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I'm going to talk a little bit again about complications, as we've been discussing

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here, and try to go over, to some degree, what we're looking at in terms of access surgery, which is starting to become a specialty of itself in both vascular and general surgery. These are my disclosures.

So probably, most of you are familiar with this paper that came out. I don't know if [INAUDIBLE] was involved in this. But these were some large series where they looked at either the use of an access surgeon or just having the spine surgeon themselves do the exposure.

And ultimately, the results were the same. There was no difference in the risks or complications, as you can see in the conclusion, that said, "Our results did not support the notion that an access surgeon is necessary." But then at the end, it says, "provided vascular surgical assistance is readily available."

So we at UCSF have actually looked at this a little bit differently. And certainly, the vascular surgeons at UCSF don't see themselves as just being available for exposure. And why is that? Because obviously, as everyone knows, the anterior and lateral aspect of the spine is covered with the vessels.

We don't want to be referred to as the Home Depot group. We're not trying to let you do it, and we help. But we want to be able to do it more as a team approach. And that's what we're going to talk about today. And it does seem as though that's the direction that, again, the specialty of spine access surgery is going.

So there are a variety of ways that you can obtain fusion of the spine. The ones that require vascular exposure are the straight anterior ALIF and the more lateral approach that get in front of the psoas. But again, we've now established that there are kind of two ways that we can do it, either a standard ALIF or now moving toward more of the lateral exposure, either as the OLIF or the NuVasive lateral ALIF.

Whatever we do, whether we're doing anterior or lateral, we're doing this, to some degree, relatively minimally invasive. There is no muscle division. It's still remarkable how many centers are still doing a standard type of a transplant incision, where the surgeon is going in and doing a major invasive muscle dividing

exposure. The exposures we're talking about today, again, require no muscle division. And whatever you do, it does require mobilization of the peritoneum. And in our practice, it's done as a team approach.

The differences in the two, between the lateral and the anterior, is really positioning. Clearly, anterior is supine, whereas the lateral is done in a decubitus position. And we feel that to some degree, the size of the incision from the lateral approach allows a more minimally invasive-- and certainly if you want to do single-position surgery, that has to be done laterally-- but that the lateral approach is more limited in terms of access if you develop a complication. And so certainly, some pathologies do not lend itself to the more lateral approach.

So how do we decide, as the access surgeon, what we want to do? Well, certainly, we want to, again, do it as a group or do it together. And what we'll talk about today is, what are the advantages of ALIF versus OLIF or lateral LIF. And can you be committed to only one procedure? As vascular surgeons, we want to be able to do all of these procedures, and then leave it up to you, or in combination of our discussion, to decide what we want to do. And I'll show some of our data in terms of what are the risks and complications from the various procedures.

When we first got involved in doing spine access, this was one of our surgical mentors, Colonel Sanders. And why is that? Well, he is a great proponent of doing one thing and doing it right. People would come to him and say, did you ever think about doing hamburgers? And you could drive-through, and they could make the burgers for you, and you could get in and out really quickly. And he said, no, I want to do chicken, and I want to do it correctly.

So at first, when we were doing spine exposures, we looked at everything as chicken. We wanted to get this done quickly so that you could get the exposure done. And to some degree, we found ourselves just doing one thing well. But the question is today, should we be offering you other exposures? Should we, as access surgeons?

The one thing that we find in terms of this is that we are taking on the risk to some degree. And what we want to do is plan to do this correctly. Our group is always great at coming to me and saying, hey, I've got this patient. It's a little bit off our

normal Do you think this is something that we can get done? And as long as you plan this correctly, often, we can get the procedure done.

Well, we know ALIF. It's a really versatile operation. We've done, UCSF, thousands of these. You can do it with many types of incisions, either a low transverse incision, a paramedian, midline, more lateral. So it's very versatile. You can approach a wide variety of pathologies.

And it is easier to deal with complications. And again, why is that? Because the abdominal wall is right in front of the spine. If you can get into the peritoneum and in the preperitoneal space, you can get exposure to the spine.

When we looked at our data-- this was a group of neurosurgical spine patients over about a six-year period. I was the access surgeon to all of these procedures. We had nearly 1,000 cases that we looked at. And again, although a recent meeting we had where we had a variety of access surgeons around the country, and a lot of people would hold the line on a BMI of 35, you could see that we had a lot of patients who were quite large. And that's probably the standard in most people's practice.

And we even had a fair number of patients over a BMI of 40, are a mix of pathologies, from deformity degenerative-- also, a fair amount of infection and a fair number of pseudos, a lot of previous spine surgery. And a majority of the patients were multilevel. Only 37% were single level, which would typically be 5-1.

And in looking at our practice, I think our results were quite good. What stands out-- and again, is a lot different than we were just talking about-- is there's almost no neurologic complications in these patients. The only neurologic complications that we had were almost always related to just the hardware getting placed in improperly in creating a neurologic problem. Otherwise, there's no nerves involved in this field, and there's almost no neurologic complications, which means, basically, the exposure surgeon is taking all the risk.

Again, interestingly, we had no arterial injuries in this, so that the vascular injuries are all venous. So we find that a majority of the complications in these cases are either venous injuries, which can be very significant, or abdominal wall problems related to hernias, or wound infections, or wound dehiscences.

When we looked at the EBL for ALIF, I think it's fairly obvious that as you get up into multilevel ALIF, three and four levels, this becomes a relatively large operation. The incision for a three-level ALIF at a minimum has to be from the umbilicus to the pubis, but it could be larger. And for four-level, it's almost always nearly a full abdominal incision.

And EBL is significant for the multilevel-- clearly four-level, but even three-level carries a fairly high EBL, even in cases that didn't have vascular injuries. When we did have a vascular injury, the EBL was almost always over two liters. But even any type of complication carried a fairly large blood loss.

So again, why is this? When we look at doing ALIFs, it's a great exposure. It gives us access to the spine, again, for a variety of pathologies. But we know that to get multilevel exposure, you have to divide every segmental vessel for the level above you're doing, so that if you're doing 4-5, you have to get the L4 segmental and the iliolumbar vein, the middle sacral vessels. And for each additional level, you have to divide the segmental vessels, which can become problematic. But that is the way that we do the procedure. And we've been able, in a majority of the cases, to do it very safely and successfully.

So again, the risk is to the exposure surgeon. Again, there's almost no neurologic complications. But certain problems are clearly much safer to approach anteriorly rather than in any other manner. And certainly, these are redos, patients who have a vascular aneurysm disease, patients with significant infections, and laparoscopic hernias. This has been a problem that we found recently that has been an impediment to doing the lateral exposure.

This was a case we had recently of [INAUDIBLE] where the patient had had a laparoscopic hernia repair. Often, the patients don't even realize they've had these operations, but you could see that there are innumerable tacks, which represent mesh and problems related to mobilizing the peritoneum laterally, so making these minimally invasive lateral approaches quite a bit more difficult.

So the alternative in our practice now is to do a lateral approach, either an OLIF or the NuVasive lateral ALIF procedure. Clearly, this is much more minimally invasive. But again, from an access surgery standpoint, it only requires us to do 5-1. The

other levels are done in a more non-invasive manner, using navigation either as an OLIF or an XLIF, but does not require vascular surgery because it doesn't get into the segmental vessels or the iliolumbar vessels.

It can be useful in patients with high BMI, because in putting the patients laterally, some of the obesity will fall away. We have found it's very helpful in patients who have had extensive midline surgeries. Chris recently had a case where a patient had had a huge midline operation, and we had to go much more laterally. And certainly it is necessary if you're going to try to do single-position surgery. This is the position we're utilizing now, a straight lateral decubitus approach to the spine.

And we know that the data would show that the complication risk for L5-S1 OLIF or lateral LIF is relatively low. There's no real injuries to spinal nerves, major vessels, peritoneal injuries, or ureters. Because of the location of the incision and the way that it's just separating the external oblique, internal oblique, the hernia risk is almost minimal. However, in multiple-level, we do see some numbness in the anterior thigh which clearly is not present in patients who have had ALIFs. And typically, it does not require neuromonitoring.

This was some of the data we have for about our first 75 OLIF patients we did at UCSF. And certainly the blood loss is significantly less than one would find in our multilevel ALIF cases. So again, in the appropriately chosen patients, this may tend to be a better way to do multilevels, like three and four-level fusions. And again, there tends to be no GI or hernia complications. And it appears to reduce the length of stay, anecdotally.

This is just a picture that we did, that [INAUDIBLE] and I did recently. This is a five-level fusion. The lower incision is the L5-S1 exposure, and the upper is the other four levels. So in the appropriately chosen patient, we do find that this can be a lot less invasive.

Again, I'm not here to say, OK, this is a procedure that one should do in every case. But what we're finding, from the point of view of an access surgeon, is we want to be able to offer you, as the spine surgeons, all these various exposures. And then you decide what you feel is appropriate for the patient.

So what we're finding is, we're trying to get away from being like the Colonel. We

don't just want to do one thing and do it well. And we're really identifying with another industrial group, and that's the employees and owner-employees of Lowe's. Why Lowe's? Because their motto is, "Never stop improving." And that's what we're trying to do as spine access surgeons. We want to be more Lowe's than Kentucky Fried.

[LAUGHTER]

Thank you very much.