

## BroadcastMed | Deep Inferior Epigastric Perforator (DIEP) Flap Breast Reconstruction

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**STEPHANIE** Hi. I'm Stephanie Caterson.

**CATERSON:**

**MATTHEW** Hi. I'm Matthew Carty.

**CARTY:**

**STEPHANIE** We are from the Division of Plastic Surgery at Brigham and Women's Hospital. And you are about to view an  
**CATERSON:** immediate breast reconstruction using a deep inferior epigastric perforator flap, or a deep flap. Our patient is a 47-year-old female who was diagnosed with right breast cancer. And she's undergone multiple attempts to treat it locally and has been unsuccessful, therefore she's moving forward with a mastectomy. And we've been consulted to do her reconstruction. She's elected to do a deep flap reconstruction, which uses lower abdominal skin and fat in order to recreate the breast mound.

OK. So we're about to start the abdominal flap harvest. And we do that by making this upper decision first. This part here is going to be the tissue that reconstructs the breast. We'll probably split in half, because she has an adequate amount of tissue on either side, in order to match her breast size. And right now, we're just going to go down to the abdominal wall muscle layer and then lift up superiorly, so we're able to redrape this upper skin down to her lower incision after we take this tissue out.

OK. So we've just finished the abdominal flap elevation. You could see that we've undermined here all the way up to-- this is the patient's ribcage, the bottom of her rib cage or xiphoid, and the bottom of the rib cage on the other side. And what that allows us to do is to be able to take this tissue and pull it down and be able to close it down to her lower abdominal incision later, and then once this tissue comes out for her reconstruction.

So next, we're going to make the lower incision and start elevating the flap. So the patient has had a c-section, which is very fine line right about here. And we're able to incorporate that scar into our incision, so that will be-- there, maybe? That will be completely gone for her.

So right underneath of this incision, there's a superficial vessel that runs called a superficial inferior epigastric artery and vein. We sometimes can use those for perfusion into this tissue, but it's unlikely. But we always take a look at them on the patient. So we'll try to identify them for us today.

OK. So this is the superficial inferior epigastric vein. There's not an artery running with this one, but oftentimes if it's sizable like this, we'll keep some length on it. Because in the future, we may be needing that for an emergency bailout for a venous drainage with the microsurgery part of the procedure. So we always look for them. We were able to find one on the patient's right. On the left, she had no sizable vein whatsoever. So we'll keep some length on that for later.

OK. So now we've elevated the superior abdominal wall flap. We've made our lower decision and identified any superficial veins that are usable. And now we're starting to lift our abdominal flap from the edges. So we lift the fat and skin up off of the abdominal musculature here. This is the obliques coming around from the side. And we stop that dissection when we get to above the rectus muscle, which we're approaching now. As we approach the rectus muscle, that's where the perforator vessels will be coming in that we are going to be investigating for her possible flap perfusion.

**MATTHEW CARTY:** You can see here the umbilical stalk and the scar that we're getting through. You always need to be careful in this portion of the dissection, because there are oftentimes perforators that are periumbilically located. You need to be careful that you don't injure those in the of this part of the dissection.

**STEPHANIE CATERSON:** There's one right there.

**MATTHEW CARTY:** There's one right here.

**STEPHANIE CATERSON:** At this point, we've isolated the abdominal flap on the underlying vascular perpetrators, and we can give you an example of them on the side. On the patient's right hemiabdomen, we have a large one here, two small ones down here. We often divide these perpetrators up in two rows. We'll described them as either a medial row perforator or a lateral row perforator based on where they are along the rectus muscle. So if I flip this tissue up this way, I would consider these three perpetrators to be lateral row perforators.

Oftentimes the perforators can connect together very closely through a split in the muscle. And so we can look at a combination of perforators for flap profusion, as well as just a single perforating blood vessel.

And then around the umbilicus, this is where the largest population of perpetrators is usually found. So there's a large one here, on the right hemiabdomen. You can feel a pulse in them when you give a gentle squeeze. So at this point, we need to decide if we are able to move forward with the perpetrator flap, or if we need to convert to a TRAM flap by taking some of the muscle.

And the decision process that goes into that is first identifying the blood vessels that we could potentially use, and then picking the one that looks like it's the largest blood vessel, the best pulse that we feel in it, the best location on the flap, and then we put a temporary clamps on all the rest of the little blood vessels that we've just dissected out to include the blood flow through them, and then we assess the flap profusion to see if it's adequate or not to move that tissue. If it is, then we start dissection with the deep flat. If it's not, we take all the clamps off and we try a different combination and we look for another type of combination of using just blood vessels.

And if, in the end, we can't find an inappropriate inflow with just using blood vessels, then we will end up converting the patient to a TRAM flap, which means taking some muscle with us in order to encompass all of those perforating blood vessels on one side to take them with the flap and use them for inflow.

So we have a sterile Doppler that we use on the field here that we keep in a little sterile bag.

**MATTHEW CARTY:** Can you [INAUDIBLE] just for a sec?

**STEPHANIE CATERSON:** That's an OK sound.

**MATTHEW CARTY:** Yep.

**STEPHANIE CATERSON:** What we'll start to do is put these yellow vascular clamps on the blood vessels that I've dissected out on this site to occlude them. So that will occlude the blood flow, and we'll double check that with the Doppler to confirm occlusion.

OK. So now the yellow vascular clamps are on all of these perforators, except for a single perforator, which is located right next to the umbilicus, right here. This perforator right here. So I'm going to double check that they're actually clamped, and once confirmed, then we'll take a look at the flap and see if we were happy with its appearance. You can hear an arterial signal on the skin.

Just looking at the tissue, it doesn't look particularly pale. It doesn't look particularly purpleish or blueish in color. Pale would be a problem with the inflow or the artery, and blueish would mean it was venous congested. I don't see either of those things happening. So, so far, so good.

Other things we can do is we can assess the blood flow at the edge of the flap. So we can rub along that edge of the flap and look to see if we see any kind of bleeding here. You can see some red blood there. Another thing we can do is check for capillary refill on the flap. And it's going to be difficult to see on this patient because she's pale, but when I press down with this circular instrument and let go, you can see the residual of a circle being left there, and then the capillary refill that comes in.

We expect that to be about two to four seconds. And she has appropriate capillary refill in the central area of the flap. If this was more rapid, we would be concerned about some venous congestion, or a problem with the blood getting out of the flap. But it appears to be adequate. I'm happy with it.

We won't use this whole piece of tissue for a breast reconstruction, and we'll show you the mastectomy specimen after it comes out and we get an idea of how large a volume that is. And we'll weigh it and so we have a weight. We likely will only need to use half of her abdomen, or maybe a little bit beyond the midline of the abdomen for the volume to reconstruct the breast. But in her, it looks like we could use a significant portion of this flap tissue.

So this is our perforator right here. And the way that we first start to dissect the perforator free is we make an incision in the abdominal fascia. So this is anterior rectus fascia that I'm incising through right here.

**MATTHEW CARTY:** [INAUDIBLE].

**STEPHANIE CATERSON:** We split the anterior rectus fascia, and we're starting to come around the perforator here, leaving a small facial cuff on the perforator itself. It's right underneath the--

**MATTHEW CARTY:** Yeah, I can see it. It's coming down right now.

STEPHANIE CATERSON: Can you see it?

**MATTHEW CARTY:** Yeah. I can see a little bit goes into there.

**STEPHANIE CATERSON:** Yeah. It's right at my tip, so don't go all the way.

**MATTHEW** [INAUDIBLE]. I want to come over here.

**CARTY:**

**STEPHANIE** Perfect. Excellent.

**CATERSON:**

**MATTHEW** You should be able to just put that right in.

**CARTY:**

**STEPHANIE** Mhm.

**CATERSON:**

**MATTHEW** Oh yeah, baby. Steph, given that we know this is here, we can probably be pretty aggressive at coming to this lateral [INAUDIBLE].

**CARTY:**

**STEPHANIE** Mhm.

**CATERSON:**

**MATTHEW** Do you think there's another--

**CARTY:**

**STEPHANIE** I don't.

**CATERSON:**

**MATTHEW** --[INAUDIBLE] I mean, that looks like that's the main--

**CARTY:**

**STEPHANIE** Mhm. Can you get it from your side, from across to me?

**CATERSON:**

**MATTHEW** There's an inscription right there.

**CARTY:**

**STEPHANIE** Hopefully it hops over inscription. It might all just come together right there.

**CATERSON:**

**MATTHEW** Let me get a little bit more grab here.

**CARTY:**

**STEPHANIE** So the perforator's coming in to the flap tissue here. Here's the cuff of anterior rectus fascia that we've just dissected off, that was connected here. And now this is the perforator or the blood vessel running directly underneath that fascia, and now it's kind of dipping down into the muscle a little bit. But we've noticed that it's heading directly towards our other large perforator on the side. And if these two happen to connect up very close to each other, we'll take both of these in continuity with each other to augment the flow the flap. We don't have to take this one, because we've assessed the flap based solely on this perforator, but if it falls into place nicely, we would do that. So we'll take a look at it and see.

**CATERSON:**

There's our mastectomy specimen. And I compare it relative to how large it is and how thick it is-- about this thick. And look at how much tissue we have down here. So we have appropriate thickness. And if you look at the diameter, I think we'll be fine with using a hemiflap to replace that tissue. And the patient would like to be about the same size as she is now, with a possible lift on her other side later.

**MATTHEW CARTY:** So given now that we know the volume requirements for the reconstruction, we can safely come through the midline of the flap, because we know we're not going to need any more of volume than what's provided by a given hemiflap, and this will assist with the ease of our dissection.

**STEPHANIE CATERSON:** So I'm going to take the temporary clamps off of this contralateral side that we're not using in order to maintain this flap blood supply while we're dissecting out the other side, in case we need to use this as a backup if something happens during this dissection. It's always good to have a bailout procedure available to you.

OK. So now with that other flap dissected away, we have a lot better exposure to the perforator that I'm trying to dissect free. So this is the perforator we initially started to dissect. This is our second potential perforator on the right hemiabdomen. And as we dissected this across the muscle, we're realizing there's a very thin couple wisps of muscle on top. And under here, our perforator continues, and it comes straight to our second perforator. Based on how large this is, it's just very adventitious to take an extra blood supply.

So we'll take a few fibers of this muscle in order to make that happen, and they'll come together nicely there. So we'll have two perforators in her that are basically in line. So there's a little bit of the muscle split. You can see this perforator coming right over.

**MATTHEW CARTY:** Yeah. Now we're back to normal.

**STEPHANIE CATERSON:** OK. So you see our perforator coming along here and joining up with the second one, and then they'll both hopefully continue down, although this one kind of branches off like this. So I'm losing a little bit as to exactly where the vessel was, because there's this.

**MATTHEW CARTY:** It looks like that's the length down there, don't you think?

**STEPHANIE CATERSON:** It's hard to say.

**MATTHEW CARTY:** I could guess.

**STEPHANIE CATERSON:** There was kind of like an H-- not even an H. Like almost like a square of vessels that kind of came together on the scan, so--

**MATTHEW CARTY:** Yeah. I think this is the main, down here.

**STEPHANIE CATERSON:** OK. So this dissection part of the case is the most tedious, the most kind of high concentration part of it. The microsurgery part of it is complex, but it is fairly routine. It's the same in every case. This part is different in every single patient. So this is the part that you really need to concentrate on, and not injure your vessel.

**SPEAKER 1:** [INAUDIBLE].

**STEPHANIE** It is, yeah.

**CATERSON:**

**SPEAKER 1:** [INAUDIBLE].

**STEPHANIE** Yeah. And so on every patient, you might have heard us mentioning the scan. We talk about the scan a lot during  
**CATERSON:** this case. On every patient before they signed up for this operation, we get a CT angiogram of the abdomen to give us a road map of these blood vessels down here. And it's pulled up on the screen across the room. I'm happy to show it to you and go over it with you.

**SPEAKER 1:** Yeah. I see it.

**STEPHANIE** And that scan gives us an idea of where the blood vessels are running and helps us--

**CATERSON:**

**MATTHEW** [INAUDIBLE].

**CARTY:**

**STEPHANIE** Yeah. I see that.

**CATERSON:**

**SPEAKER 1:** Map out what you're going to do?

**STEPHANIE** And it comes up. Yeah. It helps us map out what we're going to do. So I knew that the blood vessels looked pretty  
**CATERSON:** good on this side. It also helps me warn a patient if I think that their blood supply doesn't look good, and then we may need to convert to a TRAM during the operation. It's not foolproof, but it's a pretty good guess.

Just one artery and one vein, usually. Sometimes we'll do a second vein, but just these two blood vessels will come together, and they'll form the deep inferior epigastric arteries. Those blood vessels usually have one artery and two veins. And up in the chest, we'll find one artery, usually one vein. So that's why we disconnect one vein and one artery.

So I don't know if you can see right here how we just, right here, we split behind the muscle. And we see this white down here. That's behind the actual rectus muscle. So that should be--

**MATTHEW** [INAUDIBLE].

**CARTY:**

**STEPHANIE** --posterior rectus fascia. The rest of it down there, which is a nice place to be. So we've been waiting for our  
**CATERSON:** blood vessels to get down there.

Now that the vessel is behind the muscle, we're going to follow it a little longer for some length. And Dr. Carty is going to come up here in the chest, and he's going to expose the internal mammary vessels in order for us to hook this flap up into. And he'll be taking you through that portion.

**MATTHEW  
CARTY:**

OK. So the mastectomy portion of the case has been completed. We now have to do the vessel dissection for the internal mammary artery and vein. In order to do that, we first confirm with the primary surgeon which rib we want to capture. We do this by palpation. You can feel the underlying ribs through the pec major muscle. So we've agreed that we're going to go for this, which we believe is probably the fourth rib. We split the overlying pec major. I can feel right where the rib is.

Now we're coming down on the cartilaginous portion. You can begin to see the white sheen of the perichondrium here. Because ideally we try to expose this all the way to the junction of the costosternal junction. Now we split the interior perichondrium with the cautery here, because we're going to raise these up on either side.

And what we're going to do is we use a rib sacrificing approach to this so we can maximize our exposure. So here's the perichondrial sleeve here. And what we'll do next is we'll raise that off the underlying cartilage. So this tends to elevate fairly discreetly. Here, we can be a bit more aggressive. Take a large piece, like that. And we just gently and meticulously go lateral to medial, being sure we preserve this posterior perichondrium and don't inadvertently dive behind, because the vessels are going to be right behind here.

Now what you can see here is you can see a little bit of a ghosting or bluish tinge behind perichondrium. That, almost for sure, is one of the veins. And there oftentimes will be two-- there can be medial and lateral internal mammary veins. Sometimes it's only a single vein, but generally there's a medial and a lateral. So I don't know if that's the medial or the lateral, but that gives us a guide in terms of where the vessels will be.

And I think that'll probably be enough. Now, what I can see here-- I don't know if the camera picks this up. There's a blueish hue here. There's a white strip here. And then there's another [INAUDIBLE] here. Those most likely are the two veins and the artery in between. So we should have enough exposure here.

So now we're going to actually remove the posterior perichondrium. So what we do now if we actually take out this posterior perichondrium. and lift this up, and it actually maximizes our exposure. So we're going to take out this entire trough here. What we'll do initially, however, is we'll liberate the perichondrium out laterally, where we know the vessels are not.

And we sometimes run into a little intercostal here. We need to be very careful here that we don't go into the thorax. But we can see we come through this. This actually releases nicely.

Now we take a freer. We lift up this perichondrial edge. We very gently spread down. We sweep the underlying tissue off the backside of the perichondrium. And this actually allows us to visualize the vessels directly. And so I can see where the vessels are exactly. And now I can see the vein-- one of the lateral veins emerging. You take the freer and sweep some more-- clear off additional perichondrium.

So what this allows us to do now is we can be more aggressive about peeling off this perichondrium out here, because we know where the vessels are. We know they're not out here.

So we have the perichondrium removed. We have the vessel exposed. Now we need to skeletonize them so they're ready for the micro. We usually do this with a set of micro instruments. Can I have micro pickup, please? We have a vein, an artery, and a vein here. They're all very good caliber. What we typically are doing is just very gently peeling these off the surrounding fat. There we go.

And so we have this fully isolated if we choose to use this. Micro scissors please. Thank you. Now we advance the same maneuvers around the artery. There's typically a little bit more tissue around the artery to grab. And whether that's just [INAUDIBLE] or the second wall of the artery itself, they can be handled a bit more than the veins can.

So we have adequate isolation of this medial vein, the artery here, and then a lateral vein. Steph, are you happy with the exposure? So when we're done with the vessel dissection up here, we often will put a vasodilatory agent on them in order to reverse the effects of spasm. That can either be pavoren, verapamil, or, in this case, lidocaine. While that's soaking, we prepare the micromat, which is in my hand. This is the appearance of the micromat. It's a fenestrated mat that we customize in terms of the shape.

**STEPHANIE  
CATERSON:**

This is our flap right here, that's being retracted towards Ryan. Here's our one perforator and our second perforator that are coming together. These perforator join together, and we dissect them out through the rectus muscle. They came down under the rectus muscle and joined together to basically, at this point, become the deep inferior epigastric artery and vein-- so down around here where they're nice and large.

And then I followed them as far as I could to the sidewall of the pelvis, here, and then we've separated the artery and the two veins. So my right angle right now is behind the artery. And we have a white vessel loop around it. So that's our deep inferior epigastric artery. And then laterally, there's a small vein right here, that my right angle is now around. There's a blue vessel loop around it. That's a small lateral vein. And we have a very large medial vein right here.

So what this blue vessel loop is around, and now my right angle is the medial vein. And that's what we'll use to do the venous anastomosis up above. So the vessels here are separated out. I'll also dose them with a little bit of the lidocaine right now. And they are pretty much ready to be transacted, and then the whole flap can be moved up to the chest for the microsurgical portion of the procedure.

I marked the vessels for orientation. And once we get up to the chest, we'll know which way used to be down here. Because this is such a long and free-floating pedicle, it could easily twist 180 or even 360 degrees. And that could block off the blood supply, and you could get a loss of the blood flow, so. It's basically just to be extra cautious.

I'll take that medium clip, please. When we clip this off, as soon as I clip the artery, I'll let Megan know that we're going to start our ischemia time. And we do measure how long we keep this flap ischemic. All right. Megan, ready? Ischemia. So inschemia time starts as soon as we clip the artery.

And luckily, this blood vessel is redundant blood supply to this area. So the tissue that's left behind is not harmed by us taking it out. The rest of the pelvis has additional blood supply that connect redundantly. There we go. There's our nice big vein. OK. So the flap is free. You can see that it looks larger than what the mastectomy specimen looked like, and in thickness, it's about the same. So we'll be able to trim this down to about what the mastectomy was.



We've just weighed the flap, and it weighs about 800 grams. The mastectomy weight was 500 grams, so we have extra tissue to work with here, which is a perfect case scenario. This is the end of the vessels that we just cut. This white is the artery, and the blue over here, with the dark blood coming out of it, is the vein. So I'm flushing into the artery a heparinized saline solution, which is right here. And what that does is it basically displaces the blood volume that's within the flap with heparinized saline, which I believe helps prevent tiny little clots from forming within the small vasculature within the flap itself.

So you'll see as I start to irrigate more and more the effluent coming from the venous system is clearing up. So it goes from being a dark red a little bit later color. So the more I irrigate, the lighter that color comes, and the more the flap's blood has been replaced with my heparinized saline solution.

So for orientation down on the abdomen after I've taken the flap off-- this is our umbilicus. This is where our original perforator was located. You can see a small cuff of fascia that we took with that perforator. And then we split the fascia down to our second perforator, which was about here. Here's a small amount of muscle that we took over the top of that connecting system, but the rectus muscle is still intact, and looks very healthy.

Here is the split in the rectus muscle that goes all the way down to the pelvis, where we took those vessels out. So now we will repair the split in the muscle, which is a couple of loose stitches, and then we'll repair this split in the fascia, and we'll show you what that looks like when that's complete. If we were doing a TRAM flap, we would have cut all this fascia and this muscle out in a big unblocked section to take the vessels with us.

OK. So first we will prepare the donor vessels. So this is on the deep [INAUDIBLE] arteries and vein system here, and we're separating out the artery from the vein right now. The artery is what I'm holding in these two forceps. To dilate the artery, we take a look within the lumen to make sure it looks clean. And sort of just clean off a little bit of the outer layer of the artery, called the adventitia. It makes it cleaner with the microsurgical mastomosis. That's fine.

**MATTHEW** That's good. We might have to freshen that end.

**CARTY:**

**STEPHANIE** Yeah, just a little bit.

**CATERSON:**

**MATTHEW** You have some [INAUDIBLE] scissors?

**CARTY:**

**STEPHANIE** Beautiful. All right. So it looks nice and clean. Ryan, stop for one sec. All right. The artery looks nice and clean--  
**CATERSON:** no little flaps in there, no blood clots, a nice clean edge. Perfect. All right. So the artery is prepared. Now we prepare the vein, if I can find the end of it, which is here.

**MATTHEW** [INAUDIBLE], please?

**CARTY:**

**STEPHANIE** Venous. All right. So now the vein is cleaned off. So we're going to use a sizer, which will tell us what size of  
**CATERSON:** venous coupler to use. This is a large, so 3.5, I'd say.

**MATTHEW** [INAUDIBLE].

**CARTY:**

**STEPHANIE** Yeah. All right. So we use the-- can you show the numbers again, Matt?

**CATERSON:**

**MATTHEW** Yep. Sure.

**CARTY:**

**STEPHANIE** So right here there's a little marks. They're worn off a little, but this says 2.5, 3.0, 3.5, 4.0. And we then turn it up  
**CATERSON:** so we can look at it and look at the circle, and we can see that this vein matches. Can we put the circle straight up? Yeah. It can go over the 3.5 easily, so 3.5. Now we're putting a clip along the distal portion of the internal mammary vein. In process.

Now, we'll put a temporary clamp up here, and we'll cut here, and then we're going [INAUDIBLE] this vein to this vein using a venous coupler. Here we go. This is cartilage. I can't retract it. You want to slide that one?

**MATTHEW** You want to slide it up more?

**CARTY:**

**STEPHANIE** A little bit, if you can. Just a smidge. Yeah, that's nice.

**CATERSON:**

**MATTHEW** How's that?

**CARTY:**

**STEPHANIE** Yeah. That's good. We're across. All right.

**CATERSON:**

**MATTHEW** [INAUDIBLE].

**CARTY:**

**STEPHANIE** OK. Now we're going to cut this vein down here. Dilator?

**CATERSON:**

**MATTHEW** Irrigation to me. Can I have a sizer?

**CARTY:**

**STEPHANIE** And we measure this one, which is at least as big as the other. So we'll take a 3.5 coupler, please. All right. Are  
**CATERSON:** you happy with that?

**MATTHEW** Yeah. Easy. Yeah.

**CARTY:**

**STEPHANIE** Easy. All right. And we'll lay the vein up here on top of the artery for easy access to it.

**CATERSON:**

**MATTHEW** Can I get a micro pickup?

**CARTY:**

**STEPHANIE** OK. So this is our deep inferior epigastric vein, and this is a venous coupler. There's a plastic ring, and then  
**CATERSON:** there's metal spokes that come out towards the second plastic ring with metal spokes coming out towards the opposite one. And what we do is we pick up the vein and we pull the lumen up and through the plastic ring. And then I'm going to drape the vein over the top of these metal spokes. And I use my mark of orientation to be at the same spot on either side so I make sure that my veins line up the way that I want them to.

**MATTHEW** [INAUDIBLE]? Yeah.  
**CARTY:**

**STEPHANIE** So you can see the lumen of the vein will be stented open by this coupler.  
**CATERSON:**

**MATTHEW** Irrigation, please.  
**CARTY:**

**STEPHANIE** You can see how thin this vein is compared to the other. That's pretty standard. I'm glad on this side we're  
**CATERSON:** getting the 3.5s. [INAUDIBLE].

**MATTHEW** Yeah. Is that a valve Steph, or just a fold in it?  
**CARTY:**

**STEPHANIE** I think that's just a fold, but--  
**CATERSON:**

**MATTHEW** Irrigation.  
**CARTY:**

**STEPHANIE** --push your coupler towards me a little. Yeah. See? It flattens out. OK. So now this vein's been lifted up and  
**CATERSON:** through the-- vein there. Irrigate that a little tighter. So this vein has been pulled up through the coupler ring, and it's facing towards the other vein. So this coupler--

**MATTHEW** [INAUDIBLE].  
**CARTY:**

**STEPHANIE** --device will push these two plastic rings together, and the metal prongs from this ring will engage the plastic  
**CATERSON:** ring on the other side, and vice versa, in order to hold the anastomosis together. So, OK. Hold on one second, Matt. I'm going to give it a little gentle squeeze to encourage that to happen. OK. Here we go.

**MATTHEW** Micro pickup?  
**CARTY:**

**STEPHANIE** The two rings have come together. The prongs have engaged each other. You can actually see them poking out a  
**CATERSON:** little bit through the rings themselves. OK. Ready? One, two, three, squeeze. [INAUDIBLE]. One, two, three, squeeze. Yeah. We need a little bit of-- we can take that other flap off. Yeah. Let's do one more.

**MATTHEW** We need some fat grafts too.  
**CARTY:**

**STEPHANIE  
CATERSON:** One, two, three, squeeze. All right. So we tighten it up a little bit, and then we remove this clamp, and we should see blood flowing through our vein across this anastomosis. There it goes.

**MATTHEW  
CARTY:** Boom.

**STEPHANIE  
CATERSON:** Beautiful. Irrigation, please. OK. So now we will put a clip across our distal internal mammary artery.

**MATTHEW  
CARTY:** [INAUDIBLE].

**STEPHANIE  
CATERSON:** The arterial anastomosis, we don't use a coupler. We hand-sew it with a 8.0 nylon suture.

**SPEAKER 1:** And why is that?

**STEPHANIE  
CATERSON:** The artery is usually a lot stiffer than the vein. You can see how it doesn't flop together. It's much more thick walled. And it doesn't come up and kind of flex over the top of those prongs as easily as the vein does. You can occasionally use it. We have occasionally used it, but it's just not standard. Everything has to be perfect in order to do it. Highlighter.

**MATTHEW  
CARTY:** Irrigation to me.

**STEPHANIE  
CATERSON:** So that's our cut internal mammary artery. Snap.

**MATTHEW  
CARTY:** [INAUDIBLE].

**STEPHANIE  
CATERSON:** You take this guy off with double clips on the perforators.

**MATTHEW  
CARTY:** Micro pickup.

**STEPHANIE  
CATERSON:** And you can use that to make [INAUDIBLE]. Where's our end? A little bit more. Yeah, a little mismatch [INAUDIBLE].

**MATTHEW  
CARTY:** It'll be all right.

**STEPHANIE  
CATERSON:** Now, this is an 8.0 nylon suture-- very small. You can see there's a mismatch in our vessel size, so we'll just slowly make that up with each stitch.

**MATTHEW  
CARTY:** A pair of micro scissors, please. Irrigatin, please.

**STEPHANIE** All right. So we've finished our arterial anastomosis. I'd like to take off the clamp that's towards the flap first--  
**CATERSON:**

**MATTHEW** Irrigation [INAUDIBLE].  
**CARTY:**

**STEPHANIE** --which is this one. And that's free of everything. Then I'm going to open up this clamp, but I'm prepared to  
**CATERSON:** reapproximate it if we have a lot of leaking from our anastomosis. So open it up. All right, end ischemia. Looks good-- a nice pulse going up.

**MATTHEW** [INAUDIBLE].  
**CARTY:**

**STEPHANIE** Here's our vein hooked up with the coupler coming up this way. And our artery kind of scoots under the vein, and  
**CATERSON:** this is our deep [INAUDIBLE] epigastric artery, and anastomose to the internal mammary artery. And they look great.

So we'll show you on the scope here, up here. The pedicle jumps all the way up-- up through here, and even right here, you can see it jumping in this artery. So this is something that we look at as a sign to make sure. If you don't see that jumping right away, even if your artery looks good, there's something wrong with the anastomosis, and you should redo it. So we always double check the jumping of the artery up through the pedicle.

And as the blood flows into the flap, it will then displace that heparinized saline solution that I flushed into the flap, and then you'll see a color change in the vein of the pedicle down here. So it's already starting to get a little bit darker-- the venous outflow.

So the next step is to take the background out. So the suction background that we have here, we're going to disconnect the suction to it, and then we're going to cut out the stitch that holds it in place. We'll slide that out. And then we're taking little pieces of fat graft that are over here on the back table. And we'll take a little tiny pieces of fat and place it around the microsurgical anastomosis and where the pedicle comes out through the ribcage to hold it in place. It's just like a little cushion so the vessel doesn't drop in there and twist or kink.

So we carefully place them around the microsurgical anastomosis and the vascular pedicle. So we like to put them on either side of the artery and the vein, and then we put-- can I have another micro pickup please, Lou? Put one or two between the artery and the vein, just like that.

On the abdomen, we find that some patients, especially if they've gone through multiple pregnancies-- and she's had a multiple pregnancy-- they have a rectus diastasis. So you can see here this is a space between her rectus muscles, here and here. So they're splayed apart. And that can't be fixed by multiple situps. It actually changes the contour of her abdomen quite dramatically. So we are going to do a little bit of tightening of the abdomen, just to improve the contour down here so when we close our upper flap down to our lower incision, it won't have a big protuberance.

All right. So this is just what we call an abdominal plication. We're doing interrupted sutures to pull the rectus muscles back towards the midline, which will be much more anatomic for her, and allow her to improve her abdominal function.

OK. So this is the abdominal closure. We've done a pretty mild abdominal plication here to address her underlying rectus diastasis, and that's this midline suture line here. This is a split in the fascia that we used to take the blood vessels out of. And underneath of here, we have intact rectus muscles on either side. To contrast this to a TRAM flap, the abdominal closure on a TRAM flap would have an entire rectus muscle being elevated and rotated up to the breast reconstruction. And this entire section of natural fascia will be replaced with a synthetic mesh and sewn into place. So all natural, no mesh.

We finished the microsurgical anastomosis, and now our attention is being turned towards the inside of the flap. In order to do that, we need to kind of-- this is a triangular shape right now, so we need to curve it a little bit at the bottom and at the top to get it to be more round like the breast specimen was. And then this is a circle where we're going to keep skin from the flap on it. And the rest of this skin, we will deepithelialize in order to bury it underneath of her natural mastectomy skin. So this is what we'll move forward with now.

We weighed the flap earlier, and we will keep track of the weight of the small amounts that we're trimming off now so we'll have a final flap weight. I'll take a 10 blade, please. You're ready to reflex a little bit? To deepithelialize, we use just a scissor.

**MATTHEW** [INAUDIBLE].

**CARTY:**

**STEPHANIE** And trim off the off epidermis and partial layer the dermis. We're very happy about seeing little bit of bleeding on the flap. It's nice and healthy. OK. So one goes up, one goes down. You can take out the white things.

**CATERSON:**

As we're trimming the breast flap, we're closing the abdomen and also putting in an ON-Q pain pump for the patient. It's a pump that automatically dispenses Marcaine, which will help her with her post-operative pain management. OK. So we're downsizing the flap a little bit, because it remains a little bit large compared to what we'd like for it to be.

**MATTHEW** That's probably not a 100. That's probably about 40. Are you going to take more?

**CARTY:**

**STEPHANIE** No. I think that's OK. So now we're about to insert the flap into the pocket.

**CATERSON:**

**MATTHEW** [INAUDIBLE].

**CARTY:**

**STEPHANIE** In order to do that safely-- let go. Let go with the other hand. I want to just take a look at the pedicle line. So we can see it coming out here from our rib cage. I can see it coming over in this general direction. She looks pretty good. I'm happy with that.

**CATERSON:**

So now we'll move with the retractor. I'll slowly-- OK. And it's in place. So we put some supportive stitches between the flap and the chest wall, just to hold it in place exactly where we want it. So when she gets up and moves around, it doesn't shift too much.

**MATTHEW** [INAUDIBLE], please. [INAUDIBLE] this one.

**CARTY:**

**STEPHANIE** We're going to listen for a Doppler signal. It sounds good. The inset of the flap and how much you shape it  
**CATERSON:** depends on what the patient has on the other side and what she wants to look like ultimately. So in this patient, she would like to have a slight lift on her contralateral breast, but nothing too aggressive.

So when I'm thinking about shaping her, there are different things that we could do as far as skin resection and manipulation of the shape, but I think that we'll most likely just inset it exactly like this, so it'll be as similar to her natural breast as possible. And we'll see how things settle out, and then do her ultimate lifting, shaping a second stage procedure, which is usually about three months down the line.

**MATTHEW** Marker, please.  
**CARTY:**

So we marked this spot as a means of monitoring the health of the flap. So we use this is an indication that everything is OK in terms of blood flow, primary into the flap. So we can use the Doppler to pass it over the spot now, and here are the arterial inflow to the flap. You can hear that signal. Can I have the [INAUDIBLE] scissors?

We'll also apply a monitoring probe to the outside of the skin, that you'll see in a minute, that gives us real-time reporting of the health of the flap as well, and actually is a Wi-Fi device, and it beams to our phones. So we can monitor the health of the flap from home at 3:00 in the morning and everything else. It's pretty amazing.

So you've just seen the completion of a right immediate breast reconstruction utilizing a deep inferior epigastric perforator flap. Our patient is on her way up the intensive care unit, where she'll stay for 24 hours, and then will typically be in the hospital for about five days following completion of the procedure.

Everything went well today. Typically patients follow-up approximately one week after discharge and then several weeks after that. And by the three-month mark, they are ready to undergo the next stage, which is the second stage revision procedure at which point we reconstruct the nipple and do additional symmetry providing procedures. We expect her to recover well and have an excellent aesthetic and reconstructive result.

**STEPHANIE** Thank you for watching today. If you have any questions about the procedure, please feel free to contact us at  
**CATERSON:** our information listed at the bottom of the screen.