Atherosclerotic disease of the cervical carotid arteries is one of the primary causes of vascular disease and stroke in the United States, affecting millions of Americans. In the past decade, great progress has been made in the endovascular treatment of atherosclerotic disease that has been extended to the carotid arteries. During this live webcast, physicians from the Cardiovascular Center at Brigham and Women’s Hospital in Boston will demonstrate a newer endovascular stenting technique for the treatment of atherosclerotic carotid stenosis, a blockage of the main artery to the neck that is a common cause of vascular disease and stroke in America. Today’s program is part of Brigham and Women’s ongoing educational efforts to bring the latest information in health care to physicians and patients. During the program, you may send your questions to the cath lab at any time; just click the MDirectAccess button on the screen. This is a Harvard Medical School CME-accredited webcast.

MICHAEL BELKIN, M.D.

Good afternoon. I’m Dr. Michael Belkin and I’m Chief of the Division of Vascular and Endovascular Surgery here at the Brigham and Women’s Hospital. I’m most pleased to welcome you today to our live case of a carotid stent procedure, performed for a patient who has atherosclerosis of the carotid artery. The carotid artery is the major blood vessel to the brain and atherosclerotic narrowing of that vessel is a well recognized cause of strokes. As such, treatment of those narrowings is a well established technique for prevention of stroke. The carotid stent procedure which you are about to see is a new minimally invasive approach which has recently been approved by the FDA for selected patients with coronary occlusive disease. For these selected patients, this technique offers a minimally invasive and effective alternative to the standard surgical option which has been used for many years, known as carotid endarterectomy. At this time, I’d like to introduce you to my associate and colleague, Dr. Peter Libby.

PETER LIBBY, M.D.

Good afternoon. I’m Peter Libby. I’m the Chief of Cardiovascular Medicine at the Brigham and Women’s Hospital and we’d like to welcome you to this afternoon’s live case. The case that you are going to be watching is going to be performed by a multidisciplinary team that includes members of the Department of Surgery and members
of the Cardiovascular Division of the Department of Medicine. Now, this interdisciplinary teamwork approach is emblematic of our cardiovascular center’s patient-centered way of handling individuals with cardiovascular disease. This builds on a tradition that reaches back to the early 1990s, when we established one of the first multidisciplinary vascular centers in the country, and it is a tradition that will be reinforced as we look forward to moving to a new facility, the Shapiro Cardiovascular Center, as part of our Brigham and Women’s Hospital, where we will be able to really embellish this patient-centered approach, multidisciplinary approach to the patient with vascular disease. Now, I’d like to turn it over to the Director of our Cardiac Catheterization Laboratory, Dr. Campbell Rogers.

CAMPBELL ROGERS, M.D.

Thank you very much, Dr. Belkin and Dr. Libby. Welcome again to our live webcast, a carotid artery stenting for atherosclerotic carotid disease. My name is Campbell Rogers and I’m the Director of the Cardiac Catheterization Laboratory at Brigham and Women’s Hospital. A couple of bookkeeping issues before we get started. First is that we will be able to communicate with you, the audience, through email and answer your questions, which you can submit through email. You do that by going to the MDirectAccess button on the player window of the website. Please avail yourself of that. We look forward to questions from the audience over the next hour.

Second, this is a CME program and you will be able to redeem CME credits, again, on the website for the next 24 hours. At this point, I would like to introduce our procedural team and go into the catheterization laboratory, where my partners, Dr. Andrew Eisenhauer, who is the Director of the Interventional Cardiology Service here at the Brigham, and Dr. Ed Gravereaux, who is the Director of Vascular and Endovascular Surgery at the Brigham, are ready to greet us, introduce the other team members, and then we’ll proceed with a little information about the disease being treated and with the procedure itself. Drs. Gravereaux and Eisenhower, are you ready?

ANDREW EISENHAUER, M.D.

Yes we are. Good afternoon, everyone. I’m Andy Eisenhauer. This is my partner and colleague, Ed Gravereaux. We do have a multidisciplinary approach to the treatment of carotid disease. That approach requires not just physicians, but a number of medical professionals that are very important. I’d like to take an opportunity to introduce the folks that will be helping us to take care of the patient today. Rob is our x-ray technologist. Jen, who is over in the corner here, I think out of camera range, is the hemodynamic technologist and CVT. Allison and Brian in the background here are our nurses, who are keeping the patient comfortable and safe and allow us to do things that, without such great help, we wouldn’t be able to do.

We’re going to get started with our procedure, but first a few words about carotid artery disease, in general. I think Campbell has a few slides that he’d like to go over over the next few minutes.
CAMPBELL ROGERS, M.D.

Thanks very much, Andy. As a way of introduction, the disease being targeted and treated today is that of stroke. As you see on the slide, some information about stroke in the United States as the third leading cause of death, a disease which strikes hundreds of thousands of Americans each year. There are millions and millions of stroke survivors, many of them with significant impairments, paralysis, difficulty speaking, all sorts of chronic issues derived from stroke. There’s a huge economic burden to the health care system of caring for patients who have suffered stroke and all of these combine to make prevention the #1 priority. The procedure you’ll see today and the procedures we’ll talk about are really aimed at preventing stroke so as not to have to resort to treating its sequelae. Increasingly, there is recognition that different patients require different specifically tailored therapies, hence our multidisciplinary approach, which you’ve already heard about. Finally, there is a little bit of disheartening information, which is that following a long period of gradual decline in the incidence of stroke, that decline seems to have leveled off and we are at a place in medicine where we need to look for and develop new therapies and new preventive approaches so as to further this decline in stroke incidence.

What is stroke? Stroke is the sudden loss of blood supply to the brain and can come really from two primary causes. The first is bleeding in the brain, where a blood vessel bursts and there is blood within the brain, called a hemorrhagic stroke. The second is through embolism or the travel of a blood clot or a piece of atherosclerosis breaking off from one part of the body and traveling to another. These emboli can arise from the heart or from the carotid arteries or occasionally, rarely, from other sites. Some of the principal symptoms which patients suffer at the outset of stroke are loss of the ability to speak, loss of vision, loss of strength or sensation in one or another part of the body. An important warning sign or, if you will, mini-stroke is what is called a TIA. TIA stands for transient ischemic attack. The definition of this is symptoms consistent with a stroke, but symptoms which are short-lived and which go away within the first day. Now, TIsas are not isolated events. What they really are are warning signs. Many of the patients you’ll hear about today are patients who have this warning sign who, fortunately, fall short of having a true stroke, but are left, as you can see, with a very high risk of real stroke in the ensuing weeks, months, and years. Finally, people who have already had a stroke are at high risk of having another stroke in the future, despite the current best medical therapies which are available, hence our continuing search for ways to reduce this risk and to treat patients either who have had stroke or have had TIsas in ways which would prevent further damage.

At this point, I’d like to send it back into the procedure room, into the catheterization laboratory.

ANDREW EISENHAUER, M.D.
Great. We’re going to talk just for a few minutes about the cerebral blood supply and about some reasons for choosing one therapy over another in this condition as we get on with the case. Ed, tell us about the cerebral blood supply.

EDWIN GRAVEREAUX, M.D.

This is a rather busy slide depicting the anatomy of the neck and the position of the carotid artery, the circled region at a bifurcation of the common into internal and external branches, the typical site of the atherosclerotic carotid disease which is responsible, potentially, for embolic stroke. Now, this location is amenable to surgical repair, which has been the mainstay of therapy over the last several decades.

Randomized trials, which are quite extensive, have certainly proved the benefit of surgical endarterectomy over these trials for both symptomatic and asymptomatic patients. Now, for patients with prior stroke, or symptomatic patients, either a stroke or TIA, a lesion or stenosis in the range of 50-60% benefits from surgical intervention over medical therapy and that is provided that the surgical therapy, as depicted on the slide, can be performed with a less than 6% operative risk. Asymptomatic patients, however, typically are not intervened upon and will not enjoy the benefits of the surgical endarterectomy until their stenosis reaches the 70-80% mark.

This is a depiction of an intraoperative photo of the carotid artery bifurcation. It’s actually before any of this repair is being done, but we’ve exposed the artery, longitudinally opened the artery, endarterectomized or removed the plaque in a very specific plane, cleaned the debris out, and these days, currently, most patients have a patch angioplasty to maintain luminal patency. The surgery is well tolerated. Again, in centers of excellence, it has a very low operative risk and patients usually go home the following day. Now, there is a surgical incision and this is where it is a big difference between the procedure you’ll be seeing today, as patient comfort level is very important.

The next slide, I think Andy will talk a little bit about the stenting procedure.

ANDREW EISENHAUER, M.D.

The potential advantages of a minimally invasive approach, the first one is just that: it is minimally invasive. If you could focus down here on my hands for just a moment, you’ll see in contrast the incision that we use for carotid stenting. It’s really no incision at all. It’s two catheters, one placed in the vein, one placed in the artery, through which we can get access to the blood vessels. So the main reason why this technology has taken off, at least in concept, is because of patient and physician preference. That may or may not be a reason to do something. It is less invasive. There’s less discomfort and potentially faster recovery. It may be more efficient in terms of patient reimbursement at some time in the future and certainly it allows for a shorter hospital stay in most instances. It is a technique that allows us to treat challenging patients that may not be the best candidates for surgery. This is the main group of patients that are treated today. Radiation fibrosis of the neck, restenosis after a carotid operation, or renarrowing after a carotid operation. Patients who
are at high non-neurovascular risk, high cardiac risk, high pulmonary risk for an operation and also for lesions that are outside of the surgeon’s reach in the neck. Let’s look at the next slide.

So what to do in today’s day and age? When should one have endarterectomy and when should one have carotid stenting? Well, this isn’t well worked out yet. Endarterectomy, as Ed said, is important for symptomatic folks who are less than 80 years old, who have 60% stenosis and the surgical risk at whatever institution they’re going to have this done is low. Stenting may be more appropriate for patients who are at high risk, particularly from cardiac or cardiovascular causes or who have bad lung disease or unfavorable anatomy, but these things are changing with time. In cutting edge therapy, one has to realize that these indications will change in a dynamic fashion as time passes.

Let’s go on to the next slide and talk about, we’ve introduced everyone else except for the most important person and that’s our patient. Mr. JA is 73 years old. He’s here with us, lying on the table, quite conscious. He has a number of medical problems, most of them vascular in origin. He has mild renal disease, high cholesterol, hypertension. He is a former smoker. Most importantly, he has had a number of myocardial infarctions, the last one in February 2005, multiple coronary angioplasties, gastric bypass surgery. He has had vascular disease, including renal artery stenosis and a history of stroke on his left side.

We treated his right carotid in 2003 with a previous stent and he has done very well. His wife tells me that he needs to go to his 55th high school reunion in September. He’s back, unfortunately, with severe progressive disease in the other carotid, which was mildly diseased in 2003. He has developed progressive stenosis, still asymptomatic, so we’re going to do a noninvasive or minimally invasive approach to treat that today. We can have the slides off and we’re going to show you how we’re going to do this.

First, I’d like to show the live monitor. We’re going to show his initial aortic arch study. This shows the anatomy of the aortic arch. One can see that to the left of the picture, the brachiocephalic trunk takes its origin low on the aorta. Fortunately, we’re going to go for the left common carotid, which is almost at the apex of the arch, so this is not a completely favorable arch, but it’s nearly so.

In the next picture, this is Mr. A’s previous stent. You can see right at the center of the picture is the ghost of the stent. It’s widely patent. There’s a little narrowing at the stent that was a residual at the time that this was placed. This is the injection of the brain circulation, the intracranial circulation here, that shows in fact that there is some cross-filling now to the other hemisphere, suggesting that the other carotid is very severely diseased.

We can move on and we’ll pass over the other views on this side. This is the first picture of his left carotid, showing right below the dentures there a very severe stenosis. You can see it better in this view. I’ll stop this right there. I’m going to put this over on the still camera but we’ll stay on the live. Finally, here’s the intracranial picture on the side that we’re going to treat. Toward the middle of the screen, in the anterior cerebral distribution, you can see a relative lack of flow. That’s because of the competing flow
from the other side, the other carotid that’s open. So the first part of our procedure is going to involve placing a delivery sheath into the left common carotid for delivery of the stent and distal protection device. We have already put our catheter up here into the common carotid and we’re about to instrument the external carotid. That’s not the target vessel. The external carotid is the branch to stabilize our access to this vessel so that we can get our delivery sheath in place.

I’m going to flush out our catheter. This has been in here for a few minutes, so I want to make sure it hasn’t developed any thrombus. We’ve had it on continuous flush, as we should. We’re going to go to an oblique view, the one that I showed before that has the severe stenosis, and take a set-up picture so we can size the artery a little bit better.

Okay, we’re going to get a 6-5 device. Now we’ll take this hydrophilic wire and place it up the external carotid. There we go. I’d like to get it in that vertical branch. We can place the catheter with the wire in the smaller branches, but they can perforate.

CAMPBELL ROGERS, M.D.

Andy and Ed, let me ask one of you while you’re doing that to talk about the embolic protection device. You both mentioned it. For people in the audience who may not be familiar, what is that for and what does that do?

EDWIN GRAVEREAUX, M.D.

It’s a device which I guess is analogous to a fish net, which is a filter or a sieve which is very small caliber. It is passed through the lesion as the first instrumentation and deployed downstream in the internal carotid artery. When deployed, it allows blood flow, perfusion to the brain, but effectively filters out ideally any embolic debris which would be loosened during the manipulation of the balloon and stent placement of the actual narrow point in the carotid artery. There has been some data in the earlier trials with the carotid stenting that has decreased the incidence of cerebrovascular events during this procedure.

CAMPBELL ROGERS, M.D.

So the problem is that during the stenting itself, small particles can be dislodged and can travel and this filter effectively prevents them from doing any harm.

EDWIN GRAVEREAUX, M.D.

Well, it’s reducing the incidence of embolic events that are at least clinically apparent to the typically low range that we see in centers of excellence with surgical endarterectomy, so it’s certainly not inferior.

ANDREW EISENHAUER, M.D.
This is a special sheath that’s been developed over the past several years, primarily for carotid stenting. It’s very good to deliver stents and other interventional devices. It’s coated with a slippery or hydrophilic coating.

CAMPBELL ROGERS, M.D.

While you’re putting that up, let me throw an email question from one of our audience members. It is the following: I’m a thyroid cancer survivor. I’m 77 years old. I recently learned I have a 99% carotid stenosis and am experiencing some dizziness. Essentially what are medicines or procedures available to help me? Andy, you mentioned people who have had radiation therapy, etc.

ANDREW EISENHAUER, M.D.

This is a great question. Taking the second part of it first, dizziness is a very, very common symptom and it is not often related to carotid disease. I assume, without speaking absolutely directly to this individual, the problem is that she has disease on just one side. That’s different from bilateral disease.

EDWIN GRAVEREAUX, M.D.

Dizziness is a very nonspecific symptom, especially for carotid territory disease. It speaks more of a vertebrobasilar symptom. So 99% stenosis is actually pretty severe.

CAMPBELL ROGERS, M.D.

Let me follow up on the question to add, for somebody who has had thyroid cancer and presumably either surgery and/or radiation therapy, from a surgical approach, what are your thoughts about that and how would that person fit in?

EDWIN GRAVEREAUX, M.D.

Sorry, Campbell. I didn’t mean to ignore you, but I think we needed both hands on deck. Certainly things like prior operation, radiation therapy to the neck, prior tracheostomy or current tracheostomy certainly ups the ante for surgical difficulty. In some but not all series, the operation can be done, but it traditionally holds a little bit higher risk of a perioperative neurologic event, so clearly carotid stenting may be the best choice for someone with a more challenging surgical operation. A 99% lesion is also one that we would intervene on. When it becomes 100% occluded, typically the danger of a further embolic event is over, so we don’t operate.

CAMPBELL ROGERS, M.D.

Let me put another question to you while you’re taking this picture, Andy. This question comes from Moscow, believe it or not. This is how we know we’re really going
worldwide, which is very exciting and we appreciate people writing in. The question is this: does this procedure increase the risk of reperfusion syndrome for patients?

EDWIN GRAVEREAUX, M.D.

That’s another good question. Reperfusion syndrome is the syndrome of neurological dysfunction from reperfusion. It happens more commonly in patients with very, very severe stenoses and bilateral stenoses and in patients that have a history of hypertension. There is some suggestion that in patients who are subjected to carotid stenting and have bilateral disease, that reperfusion syndrome may be more common than with surgery, but there’s no good large series that suggests that. I think it’s something that we have to be alert for. It’s usually well treated with blood pressure control. This is to be distinguished from reperfusion hemorrhage, which is a very severe and, fortunately, thankfully, rare problem.

We’re going to actually prepare...I’m just going to prepare the protection device. That’s something that will be important to watch. This is sort of the heart and soul, perhaps, of carotid stenting these days. This is the guidance system. This is the FDA-approved system that we’re using today. It’s called AccuNet. This is the filter, actually. It’s probably hard to see. It’s contained in this little chamber and we’re flushing it through. It actually now is being sheathed into a small caliber catheter, which is now to be deployed up across the carotid lesion and deployed in the internal carotid artery.

I’m putting a little curve on the wire to the left for some steerability.

ANDREW EISENHAUER, M.D.

This, in order to go through our system, we put a little peel-away sheath on it.

CAMPBELL ROGERS, M.D.

While you’re doing that, I have another question from an audience member, a patient who has had carotid stenting. I had a carotid stent in 1999 on my right carotid. I still have a few of my old bad habits, such as smoking a pack a day and a couple of drinks a day.

ANDREW EISENHAUER, M.D.

Bad, bad.

CAMPBELL ROGERS, M.D.

What are the chances of recurrence? This is a 64-year-old patient and particularly the questions I would add are what are the likelihood of restenosis versus contralateral disease, progressive disease. How do you survey these patients in the months and years following stenting?
ANDREW EISENHAUER, M.D.

Restenosis is different from the development of disease elsewhere or even at the same site. Restenosis or fibrous renarrowing occurs perhaps 10% of the time or less and it’s generally a benign process. We have a situation here where in most instances renarrowing is mild. The development of progressive or additional disease is a different story and that is a factor, like the development of other disease, affected by the patient’s habits. We are, in fact, crossing the lesion right here with the distal protection device.

EDWIN GRAVEREAUX, M.D.

You can see on live fluoro there’s two markers several cm before the tip, which is actually the device, the umbrella.

ANDREW EISENHAUER, M.D.

You want to keep the umbrella outside the outer table of the skull. I don’t know if you recall from the initial injection, but there was plenty of intracerebral atherosclerosis and we’d like not to disrupt any of that, so it’s going to unsheath this device. The device will come out like an umbrella. You can see the device has deployed.

EDWIN GRAVEREAUX, M.D.

Those four markers denote the open prongs of the umbrella and the net is now out to catch any embolic debris as we then perform the angioplasty followed by the stenting

ANDREW EISENHAUER, M.D.

We’ll peel that away or take it off and make an injection here, so you can see the device is well deployed. It’s about 2/3 of the way up to the top of the screen and there’s contrast flow through it. With a brief injection, we’re able to see that over and over again. So it’s a porous net that will allow blood to flow through it and will trap large 80-100 micron pieces of debris.

Another question that people might ask is can you predict whose carotid is going to have lots of debris and whose isn’t? The short answer to that is no. There are some bad angiographic signs, lots of mobile debris that you can see waving in the blood flow, but in general there’s not a good way to predict who will have debris released by ballooning and stenting and who won’t.

CAMPBELL ROGERS, M.D.

So that would make it a universal practice to use such filters when possible to do so.

ANDREW EISENHAUER, M.D.
Yes. I really think it is the standard of care.

CAMPAEL ROGERS, M.D.

Let me come back to a question we had a minute ago and ask you, Ed. In terms of surveillance of patients after either an operation or a stent, what do you recommend? Are patients followed simply for recurrent symptoms or are there imaging procedures that are done as a routine? What is your practice?

EDWIN GRAVEREAUX, M.D.

We typically, here at the Brigham, for our surgical patients and as well now for the angioplasty and stenting patients, have a very detailed surveillance program. Now, we’re also in several clinical trials for carotid stenting, which mandate follow-up. We like to get, in the surgical and stenting patients, ultrasound, duplex ultrasound evaluation, at least at every six month intervals for the first two years, which is something that can pick up an early recurrence, which would...we’re going to do a balloon inflation, Campbell. I’ll get back to that in a minute.

ANDREW EISENHUER, M.D.

We’re going to actually predilate this. Some operators don’t advocate predilatation with a small balloon before stenting, but we know from having done Mr. A’s other side that he’s had fairly fibrous and resistant lesions and we don’t want to take a chance of a stent not expanding sufficiently, so we’re going to predilate this. We’ve already pretreated him with Atropine, which is essential here.

A little low. Sorry. I misinterpreted the location of those markers. There we go.

EDWIN GRAVEREAUX, M.D.

Campbell, we get ultrasound follow-up to make sure there’s no early recurrence, which could be an intimal hyperplastic phenomenon. A later recurrence is more typical of the patient’s concern that he hasn’t quit smoking yet and would be more of a redeposition of atherosclerotic plaque under probably both circumstances. We’re predilating with a 3.5 mm balloon.

ANDREW EISENHUER, M.D.

No slowing here. This is dilatation right at the carotid body, which is the receptor, of course, that can control heart rate and blood pressure, so people may, in fact, get a little bit hypotensive and slow their heart rate down during balloon dilatations. Now we’re going to take this balloon out.

CAMPAEL ROGERS, M.D.
Let me put another patient question to you regarding appropriateness of therapy, etc. This is as follows: my mother recently found out that her carotid blockages extend up through her neck and into her head. Is this procedure appropriate? She is 67, smoked for 40 years, has severe COPD or chronic obstructive pulmonary disease, high blood pressure, and emphysema.

ANDREW EISENHAUER, M.D.

There certainly are procedures that can carry stenting and revascularization into the head. It becomes a little bit more problematic because of the branch vessels at that point, but it’s something that is certainly not unreasonable, but we’re not going to show any of that today.

We’re going to put a 10 x 30 Acculink. This is a large vessel and we should be able to cover this entire lesion with a 30 mm long x 10 mm in diameter stent.

CAMPBELL ROGERS, M.D.

Are you going to be able to show us that stent?

ANDREW EISENHAUER, M.D.

Yes, we’re taking it out right now so you can see that. Thanks, Campbell. Good point.

EDWIN GRAVEREAUX, M.D.

Here is the AccuNet device. I’m flushing it out. This is the stent. We’ve selected a 10 mm diameter, if you can focus on that. This is all furled up. Now, we saw on the prior shots, earlier angiograms, the stent when it was deployed. It’s a lattice-work, if you will, which scaffolds the artery open. Here it’s in furled up sheath state. You’ll be able to see this being deployed. I’ll flush out the catheter.

CAMPBELL ROGERS, M.D.

So, unlike that balloon you just inflated, this will sort of pop open as it’s released from its sheath. Is that correct?

EDWIN GRAVEREAUX, M.D.

Right. It’s made out of a self-expanding metal which has memory. As it’s unsheathed, it unfurls and it becomes more stable and more rigid at body temperature. We will likely need to do a post-balloon dilatation to iron out what will be a residual waist, but that’s just a function of usually the density of the lesion because a lot of them are calcified as well.

ANDREW EISENHAUER, M.D.
We should mention here that we’re using bivalve anticoagulation, instead of Heparin. We have found anecdotally that we have better control with that. It’s a quicker offset after a procedure and then these patients that have lots of vascular disease typically have very good luck with a lack of bleeding complications associated with it.

CAMPBELL ROGERS, M.D.

Since you mentioned it, what is the practice regarding more potent anti-platelet drugs, for example, 2B3A blockers?

ANDREW EISENHAUER, M.D.

I think people, including ourselves, are very concerned about potent antiplatelet antagonists as a routine because of the potential for hemorrhage.

EDWIN GRAVEREAUX, M.D.

Before we deploy, one final check. This is sort of like you can’t be too rich or too thin; you can’t check too many times if you’re in the right position. So that was it. It just deployed. It’s very difficult to see on your screen.

ANDREW EISENHAUER, M.D.

There’s the device leaving.

EDWIN GRAVEREAUX, M.D.

There’s quite a substantial waist still because we haven’t fully dilated the stent.

ANDREW EISENHAUER, M.D.

This deployment is usually not associated with slowing. The stent doesn’t push on the artery very hard. Post-dilatation will be more associated with that.

CAMPBELL ROGERS, M.D.

Andy, there’s another question from our audience. That is whether these stents are treated with any anticoagulant substance, perhaps reflecting some of the interest in drug-eluding coronary stents.

ANDREW EISENHAUER, M.D.

As you know, there are no drug-eluding stents available for use outside the coronaries. I guess that’s what you’d call the bad news. The good news is that the purpose of drug-eluding stents is to prevent restenosis or renarrowing, which hasn’t been a large problem
in this vascular distribution, so certainly drug-eluding stents are being looked at for other uses besides coronaries, but right now they’re not available for the carotids, either investigationally or for general use.

EDWIN GRAVEREAUX, M.D.

Likely, given the rates of restenosis we’re seeing, it probably won’t be something that’s necessary.

CAMPBELL ROGERS, M.D.

Ed, there’s a question from the audience I’d like to put to you. It’s a fairly general but very important one: my wife is 63 years old and healthy, but diagnosed with a 50-70% carotid narrowing. Is she a candidate for this procedure? But even short of that, what would you tell such a person who came to see you in the office? Are there general approaches or are there research approaches, etc?

EDWIN GRAVEREAUX, M.D.

Well, it varies. I think at the Brigham, and this is where the multidisciplinary approach that we take here is very valuable to the patient, everybody with vascular disease in one territory likely has some sort of systemic manifestations, symptomatic or not. Now, this patient is fairly young. An asymptomatic lesion, meaning no mini strokes and no strokes, with a 50-70% lesion, by the surgical literature would not enjoy the benefits of an interventional procedure over medical therapy. That is provided the lesion does not progress. Now, that said, tracking this is important. Lifestyle modification, risk factor modification is important, and there’s also new medical regimens consisting of antiplatelet therapies as well as antilipid therapies, which can be used to hopefully stall the progression of such a plaque. Now, if it does progress and the patient still is quite young, one caveat about the angioplasty and stenting procedure is that we do not have long-term data that we do with the surgical durability, so I would be a little concerned about offering someone in their early 60s this procedure when we have a very good operation. Now, that said, there are trials ongoing here at the Brigham and enrolling patients into these trials in a way that we can hope to ascertain the long-term durability, so we would have a lot to talk about.

ANDREW EISENHAUER, M.D.

I think one of the other issues for individuals who do medical therapy is that the surgical trials were done at a time when there wasn’t aggressive therapy available for carotid disease that was medical. Many of those patients were just taking a little bit of aspirin, so we know that with the addition of lipid-lowering therapies, every trial that has looked at the stroke rates involving patients given cholesterol medicines has shown a reduction in stroke in those patients, so I think one of the challenges for any kind of intervention, surgical or carotid stenting, is the potential that medical therapy may be extremely efficacious in preventing strokes in patients who haven’t yet had them.
I’m going to take a post-shot. This is with the filter in place. Looks good. Now, we don’t post-dilate these stents to absolutely the same diameter as the normal artery. We make them almost as large, but with time, because they’re self-expanding stents, they tend to continue to enlarge a little bit.

CAMPBELL ROGERS, M.D.

Andy, while you’re getting that sheath ready, let me ask you. Again we have a question from Moscow and it is as follows: Talk to us about the procedure. Is it still in clinical trials in the U.S.? What determines your choice of stents, etc.?

ANDREW EISENHUAER, M.D.

Well, right now the only stent system approved for general use, which is this particular instance, is the guidance system. Other stents are available on an investigational basis and patients entering those trials would be given those stents, so the trial characteristics would be what would determine the use of a particular stent system. What we’re going to do right now is recovery our filter. You can image it’s expanded in the artery, like an umbrella, so we’re going to have to collapse it, then we’ll take a look and see what debris is in the filter. This is our retrieval sheath going through. That’s it. We collapsed the filter into the retrieval sheath and we’re pulling it back, taking care not to let it come out. If you can focus on Ed’s hands there, he can open that up and we’ll see if we see any debris.

EDWIN GRAVEREAUX, M.D.

This is actually what that umbrella looks like in its deployed state within the artery as it was unsheathed. Now, I’m looking down the center to see if there is any plaque or debris. It’s hard to say. A lot of it is frothy blood, maybe a little bit of debris. It’s rare to see these devices pack up with debris; however, I think it’s a little comforting knowing we have this filter able to catch anything, should it dislodge.

Okay, we’re going to go back to live fluoro and take our completion angiography.

ANDREW EISENHUAER, M.D.

There we go. That’s pretty good. We need to see it in another view. There’s a little contrast outside the stent. Sometimes ulcerated lesions actually have a little contrast in the ulcer outside the stent. That’s generally inconsequential.

Yeah, that’s what that is. It’s a little outpouching there with contrast outside the stent. I don’t think we should...in fact, I know we shouldn’t do anything about that. I need to take a look at the intracranial shots and count blood vessels to make sure that we’ve not knocked anything off, although we certainly would not see...John, squeeze your hand for a second. That’s good. You know, that command to squeeze your hand involves the use of a tremendous number of neural systems. You have to process the command, so you
have to understand language. You have to be able to interpret the command and you have to be able to carry out specific motor function, so it really is good on-table testing for whether a person is neurologically intact.

Okay, now if you remember on our pre-shot, we didn’t see a lot of filling of the anterior cerebral distribution. We expect to see some more here.

CAMPBELL ROGERS, M.D.

I have a very interesting question for you from the audience. First of all, your result there is simply stupendous. Congratulations to both of you. That is wonderful. We definitely have a few minutes left for questions and then for some thoughts from both of you, but congratulations, that’s wonderful and I’m very happy for the patient.

The question from the audience is a really good one. It is the following: I had a carotid stent in 1999. At that time, it was considered somewhat controversial. Is it still? If so, why?

ANDREW EISENHAUER, M.D.

It’s true, carotid stenting is considered controversial, still, and I think it’s because there are a number of medical and political reasons. Obviously the development of new technology always has fits and starts. From the standpoint of scientific controversy, carotid endarterectomy, the surgical treatment, is tried and true. It’s been around for almost 50 years now. It has been subjected to large scale randomized trials, the gold standard of clinical trials, and it has done very well. Carotid stenting is the newcomer. In addition, carotid stenting, as you’ve seen this afternoon, is very simple. It can be done very simply. It can be done without a neck incision. It can be done with a lot of patient comfort. So it’s easy, if you will, to convince people that this is a procedure that they ought to have, rather than having an incision made in their neck. But that may not be the right procedure for everybody, so again, the reason to look at this carefully with a multidisciplinary approach so that there’s a good interaction between people who are surgeons who do endovascular therapy, people who are cardiologists who also treat coronary disease, who can provide what’s best for the individual patient. So I think absent the politics, the science will continue to march on and we’ll come up with more and better recommendations about who should have what therapy. The third arm of that triad that I mentioned before is medical therapy. Medical therapy is appropriate for many patients and just because you have a narrowing in an artery in your neck doesn’t mean you need an operation or that you need a carotid stent.

CAMPBELL ROGERS, M.D.

Ed, let me ask you a question. This is a technical question about the procedure and I want to spend just a few minutes for the proceduralists in the office, going over specific aspects. The question from the audience is why is this patient not under general anesthesia? Perhaps this would be a good time also to go over, we do have a slide of
general pre-, intra-, and post-procedural issues. Perhaps we’ll use this question as a jumping off point to have you go through quickly, how do you care for these patients pre-, intra-, and post-procedure and why don’t we use general anesthesia?

ANDREW EISENHAUER, M.D.

Okay. Let’s put up that slide. I think there are several considerations in carotid stenting. First of all, as was alluded to by some of the other calls and questions, you ought to think about this procedure before having it. Who is the appropriate patient? Does the patient understand what’s going to happen? Is the consent that the patient has given truly informed? You have to think about, since we’re going in blood vessels and having vascular access, we have to think is there appropriate vascular access? It’s important for us to know whether the patient’s renal function can tolerate contrast. One of the regions for doing an operation, for example, as opposed to carotid stenting, would be if a patient couldn’t have intra-arterial contrast material. And whether the patient has the ability to cooperate. Mr. A is a superb patient. He has had a number of procedures, both coronary and others, and is extremely cooperative. He’s been comfortable today. He’s an old hand. He actually probably could do this if he had to. So he’s really an ideal candidate. He’s been very cooperative and that’s very important. In the procedure, an arch aortogram, which we did at the beginning of the case, is very important because most of the procedural complications come from getting your stuff in place. Having an arch aortogram is very important to know what the configuration of the aortic arch is. Doing a careful angiogram, as we did, to show cross-filling and show what the intra-cranial anatomy is is very important, and then meticulous thoughtful technique. A lot of people hurry, hurry, hurry to do this. Sometimes when you go fast, you actually go slow, so it’s very important to do that. Monitoring the blood pressure and heart rate was very important. I don’t know if you heard in the audience, but Brian mentioned to me a few minutes ago that the heart rate had slowed down. That was at a time when we were pushing on the carotid body with one of our guide wires. He was very alert. We gave the patient Atropine and the heart rate came up from 40 to 60-70, normal. It’s very important to do that. Following the procedure, blood pressure monitoring to control reperfusion syndrome, and careful clinical and ultrasound follow-up to monitor the patients.

We’re going to close this groin now. If there are any more questions, we can answer those as we’re doing it.

CAMPBELL ROGERS, M.D.

Talk to us about general anesthesia.

ANDREW EISENHAUER, M.D.

Oh yes, general anesthesia. General anesthesia, I hope there aren’t any anesthesiologists nearby, is in itself dangerous. I don’t mean that in a negative fashion because it’s a wonderful and helpful thing, but the drugs and the things used in general anesthesia are, in themselves, not something that you would do if you didn’t have to. The fact that this
procedure can easily be done under local anesthesia with a cooperative patient means that you don’t need general anesthesia and the lack of need for general anesthesia means that the patients can be awake. They can be ambulatory quickly and they can go home quickly after this.

EDWIN GRAVEREAUX, M.D.

To be fair, our carotid surgeries are going home the following day as well. General anesthesia is safe when you need it. It’s come a long way and there’s really fairly low perioperative risk from the anesthetic. However, as we were talking about, vascular disease is systemic and when you have a carotid lesion, you likely have coronary disease, whether it’s symptomatic or not. So therefore, if you can avoid general anesthetic, that’s potentially a very helpful thing.

CAMPBELL ROGERS, M.D.

Andy and Ed, let me ask you to do one thing, if you could, for the audience, which would be to show us your initial road map picture with the stenosis, which you should have on the still camera, I believe, and then show us your final picture after the stent so people can see the difference.

EDWIN GRAVEREAUX, M.D.

That’s a good idea. Our pre-lesion internal carotid artery in the proximal segment. This is our typical location, in the carotid bifurcation, for the deposition of the plaque. Here is quite a tight, certainly greater than 80%, stenosis. Our post-result, right next to it, with the stent. We do accept a small amount of residual waisting, maybe 20%, with some contrast seen a little bit outside of the stent border, which is consistent with an ulceration in the plaque. We don’t worry about it. It tends to thrombose and relaminate without any risks. We keep the patients on Plavix for at least 30 days. That’s been part of our protocol here as well, as well as within the trials, and most people actually need to stay on that for other cardiovascular risks as well.

ANDREW EISENHAUER, M.D.

If you look down here at my hands, right down here, we can show you the incision. Right there is the fang mark, or catheter mark, right there, where we had our catheter in place. We close this with a closure device and Mr. A can be ambulatory in a couple of hours. We’re going to close the venous line, which we put in to be able to give fluids and other meds, with a closure device as well and he should be able to be up and around and go home tomorrow.

CAMPBELL ROGERS, M.D.

Well, of course, lifestyle changes are important and should begin way before a patient gets into our procedure room. Smoking cessation is paramount. Weight loss. Mr. A has
over the past year or so lost about 20 pounds. He is more active, walks 4 miles a day, is doing everything right and I wish every patient were like that. Medically, it’s important to control folks’ blood pressure and to ensure that as much as possible they eat a healthy and prudent diet. Then, from the standpoint of medicines, aspirin is a mainstay. Clopidogrel or Plavix, we tend to, because of data that had been developed here and other places, tend to continue the Plavix lifetime in patients who have atherosclerosis in multiple vascular beds, like in the carotids, in the coronaries, and in the legs. Those are the mainstays of therapy. Diabetic control is important in patients who have diabetes.

CAMPBELL ROGERS, M.D.

Thank you both very much. I can’t tell you how impressive it is to see you working together as a team and doing so adeptly and making look so easy something which I know well is quite challenging. Thank you to the team in the room as well and perhaps most importantly, thank you to the patient for agreeing to participate in this educational exercise. It’s been a great pleasure to have you join us. I’d also like to thank somebody who has not been appearing on the camera, Dr. Piotr Sobyeschek, who is another member of our group, who is a cardiologist with great expertise in coronary and peripheral intervention. He has been the one filtering the email questions and so forth and I’m very grateful to him for his help as well.

As a reminder, the CME availability will be present for the next 24 hours on the website. Furthermore, this webcast will be archived at the Brigham and Women’s Hospital website for the foreseeable future, for people who want to watch it again or refer it to friends, colleagues, etc., who may have an interest in this disease process and in carotid stenting specifically here at Brigham and Women’s Hospital. Thank you very much for joining us and best wishes.

NARRATOR

Thank you for watching the live endovascular stenting procedure from Brigham and Women’s Hospital in Boston, MA. For more information, to make an appointment, or make a referral, please click the buttons below or please contact one of our referral coordinators at 1-800-BWH-9999, or email us at livesurgery@partners.org.