The risk of carotid plaque embolization during carotid artery stenting has been a subject of intense investigation over the past decade. There are emerging data to show that hypo-echoic plaque as assessed by grayscale median analysis using conventional carotid duplex scan is associated with an increased risk of carotid plaque embolization. Plaque echolucency assessment by conventional carotid duplex scan is associated with an increased risk of carotid artery stenting. However, patients with high calcium plaque volume are reported a weak correlation regarding the risk of plaque embolization. Timaran et al presented an excellent study in which they analyzed the predictive factors of plaque embolization during carotid artery stenting using various imaging modalities, which included virtual histology IVUS, transcranial Doppler, and diffusion-weighted MRI. The authors reported a weak correlation regarding the risk of plaque embolization as assessed by virtual histology IVUS during carotid artery stenting. However, patients with high calcium plaque volume are associated with an increased risk of subclinical cerebral embolization.

I have three questions for the authors:

1. The risk of carotid plaque embolization during carotid artery stenting has been a subject of intense investigation over the past decade. There are emerging data to show that hypo-echoic plaque as assessed by grayscale median analysis using conventional carotid duplex scan is associated with an increased risk of carotid plaque embolization. Plaque echolucency assessment by conventional carotid duplex scan is associated with an increased risk of carotid artery stenting. However, patients with high calcium plaque volume are reported a weak correlation regarding the risk of plaque embolization. Timaran et al presented an excellent study in which they analyzed the predictive factors of plaque embolization during carotid artery stenting using various imaging modalities, which included virtual histology IVUS, transcranial Doppler, and diffusion-weighted MRI. The authors reported a weak correlation regarding the risk of plaque embolization as assessed by virtual histology IVUS during carotid artery stenting. However, patients with high calcium plaque volume are associated with an increased risk of subclinical cerebral embolization.

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consider a neuroprotective filter device with smaller porosity when encountering high calcium volume plaque density? Or should we use a flow-reversal neuroprotective device when encountering plaque with high calcium or fibrofatty volume?

I enjoyed this presentation and would also like to congratulate the authors for a well-designed and well-presented study. I would also like to thank the authors for providing me with a well-written manuscript in a timely fashion. Lastly, I would like to thank the Association for the opportunity to discuss this study.

Carlos Timaran. Thank you, Peter, for your comments and questions. I do believe that assessing plaque composition is important prior to any carotid intervention. Not to mention, the gray scale median (GSM) is one of the most important methods and its importance is that it is derived from a noninvasive imaging modality (ie, duplex ultrasound). There are some studies that have shown that low GSM is associated with increased risk of embolization after carotid stenting. We are prospectively collecting duplex ultrasound images to correlate the degree of embolization with our VH IVUS findings and GSM. Unfortunately, I don’t have those data with me today, but I think those are important and may allow us to identify patients at high risk of embolization prior to carotid stenting. Regarding the use of statins, more than 90% of our patients were on statins, so what you are seeing here is carotid plaques that were developed in the presence of a statin. There are studies that actually show that statins can modify the plaque composition; specifically, they may decrease the amount of lipids in the carotid plaque. I do believe that this finding has implications, particularly for those patients that will be managed with best medical therapy. Regarding the effectiveness of embolic protection, what we are seeing here is the effects of plaque composition in patients that are undergoing a procedure under embolic protection with a filter. Our idea was to see how effective the filters were in those patients, particularly those with large necrotic core. Regarding recommendations about our findings, I do believe that we need to explore further the use of this imaging modality (ie, virtual histology IVUS). There is some information and findings that we have presented here; one of them is that if you have substantial dense calcium, you have to be careful about proceeding with stenting as there was a trend, although not statistically significant, to increased embolization in these cases. Obviously, different embolic protection devices may offer different results in terms of plaque composition, so that needs to be addressed in future studies, too.