

**SPEAKER:** Now are these differences in risk factor strictly related to age? Like I said, we live a decade longer. Or all these risk factors under-treated in women? Are they more difficult to treat? Should there be specific management of risk factors? Should we be thinking about specific agents, antihypertensives, that would work better in women? Are we even adequately assessing risk factors?

And that brings me to this very popular bar graph that some of you have seen in the past. This comes from Framingham Heart Study. And what it shows is it's estimated 10-year stroke risk in 55-year-old adults according to levels of various risk factors. So if you look at these variables here, the A, B, C, and D category, men are at higher risk of stroke when it comes to having one or two stroke risk factors when it's only blood pressure and diabetes. What happens later on if you have three or more stroke risk factors?

Women-- that's shown here in blue-- have higher stroke risk factors. Remember in the earlier slides, I'd show you that diabetes, hypertension, atrial fibrillation are stronger risk factors in women or more prevalent risk factors in women. Important to notice that this was a study only looking at risk in 55-year-old and above.

OK. So what does the stroke guideline not address here? Well, one is definitely the stroke risk in younger age group. How about the risk of oral contraceptive use? How about migraine with aura, which is more prevalent in women, and history of preeclampsia and other pregnancy outcomes?

Because if you look at epidemiological studies of death in women who have suffered preeclampsia, eclampsia, the cause of death in pregnancy-related complications almost half the time, 40% to 50% of the time, is written as CVA, cerebrovascular accident. And that's about it. Either you're going to get an ICD-10 or ICD-9 in the past, ICD-9 code, or a term CVA. So what about that? What about having a history of preeclampsia? That's not addressed in stroke risk profile as of 2017.

This is an intra-op picture. I'm sorry. Because of light, it's probably not projecting very well. But what I want you to look at is this is an internal carotid artery, split open right here. And this is an ugly plaque showing here. Carotid stenosis is the one that is associated with higher risk of stroke, both in men and women.

Important to remember that there are ongoing studies looking at carotid plaque morphology, carotid intima-media thickness as additional risk factors, not only that luminal narrowing. It's not only the flow-limiting lesion of internal carotid artery, but also how vulnerable the plaque is, how big the plaque area is, that's also important.

Has it been incorporated in our decision-making? Not yet. It's important to know that there are gender differences described in all three areas.

Women have-- so this is a study from 2004-- women had a higher prevalence of carotid stenosis. However, men had increased total plaque area. And the plaque area was a stronger predictor of vascular events in both. What does that tell you? That carotid disease, if stenosis is the same degree both in men and women, it's the plaque area that matters the most, or plaque area should also be considered. And if men have more diseased plaque area, then they are at higher risk of stroke.

Why is it important? You have heard about not-- so lack of benefit from revascularization procedure such as stent and carotid endarterectomy when it comes to women. So there is a gender difference in CEA, offering CEA to a woman to prevent stroke risk when the stenosis is only moderate, not severe. And part of the reason could be just this plaque morphology.

Of course, there are other reasons. Women have more complications, more perioperative surgical complications. So your complication risk has to be less than 2% or 3% for the revascularization procedure to have any benefit in the next five years.

Now this is a recent study in the last five years that strokes-- this was quite troubling and got a lot of press-- that strokes have tripled in recent years among middle-aged woman in United States. And one of the findings, main findings, of this study was that this was clearly associated with an increase in BMI going from 27 to 29 and waistline two inches bigger than they were a decade ago.