? I don't think so. Right in here we have to be very careful. There will be some branches -- let me have a Metzenbaum's, please.

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Once we're certain that this vein is not involved with tumor, then we will go ahead and divide the tissues and remove the cancerous growth. The problem is that once the tissues are divided, you've passed the point of no return. You want to make certain that you're not stuck here with all the tissues divided and yet you've got a condition where the cancerous growth has encased itself or attached itself to the blood vessels that we just cannot injure. Now, it is possible to take out a piece of this blood vessel and replace it if necessary. That's rarely done, but it can be done under very selective circumstances. Looks to me like we're going to be okay here. Now I'm just going to look a little bit more here to make certain that our vein is going to be clean. You can see now, there's a separation between the head of the pancreas, which was right over here -- Metzenbaum's, please. Richter's. And so this is
encouraging that we don't see any inflammation or encasement of the vein down here. It is stuck up here. This could be due to the inflammation of having that stent put in place. We're going to look at this a little bit more carefully here before we go too, too far. Although that looks like it's going to be all right. there's a little bit of a plane there. So we have a little bit of tissue up in this vicinity right here which we need to... that's great. Stuck right there. Good. Let me say I'm very, very circumspect about any injury to the vein under these circumstances because this is obviously in a hard spot for us to fix it. We just go very slowly. Okay, so what I'm going to do now is basically feel the mass right here in the head of the pancreas and just see whether or not there's a -- so the epicenter of the cancer is -- DeBakeys, please -- is a little higher up here. It's up in this vicinity here. And I think for these purposes, we're going to work a little bit from above and come down and make certain that all this will come away cleanly, although it's my expectation that it will. What we have here basically is an unusual orientation of the hepatic artery. This is the right hepatic artery, which is looping around the -- the cystic duct. And it's oriented in a slightly abnormal position. Normally, it would be over here, but we're going to be able to work around this here pretty easily, so that's just something that we wanted to identify beforehand so that we didn't injure that. It's very important for the nutrient supply of the liver. So we have the hepatic artery, portal vein, the common bile duct right here. So the common bile duct will be divided, and then this cancerous tissue will be flipped away from the underlying blood vessels. And we think we're going to be able to do that. We're just taking another feel here to make certain that's the case. And we're going to work a little bit right in this vicinity to make certain we can do that before we go ahead and commit ourselves to dividing these tissues. We've actually prepared the tissues, and we're going to start dividing them to take this out. There is some inflammation behind the pancreas, so we don't have 100% certainty about what the status is of the vein behind the pancreas, but from what we can see from the front and the side, I think that this is a reasonable course of action. He has no indication of any -- there's one more right there -- any spread to the liver or lymph nodes or other areas of the abdomen. So right now, we're going to divide the duodenum. The first step here is to find the duode-- all right, let me just take this from you, D. I'm just going to look for the pylorus, which is right here. That's that muscular sphincter. And we're going to divide the -- DeBakeys, please. We're going to divide the pylorus -- I'm sorry, the duodenum right about here. Before we do that, I'm going to take the blood supply, which is coming right behind the duodenum, so you're going to take a right angle right from here back to here. We're going to isolate this blood vessel and divide it. So this is the right gastroepiploic artery and vein, which we're going to be dividing now. I would go close to the duodenum if you could, right up in there and then up. Yep, exactly. 00:35:07
That's good. Now if you pull this tissue out here, you should be able to see your -- Bovie, please. Bovie, please. So this right angle is now isolated over. Close that for one second and go up this way. I'm just going to open this up just a little more. There you go. Okay, D, now if I come -- can you tighten that up for me, please? If I come the other way, then you can slide in the stapler. So we're going to use a -- I'll take this. We're going to use a stapling device here to divide this blood vessel that's in this fatty tissue right here. So I'm going to just show Dr. Prostein the tissue plane. Go ahead. Now we've got a little bleeder. So now slide that -- let me cock this this way a little bit. And slide it up into the -- there you go, right there. Good, take it. Okay. So this is a stapling device which will staple the tissues closed and divide them all at once. It's just a measure of efficiency here. Go ahead, yeah. And then when this is opened up, those tissues will be divided. Small blood vessel back here which we'll get with a Bovie. Suction in there, please. And up here. And divide this right
there with the Bovie. Okay. Where is it? Oh, it's way up here. Good. Again. And one more right here. Okay. So that's now done. The next step will be to divide the duodenum. So we'll take a stapler, and we're going to fire that -- we need a GIA load for that. It's a different-sized stapler for this. And once this is done, I'm going to take the stomach and I'm basically going to put it into the upper abdomen and kind of push it out of the way for a little while while we get this cancerous growth out. And this will divide the duodenum. Yep, yeah, I heard her. Yep, go ahead. Fire that. It's going to go straight across. So that's one of the lines of division. Now, this is the stomach, which we're now going to have to reconnect to the small intestines a little bit later on in the procedure, but for now I can just take the stomach and gently push it out of our way. And what that leaves us with -- DeBakeys, please -- is the neck of the pancreas right here, which we will divide in a few minutes, the duodenum, and the head of the pancreas right here where the cancerous growth is. So the next thing we need to do is divide the intestines down in the greater sac or the major portion of the abdominal cavity and then flip it back up into the area of the duodenum. So we're going to basically prepare the intestines now to divide them down here. And if you hold this, I'm going to actually -- this is a hard part of the procedure to actually see. Can I have a Richardson for the machine, please? The first piece of the intestines right after it -- after the duodenum ends is where we're going to be dividing the tissues. Can you just disconnect that and clean it? It's a little bit annoying. So this is the piece of intestine that we're going to divide here in just a minute, but I need to divide some of these attachments right back here where it's heading back up towards the duodenum. So what we've done now is we've basically divided the blood supply to the short piece of intestine which is heading back in this direction over towards the duodenum. And what we're going to do is take this piece of intestine and flip it behind all these tissues here up to where we've already prepared the duodenum to be removed. So Dr. Prostein's going to do that right now. Let's take this lap out. And she's now pulling on that piece of intestine, and it should flip out. And if you could just show everyone what we have. That's the piece of intestine there. So now everything that we need to remove is now in the right upper quadrant of the abdomen. And so we're just going to get everything exposed here and divide the pancreas and the common bile duct and we'll be well on our way to having this growth out. Just saw a little rush of pancreatic juice there from the center of the pancreas. Almost there. I'll open that up for you. There might be a little piece of tissue right there. Whoop, that was it. Okay, so now -- can we have an Alice clamp, please? Take this. That's the vein that we were working so hard on before. If you can get your Bovie here and let's -- let me just -- I can see it this way, from this side. I'm just going to Bovie the cut edge of the pancreas here.

00:40:26

This part is actually part of the specimen, and these tissues look very healthy. But we are going to send a little piece of this out to the pathologist now and ask them to give us a frozen section on that margin to make sure that the margin is actually free of any cancer cells. This is the edge that we'll be staying in, and I want to treat this one with some respect here. I don't want to have any injury to the pancreatic tissues. Okay. Good. Can I have a 15 blade, please? We're going to send a frozen section here. This will be the pancreatic duct margin. I want to take it from this side right here since it's right there. Yep. Give you a little piece of tissue here in just a second. There you go. So that'll be a frozen section on the pancreatic duct margin. Okay? Very good. Good. All right, so far, so good. All right. Now, at this point, we now have to take this tissue off of the vein, and this does take a little bit more time than a lot of people appreciate, and so we're going to spend a few minutes here seeing what we've got. I'm going to move this clamp back here just a little bit more. I don't want to tear anything here, but this gland seems to have enough substance
to it that maybe we can grab it here and pull it back a little bit. There are different ways that we can do this, and I'll take some Metz, please. Now, can you rotate the table to the patient's right just a little bit, please? So the cancerous growth is now over in this area here, and the only connection that we have left to take off -- that's perfect. Now, actually back a little bit. Back towards me just a little bit. That's good there. Is the connection between the vein and the growth there. So this is going to be something that we'll have to work on here for a few minutes. We're dissecting the tissues away from the vein, and, D, if you'll pull back like that, you can see the mesenteric vein is right here. And we're trying to create a plane right between the vein and the head of the pancreas. This operation, as you can see today, requires a lot of different steps. It requires manipulation of the tissues and it does take, even in very experienced hands, between four and six hours on average. Just parts of it that cannot be rushed along or should not be rushed along. Now, with new technologies - - let me put my hand in there if I could -- there's been some interest in trying to determine whether or not this operation can be done laparoscopically. And that's something certainly that I think needs to be carefully considered, but I would say based upon our currently available technologies, it's not something that I would advocate, because I think it lengthens the operation considerably. And from the oncologic perspective, that is the ability to cleanly divide the tissues -- 3-0 silk ties -- I think that it's an open question as to whether or not doing it laparoscopically can -- now we're going to get some bleeding here. Can you suction, please? I've got to do a vein. Can accomplish the same thing as the open procedure can. We've basically gotten the pancreas away from the vein, as you can see here. This is the splenic vein here, this is the portal vein here. And we're left with just a very short segment where there is some adhesion, probably some scar tissue, between the pancreas and the vein. So this is something that we're going to work on here very carefully for a few minutes. We may end up having to take a little piece of the vein wall out and either patching it or just closing it up primarily. But I just don't want to get into a position here where we tear the vein. Obviously, that would be problematic for us, although we could certainly control that. So after this operation, this gentleman, as most, will emerge from anesthesia. I anticipate that he'll be awake and breathing on his own right here in the operating room. We'll take him out to the recovery room for a few hours, maybe. I'd like to have everybody spend time in a monitored-care floor for at least 24-48 hours just to keep a very close eye on their vital signs. And he'll have a lot of IVs and catheters and connections. But after about 48 hours, 72 hours, we can start to disconnect those. And the main thing after that is to watch for return of valve function, make sure all the areas that we've reconnected here have healed. There's a little branch right there we'll have to take. And generally by about the fourth or the fifth day, we can start with some liquids by mouth. People are generally out of bed by the first or second day after surgery. And then most people are well enough to go home by a week to ten days, and I would expect that that would be the case here as well. Most patients these days get treated with a combination of treatments, including chemotherapy, radiation, and surgery. And one of the benefits of having an integrated cancer center is that you can see every individual patient, meet with your specialists, and come up with the best kind of integrated, comprehensive treatment plan for their condition, and that's one of the reasons why I was so attracted to coming to the University of Maryland was because of the Greenebaum Cancer Center, where the concept of multidisciplinary care has really kind of been one of the hallmarks of how we practice here. And I've been very fortunate to have colleagues in both medical oncology and radiation oncology that have considerable expertise in treating patients with this condition. So I always feel very comfortable knowing that after the surgical procedure is done that I will have the benefit of considerable expertise here at the cancer center so that all these
individuals can continue on with their treatment, getting state-of-the-science types of therapies. I will just say that that was the end of it, so I'm going to take this out of the abdomen. And I know that all of you looking at this will say that was a lot of work for such a little piece of tissue, and so that's basically the -- that's basically the specimen right there as it sat in the body. Is that something that you can see right now? And what we have basically is the head of the pancreas, which Dr. Prostein will show you, the duodenum, and that's circulating the head of the pancreas. Now, we have to take the duodenum with it because it's at risk of having some involvement with cancer and also because it shares a common blood supply. And this is the gall bladder and the common bile duct right here, and there are some associated lymph nodes that are here as well. So the lymph nodes are very important because they provide us with some important staging information about the extent of spread of the tumor within the abdomen. Certainly one of the things that we look at very carefully. So I'm going to take the specimen now and pass it off to the pathologist. And we're going to clean up in here and then we're going to start our reconstruction. So the cancerous growth was sitting here earlier this morning. We've taken out all of the lymph nodes along the hepatic artery, all of the lymph-node bearing tissue up here around the hepatic artery and the portal vein. The common bile duct, as you can see, is right here, which we're going to reconnect to the -- to the intestines here in a few minutes. And this is the edge of the pancreas right here, which we'll also connect to the intestine. So we have one connection here, a connection here, and then the stomach. And that's basically the end of the operation.

And this is a close-up view using the laparoscopic camera of the bed of dissection. That is the hepatic artery, and it divides into a left and a right hepatic artery going up to the liver. And immediately behind it is the portal vein, which carries blood from the intestines up to the liver. Now directly above us right there is the cut edge of the common bile duct. That drains bile from the liver into the intestine. And then if we move down here, this is the cut edge of the pancreas right here. And there's a pancreatic duct in there which is quite small which we're going to actually put some very fine sutures in to connect to the intestines. So that's basically the bed of the dissection where the cancer was earlier this morning. At this point, we're going to use this cut edge of intestine to establish the continuity of the intestinal track. We're going to take this piece of intestine and we're going to tuck it through a small opening here underneath the colon so that it can sit in the right upper quadrant here, the right upper part of the abdomen, and be connected to the pancreas and the bile duct. So that kind of sits up there very comfortably. There is generally no problem with getting a piece of intestine to sit up there like we want it. It's not twisted or anything, so we're in good shape. At this point in the operation, we're getting ready to start our reconstruction. The first thing we're going to do is connect the cut edge of the pancreas to the piece of intestine that we've brought up to this part of the abdomen. We've reinforced the closure of the intestine right there, and this little tube that I've put into the pancreas here is actually in the main pancreatic duct. And this duct, under these circumstances, is just tiny. As you can see, it's -- this is a tube that's 5 French, which is just a millimeter and a half thick. And we're going to try and put a few stitches in here and connect it to the side of the bowel and then put some reinforcing stitches on the outside. This is the connection that I always tell everyone is the most important in terms of trying to get a speedy recovery without complications. Because if there's a leak of pancreas juice into the abdomen after an operation like this, it can really delay the healing process and prolong the recovery. Called the pancreacticojejunostomy. This is the outer layer of sutures, there are two. We're going to put in the inner in just a moment. I'll need a needle-tip Bovie for that. Put one more in and then we'll put a corner stitch in, okay?
Thanks. What we do here is put in a single 5-0. This is a very tiny suture. It's an absorbable suture, and I'm going to put it in so that it anchors the linings of the intestine together. Yes, I do. Whatever you have, just let me have it, please. So this stitch will go in and out. So now do we have an opening in the intestine, that's the key. Pancreas duct, and I'm putting this in right there. and then I'm going to take this without injuring anything and slip it right into the intestine. That's going to act as a little stent. So there you go. So now that is the -- is the pancreatic duct stent with the sutures around it. So now we've got our stitches in, and I'm going to tie the sutures. The first one I'm going to tie is right here. If I can please have a -- scissor, please. Cut right here, please. Wet my hands, please. Nope, nope, nope. Wet my hands, please. Suction in there. this is the one stitch that has the knot on the inside, and the others are on the outside. And then after this, we're going to move up to the bile duct anastomosis and then the stomach anastomosis. Okay, at this point what we have done is to complete the connection between the pancreas and the intestine. So this cut edge of intestine here has now been connected to the pancreas with these stitches on the outer layer which go all the way around. And inside you saw the connection between the pancreatic duct and the opening of the intestine. Now we're going to just move up to this area where we see the common bile duct. The bile duct is a little bit inflamed from having a stent placed within it, having been obstructed because of the cancer, but that kind of thickened tissue actually is good for us because it holds stitches very well. Can I have the DeBakeys, please? So the first thing we're going to do here is we're just going to gauge the size of this duct and we're going to make an opening in the intestine directly across from it that will correspond to about the same spot. We're doing an anastomosis here, or the suturing, in the back row of the bile duct to the intestines. Sorry, it's just a little bit of routine here, so there's not a lot for me to comment on. I can tell you, the -- scissors. The bile duct here is average size and it takes generally between, oh, 15 to 20 sutures to get it all connected.

We are now finishing -- I have to tie this one -- the connection between the common bile duct and the intestine. If you can just push down on the front wall of the intestine. We've placed a number of these sutures, as you can see, into the bile duct and the intestine. And we're now just knotting these. We're then going to place some additional sutures on the front row, and that'll be the second-to-last connection that we have to do, the last one being the stomach, which, as you remember, we divided earlier in the day and we've tucked up into the upper abdomen. We'll fish that out and connect it to the intestines here to restore all of the intestinal continuity. We have a couple more of these to put in. We just space them evenly here, give us a nice seal. The tissues heal very quickly here. I would think that the two ends of these will probably have been fusable within 24 hours. The healing process, obviously, goes on a lot longer beyond that, but it's -- it's a little far back -- but it doesn't take very long for the layers of the intestine to begin to seal. A matter of hours. So the next thing we'll do after we knot these is to get the stomach and pull up a piece of intestine, which is a little further down from this one, maybe a foot or two, and then where they sit together comfortably is where we'll make our connection. So that'll be the last thing we have to do. So now we've completed the connections between the pancreas and the intestine, the bile duct and the intestine. These are going to be the new openings for the digestive juices to flow into the intestine. And now the small intestine is traveling underneath the colon here, and this is it down here in the lower part of the abdomen. We're going to take this piece of intestine here, we're going to drop the colon back in and go ahead and fish out our stomach. Can you go ahead and find it, D? It should be right up there. And we'll make a connection between these two. That's the stomach now, and it should
comfortably sit right in front of the colon so that we can connect it like that. So if you hold this piece of intestine like that, we just want to make certain this is not twisted or anything abnormal about it. It looks very healthy. That's the stomach there. This is the duodenum here. So the first thing we'll do with some 3-0 silks is put in our posterior row. And this is going to be our last connection of the day. So once we've finished with this reinforcing outer layer, we're going to cut into the intestine and cut into the duodenum. And then the connection will be made with a couple of sutures. That'll be the end of the procedure. We'll put in a couple of drains and then sew the incision closed. I'm not going to open up the duodenum. We're going to just basically amputate the suture line, the staple line we put on there earlier this morning. It's right there, if you can just pull this apart for me. First thing I notice here is that the lining of the duodenum here, this inner lining here, is very, very healthy-looking. It's nice and pink, well perfused, no swelling. And I find that very reassuring that we're going to get a nice result here. Where's the end of the staple line? Am I coming up on it? Just come straight across here? Okay. So that we can discard. So that is -- if you can suction it -- that's the opening of the duodenum. Very healthy-appearing. Now we'll create the opening here on the intestine. I want to make this a little smaller, because the intestine stretches out, okay? Now, I'm going to leave a little space here, D, so that we have a nice row to sew to. That should be big enough. Yep, I'll come up here. Do we have another DeBakey for me? Yeah, that's perfect. So what I want you to do is open that up. We just need to be right in the -- are you close to there? Just open it. There it is, now come right around here, and we'll just open this up. Perfect. The blood supply to the lining of the intestine is very rich, which is why we use the cautery here. Otherwise there would be a lot of unnecessary bleeding from the cut edges of the intestine. Intestine, I find to be a very interesting part of the body. The lining of the intestine is really replaced almost every two to three days. It's one of the most metabolically active areas of the body. And just open up this right here. That's why when people get chemotherapy, the intestines are frequently the site of side effects, because they're very sensitive to anything that interferes with their ability to reproduce regularly. Now we've got the two edges here. We just need to just sew them together. Now we've pretty much completed the back row here, and we're going to sew the front row together slightly differently. Just do one more simple stitch, and then I'll show you the canal suture.

All right, and now what you'll want to do is turn your needle around and come from in to out. Perfect. Now we may have a little bit more distance on the small valve to make up, so we'll just take slightly more advances on the small valve, so you're out, in, and out here. Okay. And this should invert it. Can you suction in there, please, inside? Yeah, perfect, mm-hmm. Start back at your last stitch, advance within the stitch. Perfect. Okay, we're putting in our last stitch now for the connection between the duodenum and the intestine, and that'll basically conclude the operation today. This has been a Whipple procedure done for a localized pancreatic head -- excuse me -- adenocarcinoma in a 62-year-old otherwise-healthy gentleman who had presenting symptoms, as I mentioned at the outset, that were very typical: weight loss, early satiety, and painless jaundice, which is yellowing of the skin and the eyes. The intraoperative findings today were actually very encouraging. He had no indication of spread of this malignancy outside of the pancreas. Go ahead and pull up on yours there. The lymph nodes were uninvolved, at least to the naked eye. The liver looked clean. Scissors, please. There was some fibrosis, as you saw early on, adjacent to the vein, but my belief is that that represents just inflammation secondary to the instrumentation of the GI tract, which he had had previous to this procedure. The tissue has been sent to the pathologist. There will be a very thorough analysis of the -- 3-0 silks, please -- of the size of the tumor. We'll look at some of
the cellular characteristics of it. A little tail. We're going to look and see whether or
not there were any lymph nodes, the number of lymph nodes that were potentially
involved with tumor. 3-0 silks, please. And the ratio of the lymph nodes that were
involved with tumor compared to the total number that were harvested. Going to
start right here and go straight up. And as I mentioned, that's very likely going to
translate into a recommendation for additional treatment, but we'll certainly wait for
the final report on that before we make that decision. The procedure was technically
straightforward. It was -- I don't want to say complicated, but it was influenced by
the fact that his anatomy, the arterial anatomy in the porta hepatis region, which is
the area where the common bile duct and hepatic artery and portal vein are located,
was somewhat unusual. His right hepatic artery looped around the gall bladder. And
therefore we had to be very careful not to injure that structure as we removed the
gall bladder and the common bile duct from that region. The overall intraoperative
course I think was fairly routine. He did not receive a blood transfusion. His blood
counts have been stable. And my expectation is that he'll wake up and be able to be
extubated so he's breathing on his own before he goes to the recovery room. We'll
keep him in our intensive -- not in our intensive care, our intermediate care unit for
48 hours. He'll be in the hospital for probably five to six days beyond that and then
should be discharged to home.

01:04:17
The only steps that we have left here are to place some drains in the vicinity of the
pancreas and the bile duct just to help us monitor the healing process there. I think
we're okay. Scissors, please. D, did I miss anything here, I've just been trying to
think of anything else to say.

01:04:57
WOMAN: [ indistinct ]
01:05:03
H. RICHARD ALEXANDER, MD: The -- the Whipple procedure is one that has been
recognized to be a procedure that should be done at centers that have some
expertise in this area. Let's have some saline, please, irrigate. And there are a
number of hospitals around the country that have established a reputation for having
that kind of expertise. When I came to the University of Maryland Medical Center
from the NIH, I was impressed by the caliber of our own cancer treatment program
here. Our radiation therapists were instrumental in conducting the definitive clinical
trial that demonstrated the benefit of radiation and chemotherapy that is now
considered to be the gold standard for most patients who need additional treatment
after surgery. Our expertise not only in the cancer center but throughout the hospital
is well-suited to take care of this kind of patient. This is something that we do very
commonly here. I would say that we qualify as a high-volume center and probably
have upwards of 50 or 60 of these a year that we do. It could be even higher than
that. Okay, let's place our drains. These are what we call closed-suction drains. They
are basically a small tube which is -- just poke straight in, there you go. I'll just take
one at a time if I could. I can only put in one at a time here. And this one on this
side will be placed adjacent to the bile duct connection to the intestine. And the one
on the other side -- okay. There you go, take it. Scissors, please. Will go next to the
pancreatic duct. So I just want to make sure that's going to slide out without too
much difficulty. Can you just cut that right about there for me? these drains stay
sterile as they are connected to a closed-bulb suction, so there's no chance of
contaminating the inside of the abdominal cavity with these. Generally this one is
taken out in two to three days. The one on the -- adjacent to the pancreas may stay
in for a slightly longer time. So we're now closing the abdomen. We have placed the
two drains that I described before, they're in position. And with a few more stitches
then, this operation will have been completed. I hope that this was informative to
those of you who are viewing this today. I would like to also acknowledge my
gratitude to this particular patient for his willingness to volunteer today to have this
procedure taped. He did so with the understanding that this may provide a service to
someone else who’s in a similar circumstance to him and who would like to see a
little bit more and learn a little bit more about this procedure and the treatment for
pancreas cancer. So on behalf of everyone here in the operating room today in the
University of Maryland Medical Center, I thank you for joining us.
01:08:47
ANNOUNCER: This has been a pancreaticoduodenectomy, more commonly known as
a Whipple, on a patient with pancreatic cancer performed from the University of
Maryland Medical Center. OR-Live makes it easy for you to learn more. Just click on
the "Request Information" button on your webcast screen and open the door to
informed medical care.
01:09:18
[ end of webcast ]