

## **Transcript: Interventional Management of Acute Pulmonary Embolism**

Dr. Sharonne Hayes: Welcome back to the Mayo Clinic cardiovascular podcast series, interviews with the experts. I'm your host, Sharonne Hayes. I'm a non-invasive cardiologist and vice chair of faculty development and academic advancement for the Department of Cardiovascular Medicine here in Rochester, Minnesota. Today I'm joined by Dr. Arashk Motiei who is assistant professor of medicine and an interventional cardiologist here at Mayo Clinic in Rochester with expertise in peripheral arterial procedures and relevant to today's topic, acute interventional management of acute pulmonary embolism. Dr. Motiei will share with us contemporary interventional management strategies for patients with massive acute pulmonary embolism, as well as those with intermediate high risk acute pulmonary embolism. Welcome.

Dr. Arashk Motiei: Thank you very much, Sharonne. Thanks for the opportunity.

Dr. Sharonne Hayes: So Arashk, who are the patients with pulmonary embolism who need to be considered for interventional treatment? I mean, who should we call in your team for?

Dr. Arashk Motiei: Okay. There are two groups of patients who need to be considered for interventional treatment. The first group comprises of patients with massive pulmonary embolism. These are cases that are relatively uncommon. The patients by definition, are unstable with hypotension or have catastrophic pulmonary embolism with PEA, such patients are frequently treated with systemic fibrinolytic therapy and less commonly with surgical pulmonary thromboembolectomy. However, the treatment approach has now evolved and most experienced centers use percutaneous mechanical thrombectomy on ECMO for these cases. The second group is the larger group and comprises of patients with intermediate high risk pulmonary embolism. These patients have pulmonary embolism with significant clot burden and also have acute RV enlargement and hypokinesia that's attributable to the pulmonary embolism. By definition, they also have elevated troponins. Now this is a large group of patients and there is a wide spectrum of risk within this group. Not all patients with intermediate high risk pulmonary embolism require interventional treatment. We tend to reserve it more for symptomatic patients and for patients who have clinical imaging and biomarker data that indicate a high risk of adverse in hospital or short term outcomes. So the key is risk stratification. We know that between five to 15% of these patients will deteriorate and meet the classification for massive pulmonary embolism. And the goal of interventional treatment is to reduce the risk of this outcome and to also affect symptomatic improvement, especially with mechanical thrombectomy. We see that the resolution of hypoxia, tachypnea, and tachycardia is quite rapid and it's common to see vital signs completely normalized by the end of the procedure. We don't know yet if percutaneous approaches and selected patients with intermediate high risk PE reduces mortality. There are trials that are underway looking at this issue.

Dr. Sharonne Hayes: What, what do you actually do in the procedure? What types of interventional treatments are available and what are, what are you selecting from?

Dr. Arashk Motiei: Sure. There are two, two broad categories of interventional treatment. We have catheter-based thrombolytic therapy and we also have percutaneous mechanical thromboembolism. There are at least two FDA approved devices for catheter-based thrombolytic therapy. This involves the placement of infusion catheters with side holes in the pulmonary arteries within the clot. And then we infuse alteplase over a few hours. And the idea is that using a low dose of alteplase, we can dissolve these clots, slowly relieve the pulmonary vascular obstruction while potentially attenuating the bleeding risk. It's quick to do in a cath lab, but it takes some time afterwards as the infusion has to run for a few hours. And during that time, the patient requires ICU monitoring. Because we're infusing a fibrinolytic it can still be complicated by bleeding. Even though the total dose of alteplase that's administered, it's quite low for percutaneous mechanical thromboembolism. There are at least three FDA approved devices. There are others that are being studied with this approach. We go directly into the pulmonary arteries, typically via groin approach and extract the clots. The procedure is longer than catheter directed thrombolytic therapy in the cath lab, but the improvement is rapid and typically an ICU stay is not required. There's a trial that's underway that compares that is looking at a comparison of the two approaches in a head-to-head fashion. I've, in my own practice, previously used catheter directed thrombolytic therapy extensively in the past, but now I mostly use percutaneous mechanical thromboembolism.

Dr. Sharonne Hayes: Yeah. 'cause the And is that because just your gut is this, it's sort of one and done. You, you've taken care of it?

Dr. Arashk Motiei: That, that's right. It's, it's, it's a quick turnaround for the patient. The patients improve rapidly, as I mentioned. They may come in tachycardic, hypoxic markedly symptomatic right before the procedure and 60 minutes or 90 minutes later. All of those things are normal and it, it is not a resource intensive approach afterwards when patients have to go to the ICU with catheter directed thrombolytic therapy, it takes a bit of time, it uses up quite a bit of resources and it's frequently uncomfortable for patients. We cannot sedate them heavily during that time because we need to do a lot of neuromonitoring and because they're lying down, they often have stiff back and are quite uncomfortable. So overall, even though the procedure takes a bit of a longer time, I think that mechanical approaches are, in my opinion, a little bit better.

Dr. Sharonne Hayes: Well, I'm assuming both of these approaches involve, also involve systemic anticoagulation. Are, have you observed, I realize that clinical trials are ongoing. Is the bleeding risk in your experience kind of similar?

Dr. Arashk Motiei: The bleeding risk is very small. You know, with, with mechanical trauma ectomy approaches, we're typically using large board devices. So there's always this concern about groin bleeding, but it's a venous sheath, even though it's a large sheath. The risk of a groin bleed in these cases is very small. I would say less than one to 2% with catheter directed thrombolytic therapy. Again, in clinical trials, the bleeding risk has been, you know, anywhere and between the one to 2% range to even higher. Some studies have shown higher bleeding rates. We don't quite know. There are now large studies that allow us to give that answer, but clearly the risk is lower than what you would get with systemic lytic therapy, which uses a much higher dose.

Dr. Sharonne Hayes: Right. So that leads me to my next question. So some of these folks will have already gotten, so they come under your care may have already gotten systemic thrombolysis. Right. And so you're dealing with, you're dealing with that as you go into this procedure. Right. But I, I guess I, it's a two part question. How do you deal with that and what considerations are there? But do you sometimes use a hybrid, I mean, deliberately use a hybrid, both the mechanical and the a systemic? So talk a little bit about that approach.

Dr. Arashk Motiei: Sure. I, I think we do get some patients who have already received systemic fibrinolytic therapy by the time we get involved in those cases, typically the systemic fibrinolytic therapy has, has gone out of the system because the half-life is relatively short. But it does bring up this issue of should systemic fibrinolytic therapy be really used for the management of current of pulmonary embolism in the current era. And, and I would say in the current era, there's really no role for the use of systemic fibrinolytic therapy for acute PE. It's commonly used in cases of massive pulmonary embolism with a high recommendation in the guidelines. But I have to emphasize that this approach is not based on solid data. There's only one randomized controlled trial that enrolled a total of eight patients, four treated with streptokinase and four treated with heparin that has looked at this in, in massive PEs. So the quality of the evidence is very weak. Just to give you a comparison, the trials of streptokinase and acute STEMIs enrolled close to a total of 50,000 patients. So there's a huge difference. There's also this tendency to consider the use of what is called reduced or half dose fibrinolytic therapy. It's half the total dose. This largely comes from a trial that enrolled 120 patients. It was based on a low risk population. It showed a reduced hospital length of stay and PA pressure on follow-up, but no difference in mortality. But it doesn't really apply to patients with intermediate high risk PE because most of the patients in the study did not have echocardiographic signs of RV enlargement. So it was a very low risk population. So in summary, I don't think that systemic fibrinolytic approaches should have a major role, especially now that we have much better studied catheter-based options with which we also have a lot of experience.

Dr. Sharonne Hayes: Well, I I would say not every patient lives within 50 miles of someone like you. Correct. And, and so might this end up being you give systemic thrombolysis if you, you know, just like for the STEMI right population is if you're in a remote hospital where you don't have options for

catheter based interventional, that maybe that's a, there's a role there. Or do you think it's better to just get them someplace where they can be intervened upon?

Dr. Arashk Motiei: I think there may be a role in that setting. Not everybody has timely access available to all the resources that are needed to do catheter based treatment. So I agree there may be a role, just like we do in STEMI's for full dose systemic thrombolytic therapy followed by reassessment and maybe intervention if needed, or even a type of a facilitated PCI type approach where it's a half dose followed by intervention. It's not being studied. But I think, I think that those are, those are very interesting questions.

Dr. Sharonne Hayes: So is, and, and my last question I guess is kind of what is the aftercare on these patients and where do you think this field is gonna be going?

Dr. Arashk Motiei: The aftercare is not complicated for patients who have either catheter directed thrombolytic therapy or who have had mechanical thrombectomy. Typically, we are able to start oral anticoagulant therapy the same evening or the next day. So that's, that's usually very straightforward. Afterwards. We now have a post PE clinic where we follow these patients, we see what their echocardiographic parameters are like and clinically how they're doing. So those are, those are usually straightforward issues to manage post procedure. The length of stay is significantly reduced. I think that's a big plus in favor of these approaches. I think there are, there is going to be an emerging role or increasing role for these approaches in PE management because there are several studies that are underway studying the utility of these approaches in comparison with each other and in comparison with anticoagulation. And I suspect that many of those studies will have positive outcomes on some of the important endpoints. I think mortality might be a little bit difficult to prove, especially for the intermediate high risk cases, but certainly hospital length of stay, symptomatic improvement, those types of things would get better and and I see this being increasingly utilized.

Dr. Sharonne Hayes: Well, thank you for sharing that because I think that that clearly is a very different approach than what we used to think of. I mean, these folks came in and you gave them thrombolysis and you just hope for the best and Right. We've really seen some pretty remarkable saves using these techniques. That's correct. Yeah. Well, thank you very much, Motiei.

Dr. Arashk Motiei: No problem. Thank you very much. Thanks for having me here.

Dr. Sharonne Hayes: This wraps up this week's episode of interviews with the experts. I'd like to thank Dr. Mote for joining me today and discussing this important topic. We look forward to you joining us again next week for another interview with the expert. Be well.