SPEAKER: Why is it important to learn about cannulation and techniques? So really two reasons, main reasons. One is to increase your success rates. So failed cannulation can occur up to 15% to 20% of cases, especially when performed outside tertiary care centers. And of course, the consequences of this are substantial. You're talking about repeat procedures, alternate procedures, and all the morbidity and cost associated with that. And the other reason is to decrease complications, which of course pancreatitis is the most common.

So these are a list of the pancreatitis risk factors, and really made up of a combination of patient-related factors, and endoscopic-related factors. And you can see that as far as the endoscopic factors, moderate to difficult cannulation is there, and one or more injections of contrast into the PD. So cannulation technique can affect your risk.

All of you are familiar with this anatomy. This is a cross-section of duodenum. You see the ampulla with the bile duct, sorry, bile duct and the pancreatic duct exiting. So ampullas and papillas come in all kinds of varieties, and really there's three main anatomic variants that we classify these into.

And the first here is an example of having a short-- short common channel between the bile duct and the pancreatic duct. And an endoscopy imaging this is what it may look like. And the second type of anatomy is when there is no common channel between the bile duct and the pancreatic duct. So in endoscopic imaging, you may actually see an ampulla that has two separate slits representing the pancreatic and the bile duct. And then the third variation is where you have a very long common channel. And on endoscopy, or endoscopic image, you'll see this sort of long, redundant, floppy ampulla. And of course these are the ampullas that are most challenging to cannulate.

So when ERCP was first introduced, the primary technique was really repetitive probing with a standard catheter. And now we have all kinds of specialized instruments to help us get into the duct. Here we have specialized cannulas including ultra tapered and steerable.

We have papillotomes or sphincterotomes, which allow you to change the angle of approach to the ampulla. They come in single, multi-lumen and we even have rotatable ones when you have those ampullas that are somewhat distorted. Guidewires come in all kinds of sizes and types. And then we also have precut papillotomy devices, such as needle knife and traction papillotomes.

So let's talk about how to approach the papilla. So for biliary cannulation, you usually want to come from below. And you want to go in-line with the axis of the common bile duct. And generally, you want to aim between the 11 and 12 o'clock position for biliary cannulation.

For PD cannulation, notice that the sphincterotome is positioned more perpendicular to the duodenal wall. And you want to position your sphincterotome towards the 1 to 2 o'clock position.

So as far as the actual cannulation techniques, you have to remember that physicians have many different styles of cannulating. And it's really important to learn to appreciate and understand all of them, because you're probably going to end up using one or a combination of these techniques to access the desired duct.

So the first technique is really using traditional cannula, repetitive probing and injecting contrast. I call this the cram and squirt technique. The second technique is using a sphincterotome. So basically, like I said, you can vary your angle of approach to the ampulla. And in fact, when you bend you can actually hook it, and pull. So that's the hook and pull and that kind of opens up the ampulla so you can get into the duct. And you can use hook and pull and you can use cram and squirt with this technique also.

And then there's assistant-controlled wire-guided. So basically you're using the wire to access the desired duct and the physician controls the sphincterotome and assistant controls the wire.

And then the last one is physician-controlled wire-guided cannulation. The difference here being that the physician not only controls the sphincterotome, but also controls the guidewire.

So this is an example of the cram and squirt technique. So basically the problem here is you've embedded a cannula but you don't know where the tip of the cannula is. Is it in the common duct, the pancreatic duct, or is it in the common channel? So it's not a very selective technique.

Here's an example of using a sphincterotome. And here we've got inadvertent injection of the pancreatic duct. Remember that every time you engage the ampulla, you inject. You go in and you get the contrast in the PD, you've increased your chance of post-ERCP pancreatitis.

And this is just an example of why I got wire-guided cannulation. Again, we're using the wire to access the duct and you see it on fluoroscopic imaging.

So what are the potential advantages of using wire-guided cannulation? Well, as I just showed you cannulation can be confirmed fluroscopically. So you basically eliminate pancreatic duct opacification. There's a soft tip hydrophilic guidewire. It may be more beneficial for certain anatomys as compared to using a rigid sphincterotome. And then physician-controlled wire-guided manipulation, you eliminate the constant communication between the tech and the physician.

There are potential complications of wire-guided including internal dissection of the papilla, false passage, and perforation of the pancreatic duct side branches. This is usually eliminated by using a soft tipped guidewire. And then you can have failure with very stenotic ache or floppy papillas. So again important to know a variety of techniques.

So one of the questions that are asked is can guidewire cannulation reduce the risk of post-ERCP pancreatitis when comparing it to conventional contrast injection. So it's interesting every year at DDW there's an abstract on this, and every year it's somewhat conflicting.

This is from a metaanalysis looking at guidewire versus conventional contrast injection, or cannulation, and the risk of post-ERCP pancreatitis. So in this metaanalysis, these are all random prospective randomized controlled trials. Most of them are article, there are two abstracts. Five of these are non-crossover trials and two are crossover trials. Crossover meaning that they were randomized to start with one technique and then after 5 or 10 minutes, depending on the study, they switched to the alternate technique.

So looking at rates of post-ERCP pancreatitis. So if you look at the vertical line, everything to the left favors guidewire; everything to the right favors contrast. And if you look at the non-crossover trials they found that post-ERCP the pancreatitis was significantly lower in the guidewire group as compared to the conventional contrast. In the crossover trials, there was no statistical difference.

And then looking at primary bile duct cannulation of success rates so. This was available from five of the studies. Again, in this particular graph, anything to the right favors guidewire, to the left favors contrast. And you can see that there was a significant rate of primary cannulation higher with the guidewire versus conventional contrast.

So guidewire cannulation may reduce the risk of post-ERCP pancreatitis compared with the conventional methods. And it seems to be associated with a higher cannulation success rate. We continue to see data on this topic.

So these are the current short-wire ERCP systems that are available for physician-controlled. This is the Boston Scientific RX. This is the Cook Fusion. And in both of these, the wire is locked externally near the biopsy port. The third example here is the Olympus V system where the wire is locked internally at the gate.

So to perform physician-controlled wire-guided, basically you preload your sphincterotome. You drop down the channel. Once you're in duodenum you basically split the wire. And then you control the physician controls the sphincterotome and the wire.

So I'll show you a couple of techniques for using a wire-guided cannulation. The first technique is where you put the guidewire at the end of the sphincterotome. So, in essence, you're using the guidewire as the cannulating device. Now here's an example where we're in the mid-position and notice that we have a somewhat small ampulla. So here we're using just the wire to access the duct. And again, this is that soft tip hydrophilic guidewire. Once the wire is in the bile duct, we simply follow it up with the sphincterotome.

So I'll show you another example. This is a large ampullary adenoma, and we're about to perform ampullectomy. But before doing that we want to confirm that there is no involvement of the distal bile duct or the distal PD. And the reason I'm just showing you this is just to make the point about wire guided cannulation.

So here we use pure wire-guided. First we're getting into the bile duct, and we're going to inject contrast here, which is going to show that there's really no involvement at the distal CBD. And then, in a similar fashion, we're going to use just a wire to get into the pancreatic duct also without engaging the sphincterotome. And in fact, this patient had no involvement. So we did do the endoscopic ampullectomy. Again, that was just to kind of make the point of the wire-guided.

The second technique is basically where you engage the sphincterotome and then advance the wire. And this is more traditional approach that you guys are probably used to.

And the third technique is called the double wire technique, which we use it quite often. It's very useful. And basically here the idea is, so you've gotten into the pancreatic duct multiple times. I usually cut off at three. Then you leave the wire in the pancreatic duct. You take your sphincterotome out. You preload your sphincterotome again with another wire. And then you go back down the channel. And then basically you're using your pancreas duct wire to help you access the bile duct.

And I'll show you an example of this. So here we notice how floppy and redundant this ampulla is. So we're unable to get in. And we leave a wire into the pancreatic duct. And here we're trying to get into the bile duct. Now, initially we're just kind of putting the sphincterotome over the PD wire, and we try to push the wire in. And that doesn't actually work.

So the correct way to do this is when you push your sphincterotome out, you actually want to drop your elevator, bend just a little bit. And what that does is it pushes the PD wire out of the way, so down and out of the way. And it opens up the ampulla or the bile duct. So it's easier to get in and then eventually we're able to get in with this wire. And this is sort of the what double-wire technique looks like on fluoroscopy. So again we didn't inject any contrast here.

So using wire-guided cannulation for a routine case. Well, again you don't have to inject to identify the duct. Fluoroscopic projection of the wire will indicate which duct you're in. You don't lose anything by doing a wire-guided. You can still do your cram and squirt, hook and pull techniques. And of course as I showed you, it easily sets up the double-wide technique for more complicated cases.

So this is a algorithm, a proposed algorithm, that we use for our Fellows. Basically, we start with physician-controlled. We actually tried just with the wire first. Depending on what the anatomy is like or we engage, but it's always physician-controlled wire-guided. If that works, great.

If you haven't gotten in and you've tried four or five times you obviously have to do something different. So then it kind of splits up. Depends on if you're getting into the pancreas duct or not. If you're not getting into the pancreas duct, then we do a hook and pull, and we do small puffs of contrast. If that works, great. If not, then you move on to needle knife or US rendezvous, whatever to get in.

Now if you continue to get into the PD then we set up the double-wire technique. If that works, great. If not, then we place a PD stent into the pancreatic duct. And at this point, it really depends on how long you've been cannulating. But you can leave the stent and cannulate over it, or you can go directly to needle knife sphincterotomy. And remember that when you're doing a needle knife you really have a stent in, so it actually helps you. And there's data that shows that it actually may reduce the rate of post-ERCP pancreatitis.

I want to move on to a little bit more complicated cannulations. So this is those interdiverticular papilla. We see a lot of these. Especially on that Friday, that 85-year-old, with cholangitis. And you got to get in, and then you find this large diverticulum. So I think it's really important to understand how to manage these. They don't need to go to IR, unless you absolutely can't get in. But it's usually an emergency for most of these patients.

So these are a couple of ways of how to get in. Some of the things that are described in the literature, balloon dilation of the diverticular rim. Use of two devices and one channel. Saline solution injection to lift the papilla has also been described. And then endoscopy clipping of the rim to expose the papillary orifice.

And here's an example of a large diverticulum. The ampulla papilla is somewhere inside. So here we're using a clip to try to evert the papilla. Using a clip through a side viewing can be somewhat challenging at times. It is kind of difficult to do. In this case we applied the first clip but it didn't really do anything. Here we're applying a second one. Again, which is kind of everting the lip there. And then once we place this clip, you'll actually see that there's a slit right here, which you'll see better in the second. You can see bile draining from there.

So now we've got a great position, and we basically just do our little wire-guided cannulation after we've changed of position here. And then this patient and multiple stones in the duct, and we can see the two clips.

Another way of using the clips. So in this case you can actually see the ampulla. It's just all the way to the left. The ampulla-- or the diverticulum is above. So we've tried, you can see blood here, we've tried to cannulate. So one thing you can also do is grab. You've got to find out where to grab it, but if you grab it down more inferiorly you can see that it changes the position of the ampulla. And so now we're able to easily get into the duct.

And then here's just another case where it wasn't possible to put a clip because of the anatomy. We can get it out of the channel. So here we decided to do this kind of two-- using two instruments simultaneously to get into the duct. So what we're doing is, we're grabbing with a small biopsy forceps. We're grabbing the lip and we're going to push it down while simultaneously using this tome.

And you can see a slit opens up right around here at this 6 to 7 o'clock position. So then we're going to reorient our sphincterotome. And try to access that while we're pushing it down with the other biopsy forceps. And then here again, we're just going to use a wire-guided. It's actually very difficult to just engage this without getting out of a good position. Once we're in, then we engage the sphincterotome, follow it up.

And here you can see we've injected contrast. You can see the forceps holding at the same time.

So the other difficult cannulation can be B2 anatomy. Remember here you're advancing your scope through the afferent limb and up to the ampulla. Everything is kind of reversed here. Instead of cannulating at the 11 or 12 o'clock position, now you're going to cannulate at the 5 to 6 o'clock position.

So here's an example. So basically we're in the afferent limb. We've clipped it just to know where we were. And here's the ampulla. So notice that the sphincterotome looks like the swan neck deformity. So what we've done is we've rotated the sphincterotome completely. Remember that you have to cannulate towards the 5 to 6 o'clock position. So that's what we're attempting here. Unfortunately we're not getting into the bile duct. We keep getting into the pancreatic duct.

So we decide to leave the pancreatic duct wire in. And now we're going to go back down and we're going to do sort of a reverse double-wire technique. So we're going to push that PD wire away and try to engage here, and try to get a wire into the bile duct. And then eventually we are able to again, with wire-guided cannulation, get into the duct.

And this is kind of your typical B2 anatomy ERCP. And this is what it looks like. Again you've got your double-wire. We inject contrast. There was some sludge. We decided to cut. So here we're cutting, not at the normal 11 or 12 o'clock, but we're cutting down towards the 5 to 6 o'clock position. And then we extracted the sludge from the bile duct.

So in summary, understanding the anatomy is really the key to selective deep cannulation. Cannulation techniques are important for successful cannulation, and may play a pivotal role in the genesis of post-ERCP pancreatitis Wire-guided cannulation allows tactile feedback and avoids voice opacification of undesired ductal system. Probably the most important point here, is really know a variety of techniques.