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Tailored Treatment in Retinal Disease: Using Biomarkers to Guide Anti-VEGF Therapy

Announcer:
You're listening to *Eye on Ocular Health* on ReachMD, and this episode is sponsored by Regeneron. Here's your host, Dr. Jennifer Caudle.

Dr. Caudle:
This is *Eye on Ocular Health* on ReachMD, and I'm your host, Dr. Jennifer Caudle. And joining me today to discuss biomarkers and clinical indicators that guide personalized treatment decisions across retinal therapies is Dr. Michael Javaheri, who's the Managing Partner and Director of Research at Retina Specialists of Beverly Hills as well as an Adjunct Clinical Professor of Ophthalmology at the Keck School of Medicine at the University of Southern California. Dr. Javaheri, welcome to the program.

Dr. Javaheri:
Thank you for having me.

Dr. Caudle:
Of course. So if we start off with some background, retinal therapy has typically followed a fairly fixed injection cadence, but how is the growing use of biomarkers helping us create more personalized treatment plans?

Dr. Javaheri:
Well, the use of these biomarkers is transforming the traditional fixed-schedule approach to anti-VEGF treatment into a more personalized, biology-driven model. Imaging biomarkers, such as central retinal thickness, subretinal, and intra-retinal fluid patterns, and pigment epithelial detachment morphology on OCT allow us clinicians to gauge real-time disease activity and adjust dosing intervals accordingly. Patients demonstrating rapid anatomic improvement after initial injections can often be extended safely, while persistent or recurrent fluid signals show the need for closer follow-up.

Beyond imaging, genetic and molecular markers, such as CFH and ARMS2 variants, and inflammatory cytokines like IL-6 are emerging as predictors of treatment response and resistance. Integrating these multimodal indicators helps align our treatment intensity with the individual disease biology that we're treating, helping to improve outcomes while minimizing the treatment burden.

Dr. Caudle:
Thank you. And when it comes to making these tailored decisions, why are imaging features like central retinal thickness and fluid patterns on OCT so central to predicting a patient's treatment response?

Dr. Javaheri:
Well, when we start patients on treatment, we know that a rapid central retinal thickness reduction after initial injection suggests that they will be ready for injection interval lengthening much sooner than others. And when we see persistent or fluctuating fluid, we know that we need to be more persistent with monthly dosing and are unable to extend them. Most clinicians use the treatment extend protocol, and these decisions with OCT are most important when deciding to extend patients when monitoring their fluid.

Dr. Caudle:
Excellent. And what about a patient's baseline visual acuity? In your experience, how does this help shape your expectations around treatment outcomes?

Dr. Javaheri:

Well, a patient's baseline visual acuity remains one of the most informative predictors of treatment outcomes, but it must be interpreted in a nuanced way. In general, patients who begin therapy with a better baseline visual acuity tend to maintain more stable vision over time and can tolerate longer treatment intervals once anatomic control is achieved. Those presenting with poorer starting vision may still experience substantial functional improvement if they show a strong early anatomic response on OCT, particularly with rapid fluid resolution.

Ultimately, individualized treatment planning that integrates both baseline visual acuity and early response data helps avoid overgeneralization and ensures that therapy intensity is tailored to each patient's true potential for visual recovery.

Dr. Caudle:
For those of you who are just tuning in, you're listening to *Eye on Ocular Health* on ReachMD. I'm your host, Dr. Jennifer Caudle, and I'm speaking with Dr. Michael Javaheri about how we can use biomarkers and clinical indicators to make personalized treatment decisions for patients with retinal diseases.

Now, looking beyond imaging and vision, Dr. Javaheri, recent research is pointing towards molecular and genetic predictors. Can you tell us about some of the emerging biomarkers, like CFH or ARMS2 genotypes, and inflammatory cytokines that may influence future treatment decisions and outcomes?

Dr. Javaheri:
So variants in these genes, such as CFH and ARMS2, have been linked to differences in disease susceptibility and variable responses to anti-VEGF therapy. For example, patients carrying certain CFH risk alleles may demonstrate a higher degree of complement dysregulation and, in some studies, a less robust response to VEGF inhibition, therefore suggesting that complement-modulating agents could eventually play a role in determining personalized therapy for these individuals.

Similarly, the ARMS2 genotype has been associated with more aggressive lesion behavior and potentially faster recurrence after treatment, which could influence dosing intensity from the start.

On the molecular side, inflammatory markers such as interleukin-6, TNF-alpha, and VEGF-a polymorphisms have been correlated with treatment resistance and chronic fluid persistence, especially in diabetic macular edema.

As these insights mature, combining genetic and cytokine profiling with traditional imaging metrics may allow us to predict therapeutic responsiveness, guide agent selection, and tailor dosing frequency more precisely.

Dr. Caudle:
So then if we bring all of these imaging, clinical, and molecular indicators together, what role do they play in helping us tailor dosing intervals more precisely for each patient, especially those receiving anti-VEGF therapies?

Dr. Javaheri:
When integrated together, imaging, clinical, and molecular indicators provide a comprehensive framework for truly individualized anti-VEGF treatment planning. OCT biomarkers, such as early fluid resolution, reduction in central retinal thickness, and stability of outer retinal layers, help identify patients who can safely extend dosing intervals without compromising outcomes. Clinical factors, such as baseline visual acuity and early functional response, further refine our expectations for durability and visual potential. Meanwhile, emerging molecular and genetic markers, such as CFH, ARMS2, and IL-6, may soon allow us to predict which patients are likely to be non-responders who require more intensive therapy.

Dr. Caudle:
And I just have one final question for you before we close, Dr. Javaheri. Given all of these emerging predictive tools, how can we best integrate these insights into everyday treatment decisions?

Dr. Javaheri:
Well, we have to be thorough. Routine imaging and visual acuity assessments are already cornerstones of how we treat patients, and we need to keep those as the cornerstones of how we treat patients. But we need to slowly blend in biomarker profiles once they are fully available to us and integrate them into our complicated patient days and our complicated patient workflows. We need to know how to integrate them and when to integrate them into our EMR and into our further education of other clinicians to know that these are there and can help guide their treatment.

We know that AI is becoming a bigger influence in how we take care of retina patients, and I know sooner than later, it will be involved in how we're tracking certain diseases and looking for their progression and for how they're improving. So once we're able to integrate these things and still be very efficient for our patients, I think their clinical outcomes will be tremendous.

Dr. Caudle:
With those key strategies in mind, I'd like to thank my guest, Dr. Michael Javaheri, for sharing his perspectives on biomarkers and tailored treatment plans for patients with retinal diseases. Dr. Javaheri, it was great having you on the program.

Dr. Javaheri:
Thank you again.

Announcer:
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