

STATE-OF-THE-ART HIP SURGERIES FOR ACTIVE ADULTS

Thomas Jefferson University Hospital

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ANNOUNCER: Welcome to Thomas Jefferson University Hospital in Philadelphia, Pennsylvania. Over the next hour, orthopedic surgeons will demonstrate and discuss state-of-the-art surgical options for young and active older adults with hip disease. Viewers are invited to email questions to the surgeons at any time during the webcast. Medical professionals may take a post-assessment survey at the end of the program for CME credit. Now, let's join the doctors

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JAVAD PARAVIZI, MD, FRCS: Hi. Good afternoon and thank you for joining us on today's webcast at Thomas Jefferson University Hospital. My name is Javad Paravizi; I'm an orthopedic surgeon at Thomas Jefferson University Hospital specializing in hip and knee joint replacement. And today with me I have Dr. William Hozack, who's a Professor of Orthopedic Surgery and director of adult reconstruction surgery at Thomas Jefferson University Hospital, and Dr. Matthew Austin, Assistant Professor at Thomas Jefferson University Hospital who also specializes in hip and knee replacement surgery. For our viewers, I would like to remind them that throughout the course of the discussions today, you are encouraged to send your emails and click on the MDirect button on your screen with any questions you have. So with that I will now pass the -- I will ask Dr. William Hozack to start telling us about some of the state-of-the-art hip replacement surgeries.

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WILLIAM J. HOZACK, MD: Thank you, Jay, and we're going to cover today hip surgery for active adults, and perhaps the best thing to do at this point would be to pan to the PowerPoint presentation. The goals of the discussion today will be to explain some of the new techniques that are available for patients suffering from hip arthritis that we do here at Thomas Jefferson University Hospital; to discuss the potential benefits of each procedure; and to compare the choices so that hopefully the patient can have an understanding of what might be the best choice for them. Traditional total hip arthroplasty, in some people's minds, does not provide enough for the patient; patients are given restrictions on their activities, they're not allowed to do everything they want to do. And this sometimes is not an acceptable thing for the patient. What people are more interested in these days is a more unrestricted quality of life: the ability to go out and do anything that they want to do and they are able to do. And that's what we're trying to do here, and we're going to show you some of the alternatives that will allow you to do that. The choices that we're going to discuss today -- and we're going to see some live surgery videos of these types of procedures -- is a small incision total hip replacement; total hip resurfacing; and impingement surgery, again as performed by the three of us here at Thomas Jefferson University Hospital. The first video we're going to see today is a small-incision total hip arthroplasty. Again, the goals of the operation: earlier discharge; reduced blood loss; less pain after the surgery leading to faster rehabilitation and a quicker return to activity and to work. Just to review: a small-incision hip replacement still uses the traditional high-speed hip replacement parts. The metal stem is made out of titanium; the socket is made out of

titanium. The femoral head is removed and replaced with a metal or ceramic head on a cross-linked polyethylene bearing or a ceramic bearing, or even a metal bearing. We talk about minimally invasive surgery and it has different meanings for different people. Certainly a small incision is part of it but we're going to discuss that as not being the most important thing. And what we're really trying to do with less-invasive surgery is to reduce the overall trauma to the patient, so that the rehabilitation and recovery will be less painful and more rapid. This type of surgery, as you will see over the next few minutes, requires special instruments and techniques, and perhaps, at this point, it's a good time to go to that surgical video. So if you would just start the video of the small-incision hip replacement surgery... here's a patient whose left leg you see, bandaged up. The yellow material covers the hip joint. I'm standing there to the right on the video; the anesthesia people are up top. This is the left hip area; the incision is marked with a pen. And the potential length of the incision is marked with a pen all the way but only part of the incision is utilized for the procedure. The length of the incision will vary depending on a patient's size, mass, muscle tone, flexibility, bone deformity. This particular patient was one of the more ideal patients for a relatively small incision. Again, we focus on seeing what we have to see in order to do the operation properly, so we often will lengthen the incision during the surgery to make sure we get the appropriate exposure, minimize the trauma and put the parts in the proper position. This video is actually edited, so it'll jump forward periodically and not every step in the operation will be demonstrated, as you will see. We pay special attention to keeping the bleeding down to a minimum; our patients these days do not need to donate blood for the surgery. The ways we minimize that, we'll explain that in a minute. This is a deeper dissection; we're now down to the muscles that surround the hip joint, using the Bovie to elevate the muscles off the bone. Sometimes we remove -- and it's part of an insertion of the muscle -- and we do this because, by doing so in a controlled fashion, we can minimize the overall trauma to the tissues and have the patient recover sooner. Sometimes if you try not to do any removal of insertions you can actually traumatize the muscles more severely.

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JAVAD PARAVIZI, MD, FRCS: So how small is that incision, Dr. Hozack?

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WILLIAM J. HOZACK, MD: Well, the funny thing about that, Dr. Paravizi, is that we didn't actually measure the incision. Based on our studies that we've published, the incisions range anywhere from 10 to 12 centimeters, which is about four to five inches in length -- again, depending on various patient characteristics. This one I would guess to be about four inches.

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MATTHEW AUSTIN, MD: And just to orient the viewer to the patient: the head of the patient's to the right -- is that correct, Dr. Hozack?

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WILLIAM J. HOZACK, MD: Yes.

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MATTHEW AUSTIN, MD: And the foot is to the left. The front of the patient's body is at the top of the screen. And what are we exposing here?

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WILLIAM J. HOZACK, MD: What we're seeing now is the -- getting close to the hip joint, what's called the femoral neck. And soon you'll see the femoral head, which is going to be hidden underneath the muscle. So this is the -- getting close to the hip joint, we're exposing and going through the capsular structures, the structures that surround the hip joint. We don't remove any of these structures; we incise them. And this is what leads to the high level of stability after the surgery, leaving most of the structures intact.

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MATTHEW AUSTIN, MD: Now there's surprisingly little blood seen here. What is responsible for that? Is it the tool you're using now?

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WILLIAM J. HOZACK, MD: It's a combination of things, Dr. Austin. The -- it starts with the anesthesiologist. We use spinal anesthesia, which has been strongly demonstrated -- or, *convincingly* demonstrated to reduce blood loss compared to general anesthesia. They also reduce the blood -- the blood pressure, again minimizing blood loss. I'll cover some more -- now we're dislocating the hip here and getting the femoral head in view. Other things we do is do the surgery in a relatively quick fashion and also, again, using special instruments to stop the bleeding as the surgery goes on. So now we're placing these special retractors around the femoral head which is partially hidden by the fat tissue. There is a clamp on the femoral head which is to the right; that clamp is to the right on your picture here. My finger is outlining the bottom part of the femoral neck -- of the femoral head, where we will make an osteotomy or a bone cut using an oscillating saw. Here's the oscillating saw. This is very much like a saw you might use as a tool in your shed or using -- a carpentry tool. It's a battery-operated -- almost like a Black and Decker saw. And so this is cutting through the femoral neck at a defined location that we've identified through preoperative planning and marked on the x-ray. We use this osteotome to remove the femoral head. And this is the one step of the procedure that you'll identify as being different from the hip resurfacing surgery that you'll see later. In the hip resurfacing we don't actually remove this femoral head but re-cap it. But in the small-incision hip replacement you can see that this femoral head which is about two inches in diameter, is, obviously, smaller than the incision but not much smaller.

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JAVAD PARAVIZI, MD, FRCS: What happens to the femoral head that you just removed?

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WILLIAM J. HOZACK, MD: That femoral head is evaluated by pathology and then discarded, essentially, in a safe fashion. It can be used, in special cases, for bone grafting -- put back onto the patient with special techniques to supplement areas where the bone has been worn away. Now you're seeing special graters, what we call reamers, which fit into the acetabulum. This is on the pelvis side of the hip joint; that's the acetabular bone you're looking at. Again, up is the front of the patient, down is the rear end of the patient, to the right is the head, to the left is the foot. These reamers increase in size one millimeter at a time, so we can very closely match the patient's anatomy and sizing. The goal is to create small bleeding areas in the bone. As you see here, these bleeding areas allow the bone to grow in, essentially bonding the bone to the titanium prosthesis that we subsequently place into that prepared bed. And it's very important to do a proper preparation here. Again, it's a series of reamings -- reamers. We have a reasonably good idea what size we're going to use based on our preoperative measurements, but again, the final measurement is made in the operating room.

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MATTHEW AUSTIN, MD: I think an important point here is you're really not compromising the visualization of the hip socket, even through a smaller incision.

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WILLIAM J. HOZACK, MD: I think it's -- I mean, reasonably clear to the viewers that everything that needs to be seen can be seen. If there's any question, we have no hesitation about making the incision one inch longer -- whatever it takes to do the operation properly. Again, we're trying to minimize the trauma so, if the incision is getting in the way, you have to make it longer. This is the actual acetabular component. It's a hemispherical prosthesis on the outside coated with a special porous, a rough-coated titanium, and on the inside, available for insertion of a bearing. So this prosthesis is impacted into the bone, into the prepared bed, and you're going to see us inserting it through the incision. Again, the impactor -- this allows -- we, again, have great visualization so that we can appropriately position the component. Here we're impacting it into bone.

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MATTHEW AUSTIN, MD: And then we test this with the inserter to make sure it's firmly secure to the patient's bone.

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JAVAD PARAVIZI, MD, FRCS: Do you ever use screws to fix this?

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WILLIAM J. HOZACK, MD: Dr. Paravizi is asking about the possibility of using additional fixation to hold the prosthesis in place, and if it's necessary there are screw holes in the acetabular component that allow us to place actual screws into the pelvic bone. These screws will, additionally, help with fixation if it's necessary. We're now cleaning out the area around the prosthesis so you can see there's a shiny inside of the prosthesis, and into that shiny inside a specific bearing will be placed. This could be, in theory, a metal bearing or a ceramic bearing, but in this case it's going to be a plastic or cross-linked polyethylene bearing. There's different types of bearings; this particular type of bearing, polyethylene, has been specially manufactured to almost eliminate the wearing-out process. It's not completely eliminated but substantially reduced as compared to five and 10 and 15 years ago. In theory, that will then hopefully lead to a longer-lasting hip replacement. So that's the plastic bearing which is snapped into that acetabular component. Now we're going to do the other half of the hip replacement; that titanium prosthesis will be inserted inside the femur. Again, reorienting you: to the left of the screen is the patient's foot; to the right is the patient's head. What you're seeing is the top of the femur bone, just below the neck cut that we made with the saw. This curette allows us to sound the canal; the canal extends down past the incision. This reamer further defines where the canal lies, allowing us to accurately insert the femoral component in the proper position in the canal.

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MATTHEW AUSTIN, MD: All that fluid that's coming out, that's bone marrow material from the femur. Is the correct?

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WILLIAM J. HOZACK, MD: All that -- what looks like soft, watery material -- is actually the bone marrow contents which, in theory, could be used for bone grafting, should that be necessary. Most of it, in this area, will be relatively fat -- contains a lot of fat material, unfortunately. So again you can see that bone marrow content -- the cancellous bone is what we call it. These are specially designed rasps, or we call them broaches, and they are in the shape of the final prosthesis, and they cut into the femoral bone, preparing a space into which we will eventually insert the titanium femoral component. These also increase in size by one to two millimeters at a time, allowing us to precisely fit the prosthesis to the femoral canal. There are a lot of clues about how to determine fixation -- in this video I'm talking about it -- but basically, it's based on a combination of feel, how you see it, and there's a pitch that's created by the impacting of the broach into the canal that helps us with -- gives us clues about how well fixed the prosthesis is. So as we go through the sequential broaching, just like we did with the sequential reaming, I've decided here that I needed to make an adjustment to the length of the neck cut within the incision. So I'm removing a little bit more of the femoral neck to allow me to more precisely fit the femoral component. That particular instrument is called a rangeur, and it takes away -- it's sharp enough to take away bone. Now we're re-broaching the canal. Again, you see how we're irrigating away at all times. Again, this type of technique will reduce the chance of infection, which is one of the other reasons -- one of the reasons we're wearing all of these unusual suits. These are called space suits. It essentially sort of shields us from the patient so we cannot contaminate anything about the patient. You see all these special drapes around the room. And the room itself is also, what's called laminar flow which is a special air-exchange system to minimize the potential for any infection in the operating room. Of course we also give the patient antibiotics. What you're seeing now is a testing of the -- trial testing of the final component. Special attachments are added to the broach; we reinsert the hip into place; we check for the stability of the hip, the range of motion of the hip. And as you can

see we're pretty aggressive in testing for stability. This allows us to be certain that the patient's hip is stable, no matter what the patient might want to do after surgery. And this allows us to let the patient pretty much do anything they want after the operation. Now what I'm doing is measuring leg lengths. It's our goal to make everybody as clinically equal as possible. It's not always possible to do so, and there are a lot of reasons for that, but our goal is to be as accurate as possible. That, you saw briefly, is the final component. It's, again, a titanium prosthesis. Has a special coating on it, that white area; also has a special rough surface. There is a white covering which is called hydroxyapatite which actually is a constituent of bone. And this encourages the bone to more rapidly heal directly to the prosthesis, locking it in place. Again this is designed, again, to allow us to more rapidly mobilize the patient. So now we're impacting the femoral component into the femoral canal. And based on various sounds and feel we've decided that the femoral component is now fully impacted.

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JAVAD PARAVIZI, MD, FRCS: So, important for viewers to know that this is an uncemented component which is very important for young patients. You could be putting that femoral component using glue or cement, which we don't use in the younger patients.

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WILLIAM J. HOZACK, MD: And again, any patient with good bone quality is a candidate for the uncemented technique so.... Especially in young patients and even in the more active, older population, uncemented techniques work extremely well. This is the femoral head; this particular femoral head is made out of cobalt-chromium metal. There are also ceramic heads which can be used and there's various indications for that. In this particular case a well-machined cobalt-chromium head is used, and this will be the final prosthesis before reduction. So, that's the final femoral component; the femoral head has been replaced by a metal, cobalt-chromium femoral head. And the final reduction will occur.

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MATTHEW AUSTIN, MD: How long does a procedure like this take, though?

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WILLIAM J. HOZACK, MD: This is an edited version of the surgery but the traditional time for surgery in our hands is anywhere between 30 minutes and an hour. And again, we're not trying to rush through the operation. Our goal is to do the operation in an efficient and safe fashion, but if you have a good team like we do at Thomas Jefferson University Hospital we can do this operation relatively quickly. And again, the advantages of that are less blood loss, less chance of infection, and less anesthesia, and all those things can translate into a more rapid recovery and a better clinical result.

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JAVAD PARAVIZI, MD, FRCS: So again you're washing the wound there, and washing is done for reducing the risk of infection?

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WILLIAM J. HOZACK, MD: Yes. I mean, a lot of things that we do -- that drape, did you see there, is to minimize the bacteria on the skin. The irrigation of the wound, multiple times, is to do that; the final irrigation does the same thing. And now we're taking a measurement of the incision after the end of the surgery because, it's the length of the incision at the end of the surgery that really counts, and it's about four inches in this particular case. I think at this point it would be reasonable to go on to the PowerPoint; maybe you could... we're going to see the closure at this time but I don't think that's going to add any particular -- more information at this point. We've actually studied this particular type of technique using regular surgery versus less invasive surgical techniques. And this is a prospective randomized study which will -- is on its way to publication. We looked at this type of patient population -- same type of anesthesia, same pain management techniques, and other things -- and what we found is that there were definite advantages to minimizing the overall trauma to the surgery. There's differences in function. That's not to say that the regular

surgery doesn't do extremely well -- in fact they do it very, very well -- it's just that if you measure this in a prospective fashion, the less invasive, smaller-incision surgery can give you slightly better results. I think at this time, I want to make sure I emphasize a couple things about small-incision surgery. It's important to realize that the length of the incision should not be the focus of the surgery -- it should not be allowed to compromise the final result of the surgery -- and that the ultimate length of the incision depends on many different patient characteristics like we've talked about: the size of the patient; how much fat tissue there is; how much muscle tissue there is; how much flexibility the patient has; and how much bony abnormality the patient has. So again, small-incision surgery can be done but should not be the only focus of the operation. So perhaps at this point -- I think the next step is to talk about another type of surgery that we perform at Thomas Jefferson University Hospital. It's called hip resurfacing hip replacement and there's a lot of enthusiasm for this technique in many areas of the world. And we certainly do this surgery here at Thomas Jefferson University, and I want to make sure we show you exactly how it's done.

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JAVAD PARAVIZI, MD, FRCS: Again, we would like to remind our viewers that you can send us your question via email, and we're standing by to answer your questions for you. Please, go ahead; I'm sorry.

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WILLIAM J. HOZACK, MD: Yeah, that's a good point, Jay; thank you very much. So hip resurfacing. Hip resurfacing is similar but also different from hip -- standard hip replacement. If you saw the standard hip replacement video, we removed by using a saw the femoral neck and the femoral head. And with hip resurfacing you don't do that. Instead, you trim the femoral head -- you trim the femoral neck -- and cap it with a metal cap. The socket side is very much the same, but instead, on the femoral side, you just cap the femoral head. The video will kind of show you that difference. I want to kind of also mention that it really is a hip replacement. It involves the same preparation for surgery, the same type of good anesthesia. The exposure techniques are similar -- actually, slightly larger than the standard small-incision hip. So in many respects it's much the same. The potential complications of hip resurfacing are very much the same. You could develop a phlebitis, an embolism. You could get an infection. There could be injuries to nerves and arteries, and there could be other more serious complications that could occur. Again, very much the same as standard total hip arthroplasty. On the other hand, there are some potential advantages. And one potential advantage is that certainly, there is less bone removal, less bone invasion on the femoral side. Instead of removing the femoral neck and the head, we preserve it and cap it. So I think that has some potential advantages. There is the thought that it feels more like a normal hip, because we don't put a femoral component into the femoral canal like you saw with that broaching technique on the small-incision hip. And there are some studies suggesting that the gait of patients with hip resurfacing might be more normal. However, we don't have all the data, and if you look at the short-term data, there are some patients that are very good candidates, but we have to be very careful about selecting the patients. So maybe at this point what we should do, is go to that hip resurfacing video, which will be more highly edited, and kind of highlight the differences that might be seen. Again, this is a left hip; patient's now on their side. The first thing you see that's different is that's a significantly larger incision. So if you're looking for a small-incision hip replacement, the last thing you want to talk about is hip resurfacing arthroplasty. But that being different, the results are very very good. So we make a fairly large incision; now, that's because the technical aspects of the operation are different, and it requires more surgical exposure to do it properly. This is that same femoral head -- different patient -- that femoral head is maintained. We're measuring the actual size of the neck to know the size of the component. So instead of removing the femoral head with a saw, we actually take a retractor and get it out of the way. So this is the retractor going

around the femoral head and neck, and we're retracting it out of the way, and allowing us to do the next step of the operation which is that reaming of the acetabulum that you saw on the previous video. So again, we use these one-millimeter-increment reamers to size the acetabulum, and insert a component that's very much the same as what you saw with the total hip arthroplasty. It has a special coating on the back, a special rough surface; a special coating to grow into the bone. The main difference, as you'll see once we remove the impactor -- so again, we impact the prosthesis into the bone with significant force. We remove the inserter. And what you see now is that the surface in the inside, rather than being somewhat rough, is smooth and metal. We now take the special guided devices -- and this is the femoral head that we're measuring out -- and we're going to prepare the femoral head. So what you're going to see here now is a special reamer that we use to create size and prepare the surface of the femoral neck, and this allows us to make sure that the cap that we place on fits properly. These cap sizes are every two or three millimeters in height. So then we take a second reamer, and this reamer does some final preparation of the femoral head to fit the inside of the cap that we're going to insert on. You can see, we use lots of irrigation just like we did on the previous hip replacement. After the final preparation is done we thoroughly irrigate the femoral head, cleaning all the blood out of the femoral head. And the reason we do this is, we're going to actually cement that prosthesis onto the femoral head, unlike the other technique which uses uncemented technique. So here we are cleaning out the -- any of the debris inside the bone.

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JAVAD PARAVIZI, MD, FRCS: What is that instrument that's sucking out blood?

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WILLIAM J. HOZACK, MD: That little sucking out of the blood there is to keep the blood from going into the bone around the femoral head, and that allows the cement to bond more directly with the bone, providing a more secure fit. So that's the femoral component which is a cap; the white, juicy material inside is cement. We insert it down the hole that was pre-drilled, and then we just impact the femoral cap onto the femoral head, and it's locked in place. So you can see how shiny that is, that's a very good bearing surface. It's a much better bearing surface in bigger bone, which is why this procedure is probably best done in patients with big bone quality, which on average will be more in men than in women. So the final reduction is being obtained here; the femoral head is being placed back into the acetabular component which we had previously inserted. And we're going to just do a brief inspection, here, of the hip joint. All that fluid is irrigation that we left in place during the reduction; that's not the patient's blood. So we're cleaning out the hip joint here, and you can see the articulation -- and now we test for the motion of the hip and as you can see here there's excellent motion of the hip, very great stability, and this allows us to allow the patient, basically, to do anything they want after the surgery without fear of dislocation or any complications. So that's hip resurfacing; let's look at the PowerPoint one more time, just for a few more slides, talking about some of the clinical issues. And again, the results of hip resurfacing have been evaluated across the world, and many places are keeping lots of data. And perhaps the best results for hip resurfacing are in the younger patient. If you look at this slide, the lowest percent failure which is on the left, is in the patients under the age of 55. Anybody over that age, the hip replacement -- the standard type -- has better clinical results in the first three years. There are still issues of how long a hip resurfacing is going to last. There are changes in the bone quality over time, femoral neck narrowing, which may lead to late failure after 10 years. We don't have clinical experience with this particular type of hip resurfacing for more than 10 years. And other changes can occur that might lead to failure after the 10-year point. The operation is definitely more complicated than primary hip replacement, so hip resurfacing probably should be done in centers where they have extensive experience with all types of standard and more complicated total hip arthroplasty. And the surgeon and the patient have to be aware that early failures of hip resurfacing can occur. So, to summarize, hip resurfacing is not for everyone. If you have bad bone quality,

deficient bone, you should have a standard hip replacement. If you're over the age of 60, I think a standard hip replacement, small incision type, would probably be better. And other types of patients are not ideal candidates for the hip replacement -- hip resurfacing arthroplasty. I think at that point, that covers all the points I want to make about hip resurfacing. I'd also like to again remind you as we did before that you're welcome to email us questions and we'd be glad to answer them at any time. Jay?

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JAVAD PARAVIZI, MD, FRCS: Thank you very much, Dr. Hozack. So that's wonderful. We've covered the hip replacement and resurfacing which are both types of replacement in which the hip joint is replaced either with metal or plastic or ceramic. But, not every patient who has arthritis of their hip needs a hip replacement. There are patients in whom the degree of arthritis is not severe enough to require replacement surgery, and these patients are candidates for what we call joint preservation procedure. One of these procedures is impingement surgery. The impingement surgery is a condition in which there is an abnormal contact between the rim and the -- namely, the socket -- and the femoral head. And these patients develop what's called a labral tear, and also cartilage lesions, which then leads to pain in these patients. This was a condition that was actually described by a professor from Switzerland, Professor Ganz, as late as 2003. When I was his fellow we discussed and described this condition in the English literature and since then it has gained immense popularity and now orthopedic surgeons are all aware of this condition, and refer these patients for treatment when the time comes. So let me show you the picture of a 20-year-old athlete who's been having severe pain in the hip for the past three years. At first sight, his hip actually does not look abnormal; there's not a huge degree of arthritis, and this patient has got pretty good bone stock. Everything on that hip may appear normal, and in fact in the old days these patients would usually end up getting hernia repair and all sorts of investigation before hip was considered to be the cause of their problem. But if you look closely, and especially where that orange arrow sits, this hip is abnormal indeed. The femoral head is not round; there is a small bump at the top of the femoral head at the junction of the neck and the head, and that bump is forced into the socket each time the patient bends their hip or engages in any activity, especially if it's athletic activity. And that leads to the tear of the labrum, which is a soft structure around the socket made of the same material as the meniscus in the knee, and that tear of the labrum becomes symptomatic and these patients, then, come to see us with the problem. If you're not sure on the x-ray if -- regarding the labral tear, the possibility of cartilage tear -- then you can do what's called an MRI arthrogram. An injection of dye into the joint is performed prior to doing an MRI of the hip. Here is an MRI of the hip of a normal hip. You can see that the femoral head is nice and round as you can see by that circle around it. And we have measured, here, what's called an alpha angle, which is the measure of how normal the femoral neck is, or how narrow or wide that waist of the femoral neck is. And this person has got a normal alpha angle being less than 48 degrees. But look at this patient, who has now got pain in their hip, and if you look very carefully there in fact is a large bump at the junction of the femoral neck and head. And that alpha angle is hugely abnormal. The orange arrow pointing to an area where the labrum is torn, and it's perhaps the cause of this patient's problem. And this in fact is the case; when you go into the surgery you can see that the labrum, as we are holding with that instrument, is torn and it's in communication with an underlying cartilage, which is the cause of the patient's problem. What we do with this is to go ahead and shave down the bump on the femoral neck and make that neck normal, and the femoral head becomes spherical after the removal of this. This is the procedure called femoral neck osteoplasty. And if the problem is on the acetabular side also, which sometimes it is, then you remove that area of prominence on the acetabular side, resolving the impingement that this patient has. So here's a picture of a patient that has the big bump at the femoral head and neck junction as is seen on that before x-ray. And if you look at the after x-ray, that bump on the femoral head has gone, and now this patient has a

round femoral head, and also, part of the acetabular rim has been shaved down. There's also two small white screwlike material in the socket, which is the anchor sutures that's used to reattach the labrum as I will show you in the surgical video in a minute. So with that, we will go through the video, or switch to the video, and I will show you the procedure for these patients.

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So here's a patient that has impingement and a hip problem. You can see that there's limited range of motion, there's not much of internal rotation. The patient can't rotate the foot outward. We do the surgery through a small incision, usually about two inches, in the front of the hip. That's done under regional anesthesia with the patient lying on their back, so here if I want to orientate you the top is basically where the head is and bottom is where the hip is. So we're now through the skin, and underneath is a muscle layer that we actually split as opposed to cut, then we expose the acetabulum and the femoral head through this direct approach. There is the capsule which holds the hip in place, and we cut the capsule in a very specific region. It's very important to be careful about where to do this so-called capsulotomy, because if you're not careful you can disrupt blood vessel to the femoral head which then leads to avascular necrosis of the hip. Just like the minimally invasive surgery we use a special instrument; here's an instrument that has light attached to it. So there with my probe I'm showing the labral tear that has detached from the socket. And that is the cause of the patient's problem; you can see that labrum is a pretty chunky mass of tissue detached from the acetabulum. On the femoral side you can see that the cartilage worn down, arthritis being the cause of their pain, and in fact there is a pretty big bump which is probably difficult for you to appreciate. There's also cartilage tear, as the probe shows you, the region between the femoral head and the socket. Here we're trimming down the socket region and also removing that cartilage lesion inside the socket, which flips in and out of the socket usually during a hip range of motion and it is the cause of pain. These are the anchor sutures we use to repair the labrum -- very important part of the procedure, something that arthroscopy cannot do. And I believe, and it's been shown by the studies, that it's extremely important to repair the labrum as opposed to debride it, which is usually what happens during surgery. So we use these sutures and reattach the labrum back onto the area of the socket that has been trimmed down and cleaned out. And once that part of the procedure is performed, we then move on to the femoral side where the bump is identified, and that bump is then shaved down to allow free range of motion. There is the bump region. With the use of a special osteotome, that area of the bump is removed. We remove just enough bump to allow adequate range of motion -- impingement-free range of motion -- but not too much that will then compromise the mechanical strength of the femoral neck and lead to fracture of the femur. So under direct vision, we can remove the area of the bump. Again, very different from arthroscopy where you rely on the flat screen tv to tell you how much of that bump to remove, here we can visually see that. And, as I said, we remove in a stepwise fashion. Just enough of the bump is removed to allow impingement-free range of motion. So most of the work is done by osteotome, and once we have accomplished that, then we will bring in a burr, which is similar to what the dentists use to clean the teeth, and in that area we'll just shave down the bump remaining area, smoothen that out. And once that has been smoothened out, we will test the range of motion to ensure that the patient has good range of motion as I'll show you in a second. And that area of the bone is then -- receives bone wax, which prevents that bump from growing back and also prevents the scar tissue from tethering down to that area, which limits the range of motion. Once that has been done, we close the split muscles. And there is the range of motion: as you can see there's been significant improvement in range of motion. Again, that surgery is not done to improve range of motion alone; it's done to relieve the underlying cause of pain which is usually the labral tear as well as the articular cartilage tear. And these patients do fairly well.

00:40:21

So that was impingement surgery for you and as I told you, at Thomas Jefferson University Hospital we do this through a small incision. And it's done under direct vision; the patients stay overnight and they go home the next day. We used to do arthroscopy here; we have abandoned doing hip arthroscopy for multiple reasons some of which I mentioned during the annotation of the video but the major reason being that you cannot repair the labrum through arthroscopy easily. And arthroscopy is a pretty invasive procedure; the patient has to have the extremity under traction which is the equivalent of four adult people basically pulling on your leg, and that can happen for up to about an hour to an hour and a half. And more importantly, the space inside the joint is so confined that arthroscopy can't accomplish most of the steps that I just showed you. So here we've stopped doing hip arthroscopy and most of the impingement surgery is done through a small incision, and an overnight stay. So those were the three procedures that we just showed you, and now I would like to ask my partner and colleague Dr. Matthew Austin to annotate and tell us a little bit about the programs we have following joint replacement -- the rehab rotation -- and what we do here which sets us aside from other centers that don't do as high volume of surgery as we do here. Dr. Austin?

00:41:41

MATTHEW AUSTIN, MD: Thank you, Dr. Paravizi. So, one of the greatest fears patients have going into surgery, whether it's hip replacement surgery or hip resurfacing or osteoplasty, is pain, and how they're going to recover from the surgery in terms of physical therapy and getting back to their activities of daily living. So if we go to the PowerPoint presentation here.... We've instituted a rapid recovery program primarily aimed, mostly, at the hip arthroplasty population. We perform prehabilitation, which is basically rehabilitation before the surgery. Oftentimes, patients receive rehabilitation only after they've received the surgery, and it makes it much more difficult. They're dealing with postoperative pain; they're dealing with things that are new to them, that are unfamiliar. So we've found it useful to have patients actually go to a rehab program before the surgery so they can learn the exercises and make it much easier on themselves and their families after the surgery. This focuses on upper-extremity exercises; crutch training; stair climbing; and activities of daily living. It's important to involve the patient's family early on. In the first couple of weeks after hip surgery, they'll require support. Even basic things like cooking and getting around the house require support, at least for the first week or so. Our postoperative therapy program emphasizes a lot of the prehabilitation principles. We allow our patients to be weight-bearing as tolerated for the most part. They're gotten out of bed the day of surgery, and they start ambulating right away. We looked at the results of our so-called fast track program where we had an accelerated rehab protocol. Eighty-four percent of our patients who were enrolled in this program were discharged on postoperative day two, and all patients who ambulated on the day of surgery were discharged on postoperative day number two. Our goals are to understand pain and understand better ways to control our patients' pain. There's no one modality that's been shown to have an overwhelming influence on control of pain so we use multiple modalities, anti-inflammatory medications, Tylenol, and also rehabilitation protocols that have been shown to reduce the patients' pain. We have a team of pain management physicians that include the surgeon as well as anesthesiologists and nurses that help control our patients' pain, usually to a very low, tolerable level. In terms of rehabilitation, in general our patients have no restrictions after surgery. We performed a study where we looked at traditional hip precautions which really restricted patients; they were only able to lie on their back after surgery. It limited their hip flexion; they had to sit in special chairs and perhaps use special beds. We compared this traditional hip precaution group to a group which did not require these hip precautions. We found, in fact, no significant difference between either group, and this has allowed us to scientifically do away with hip precautions which really limited patients in the early period after surgery. We found that the patients who were in the unrestricted group had very high satisfaction levels. They were able to return to work earlier than the patients in the hip

precaution group. They slept better because they were able to sleep in positions that they were more comfortable in. They returned to driving earlier. And it was associated with a lower cost in that special equipment was not usually necessary. We'd like to highlight one of our patients who underwent a hip arthroplasty procedure, and is in fact now out less than one year from surgery and is doing quite well.

00:45:50

BILL UNDERWOOD: As a plumbing-heating-cooling contractor and an avid ballroom dance competitor, the hip pain had taken away the joy and the abilities that I needed to perform my work and our hobby. And now, it's given me the ability to do my work without having pain, and it's put the joy and the passion back in our ballroom dancing. And it's just fantastic.

00:46:20

MATTHEW AUSTIN, MD: Well thank you, Mr. Underwood. And now we're going to have some questions posed by Dr. Paravizi.

00:46:28

JAVAD PARAVIZI, MD, FRCS: OK, I would like to remind you that you can send us your questions via email. Please do so; we're standing by to answer any of your questions that you may have. I would like to ask my partners here a few questions. Let's start with Dr. Austin. Dr. Austin, can you tell us who actually is a candidate for hip replacement?

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MATTHEW AUSTIN, MD: So patients who are candidates for hip replacement, Dr. Paravizi, are generally patients who complain of pain mostly in their groin. They've usually taken anti-inflammatory medications for an extended period of time; they've modified their activities and in general are just not happy with the quality of life that's been provided with these different modalities. Usually they're seen by their primary care physician who order x-rays and recognize that the patient has arthritis or a degenerative joint disease of the hip. They are usually, then, evaluated by an orthopedist; we see them in the office, we take a history, make sure that they have pain that's consistent with arthritis, that they've been treated appropriately. And if they're an appropriate candidate for hip replacement we present them with the risks and the benefits of surgery and allow the patients to decide for themselves whether their quality of life is indeed poor enough that they would like to undergo surgery.

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JAVAD PARAVIZI, MD, FRCS: OK, so hip replacement or resurfacing, Dr. Hozack -- what percentage of your patients qualify for hip resurfacing, and would you mind recapping on again, who is a candidate for resurfacing versus traditional hip replacement?

00:48:05

WILLIAM J. HOZACK, MD: Yeah, sure, Jay. I would say that, to outline, the patients I would consider good candidates are patients that are younger, generally under the age of 60. Patients who have excellent bone quality, have primary osteoarthritis of the hip and not rheumatoid arthritis or avascular necrosis, and who understand that the hip resurfacing is an operation that we don't have long-term data at this time. And in those patients -- we have that discussion; if they're willing to understand these things I think that about five percent, up to 10 percent of my patients might be candidates.

00:48:43

JAVAD PARAVIZI, MD, FRCS: For resurfacing.

00:48:44

WILLIAM J. HOZACK, MD: For resurfacing.

00:48:45

JAVAD PARAVIZI, MD, FRCS: Well, I've -- I'm a patient come to you and I have a hip replacement. One of the questions I might ask you is what sort of activity am I allowed to do after hip replacement? And is the degree -- is the type and the degree of activities I do different if I had a traditional hip replacement versus resurfacing. Dr. Austin, do you want to

take that question first? And then we'll ask Dr. Hozack and see whether he feels there's a difference between resurfacing and hip replacement.

00:49:09

MATTHEW AUSTIN, MD: Sure. In general, with hip replacement patients, we generally don't restrict their activities. We encourage them not to perform joint impact activities on a regular basis such as marathon running. Certainly, that could potentially shorten the lifespan of the implant but we don't have hard data on that. And for the most part our patients return to activities that they enjoy doing -- whether it's skiing, whether it's just playing with their grandkids -- the goal is to return them to their life and return their quality of life without restricting them severely.

00:49:46

JAVAD PARAVIZI, MD, FRCS: Is there a difference between traditional hip replacement and resurfacing, Dr. Hozack?

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WILLIAM J. HOZACK, MD: I think the -- I really treat all my hip replacement patients -- either the regular, small-incision, the hip resurfacing -- the same. I let them be as active as they feel they want to be; I let them do the things they want to do. And the quality of the products these days are such that the patients are very happy doing all these things and, as you saw from the patient who talked about his hip replacement, they're able to do some. So, I don't see any difference between them; I choose the operation based on a variety of patient characteristics but, after the surgery, they're all very happy.

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JAVAD PARAVIZI, MD, FRCS: Now we talked about younger patients and older patients today. Is there a difference in what you do for the younger patients here at Thomas Jefferson University Hospital, both in terms of preoperative work, the surgery, the type of implant you use, the type of anesthesia and postoperative rehab, or is it a same type of procedure for both groups?

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MATTHEW AUSTIN, MD: Certainly the patients that are more elderly will not -- most likely; not every patient's the same, there are certainly very elderly patients who are more active than some of our younger patients -- but some of the more elderly patients aren't quite prepared to undergo an accelerated rehab protocol. That's fine; they may spend an extra day in the hospital. Ultimately they are able to return to their activities of daily life.

00:51:12

JAVAD PARAVIZI, MD, FRCS: An extra day being how many days in the hospital usually for these patients?

00:51:15

MATTHEW AUSTIN, MD: Perhaps three instead of two.

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JAVAD PARAVIZI, MD, FRCS: And these patients go to rehab, or do they mostly go home?

00:51:21

MATTHEW AUSTIN, MD: The vast majority of our patients go home.

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JAVAD PARAVIZI, MD, FRCS: And do you ever do both hips at the same time at Jefferson?

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WILLIAM J. HOZACK, MD: I mean, yeah, we -- it's called bilateral hip replacement surgery. And bilateral hip replacement surgery has been shown to be very successful, done under one anesthesia and the properly chosen patient. And I think there are some criteria -- they have to be in the proper medical condition; good health, no associated medical problems, not too old. So those kinds of patients will do very, very well if they have equal pain in both hips, and have arthritis in both hips.

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JAVAD PARAVIZI, MD, FRCS: So Dr. Austin, I'm a runner and I am in need of a hip replacement. What is the time I can get back to running? How long does it take for me to recover enough to get back to my athletic activities?

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MATTHEW AUSTIN, MD: In terms of higher-end activities like that, I would say it would take a patient somewhere between three months and six months to return to full activity.

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JAVAD PARAVIZI, MD, FRCS: And the sense I got is that there is really not much restrictions in terms of what patients can't do as long as they avoid very high impact sports. Is that correct?

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MATTHEW AUSTIN, MD: That is correct.

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WILLIAM J. HOZACK, MD: Jay, maybe I could ask you a question if you don't mind. You talked about osteoplasty; maybe you could kind of highlight how you treat the patients afterwards. Do they go back to all their activities and what's the course of their recovery?

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JAVAD PARAVIZI, MD, FRCS: So the difference between the open technique we do here and the arthroscopies that -- I do restrict these patients from weight bearing because we have repaired the labrum and it takes a while for the labrum to heal. So usually these patients are on crutches for six weeks. After that, we examine them and clinically can assess to make sure the labrum has healed. And if the labrum is healed then we let them get back to any type of activity they wish to engage in. And there is no restriction at all, but the patient needs to understand that the higher the impact -- the higher their activity level -- the more symptoms they may experience. But in terms of returning to sports, the majority of the patients who have had this surgery return to sports and most of them do very well afterwards. We've had examples of athletes who do much better after having their impingement surgery than before. But again, this surgery is for only a select group of patients who understand that the degree of arthritis they have is minimal and not severe enough to require hip replacement. So in terms of the resurfacing, Dr. Hozack, you mentioned female -- there have been problems, or at least there have been concerns with regard to the release of metal ions. If I am right, resurfacing can only have one type of bearing surface and that's metal on metal bearing surface. And studies have shown that some of these metal particles find their way to the body. And people have expressed concern that females of childbearing age shouldn't have resurfacing because these metal ions could cross placenta and could affect the fetus. In your opinion, is that a real concern? Is that something that patients should worry about?

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WILLIAM J. HOZACK, MD: I think you've stated the problem very effectively, Jay, and I agree with that entirely. There is no absolute proof that there's a negative effect but the fact that the ions are in the body at higher levels and can cross the placenta is something that concerns me, so I would not offer that to a young woman who might be of childbearing age and that age changes, though, as years go on. The other types of people where the bearing surface doesn't work as well is when the bearing gets smaller. And that's in smaller-boned people; the bearing, the metal bearing doesn't work as well. So again, because the standard mini-incision, small-incision hip replacement works so well, has such good results, I think I would personally default to that rather than offering them a hip resurfacing that might lead to problems.

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JAVAD PARAVIZI, MD, FRCS: Dr. Austin, one question is, at Thomas Jefferson University, because of the very high volume of hip and knee replacement we do here, we've developed very specialized and streamlined protocols some of which we've discussed and some of which, because of the time, we haven't been able to discuss. But one of the things that was

briefly mentioned in the videos is that most of our patients have regional anesthesia. And we alluded to the fact that one of the advantages of regional anesthesia is it minimizes blood loss during surgery. What other advantages are there? Why shouldn't we put the patients to sleep? Why do we have them under regional anesthesia as opposed to general anesthesia?

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MATTHEW AUSTIN, MD: Well there are several advantages as you've stated. One is the blood pressure is lower and so it reduces the amount of blood loss the patients have. The other is that it's been shown to have a decreased incidence of blood clots, which can lead to complications as Dr. Hozack alluded to in his presentation. So, lower incidence of blood clots, less blood loss. In addition, it's an excellent preemptive analgesic. It stops, basically, the transmission of the pain from the hip joint to where the brain perceives pain and that's a very important step, as we now know, in preventing pain after surgery. So we're able to use less narcotics after the surgery because we've preemptively interrupted the pain pathway.

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JAVAD PARAVIZI, MD, FRCS: I want to thank you very much. To our viewers, we've come to the end of the session today. We'd like to thank you very much for being with us. For those of you who've missed part of the webcast today, please know that the webcast will be archived later and you can access that on jeffersonhospital.org. And if you would like to make an appointment to see any of the hip surgeons at Thomas Jefferson University Hospital, you can call by calling 1-800-JEFF-NOW, J-E-F-F now, or you can click on the 'make an appointment' button on your computer screen. And for those of you who are listening to this program and have interest in CME, please be aware that there will be a post-assessment survey that, again, you can access on your computer and there are instructions on your computer screen as to how to perform this. With all of this, I would like to thank my partners and friends, Dr. William Hozack and Dr. Matthew Austin, for being part of this webcast. And we would like to thank you for listening to us, and please send us your questions; we are standing by to answer them for you. Thank you very much.

00:57:47

ANNOUNCER: This has been a demonstration and discussion of state-of-the-art surgical options for young and active older adults with hip disease from Thomas Jefferson University Hospital in Philadelphia, Pennsylvania. To make an appointment with a Thomas Jefferson University Hospital physician, call 1-800-JEFF-NOW, or click the 'make an appointment' button. Medical professionals may now take a post-assessment survey for CME credit. Instructions are on the computer screen. This Internet broadcast represents the hospital's ongoing efforts to bring the latest medical education to both patients and the healthcare community.

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[end of webcast]