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Understanding MRI: Common Challenges and Expert Guidance for MS Diagnosis

Announcer (Introduction):
Welcome to ReachMD. This medical industry feature, titled “Understanding MRI: Common Challenges and Expert Guidance for MS Diagnosis,” is sponsored by Novartis Pharmaceuticals Corporation.

Here’s your host, Dr. Jason Freeman.

Dr. Freeman:
MRI is the most important tool for diagnosing and monitoring multiple sclerosis, also referred to as MS. Use of MRI has been a part of the diagnostic criteria for more than 20 years. It's the most sensitive way of imaging demyelinating lesions within the brain and spinal cord, which are key markers for MS. Abnormal FLAIR, or fluid attenuated inversion recovery, could be a sign of abnormality. Therefore, one of the major challenges lies in determining whether an MRI is characteristic of MS, or something else entirely. So what are some of the ways we can overcome that challenge?

This is ReachMD, and I'm Dr. Jason Freeman. Joining me to help translate MRI scans for MS diagnoses is Stephen Yeung – Dr. Stephen Yeung, also with us is Dr. James Stankiewicz. Dr. Yeung, Dr. Stankiewicz, welcome to the program.

Dr. Yeung:
Great to be here. Thank you.

Dr. Stankiewicz:
Thanks for having us.

Dr. Freeman:
So given the varying ways that patients could present, Dr. Yeung, what should clinicians actually look for in an MRI scan when they suspect MS?

Dr. Yeung:
That's a great question. I think that, um, MRIs for MS patients typically follow a very specific pattern. So you do want to focus on the FLAIR imaging signals, uh, first and foremost, that's where you're going to see the most obvious kind of, um, classical changes that, teach and, uh, show patients.

So on these FLAIR images, uh, what you can see as these bright, uh, signal intensity changes, or kind of, you know, what we call lesions, uh, that, you know, we will be able to show, um, a patient. And it can appear on brain, spinal cord, and, uh, you know, even optic nerve. Uh, classic example of kind of, you know, is the presence of, uh, these lesions that you can see arranged in, um, uh, a pattern that we call, uh, Dawson's fingers, um, just because, um, they appear to be like fingertips splaying out from the paraventricular, uh, region.

But, uh, when you're looking at MRI, um, uh, MRIs of the brain in MS patients, they typically follow this pattern where it's, uh, discrete lesions, they're ovoid in, you know, shape. Uh, they're arranged in the periventricular regions, they can be found in other regions, like the juxtacortical, um, kind of, you know, areas of the brain, the, uh, corpus callosum, uh, the cerebellum and brainstem. Uh, when you're looking at the spine, typically you're going to see, uh, partial transverse myelitis. So that's just, uh, some of the kind of more classical, uh, uh, patterns that we look for.

Um, so MRI is just one tool. Uh, because of its, um – it’s common to be missed or mistaken kind of, you know, overdiagnosis of MS is a

risk. It is important to pair any findings of the MRI scan to a patient's clinical history, their presentation, and then obviously kind of, you know, further testing like, uh, spinal fluid if need be, uh, especially in patients with nonspecific symptoms.

Dr. Freeman:
Thank you. So turning to you, Dr. Stankiewicz, can you elaborate on those guidelines, um, that aid in the clinical diagnosis that Dr. Yeung just mentioned?

Dr. Stankiewicz:
Sure, I'm glad to. So diagnosis is made with the McDonald criteria, and they've been revised over the years. The key, uh, point of McDonald criteria, which cannot be overemphasized, is that, while MRI is important, it's an overall clinical impression. Uh, and so MRI is part of the diagnosis, but not the sum total of the diagnosis. Related to the MRI and the imaging features that, uh, characterize, uh, what an MS, uh, uh, uh, something that would be consistent with an MS diagnosis. It's, as Stephen alluded to, you have, um, these four regions of the brain that we consider there's the paraventricular area, there's the infratentorial space, which as Stephen discussed, it's, uh - it's both the brainstem and the, uh, uh, cerebellum, you have the, uh, juxtacortical or, um, uh, cortical, uh, space, and then you have, uh, spinal cord. So that's - those are four areas. And in order to fulfill criteria for dissemination in space, you need lesions in two of those areas.

Um, the other thing is that you need to – to fulfill criteria for dissemination in time. Uh, or the way that you can fulfill dissemination in time by MRI is, uh, that you have either a baseline scan, and then a subsequent scan, you see new T2 lesions, or you can have a scan – uh, a single scan, where you have some lesions that, uh, enhance and some that don't, implying that there, uh, are some new lesions and some that are – are older. Because enhancement is something that, uh, really typically, depending on technique, lasts for about a month and relates to the breakdown of the blood-brain barrier from an acute, uh, lesion.

So, um, really, you need dissemination in space and time. Just a couple of quick comments about the most recent 2017 McDonald criteria. So, uh, the first thing is that it - it's become easier to diagnose because, uh, you can, uh, use cortical lesions, uh, in the diagnosis. And, uh, at - at first presentation, posterior fossa lesions, even if they're symptomatic, can be included, uh, in – in – in, diagnosis. And the other, uh, thing about the, uh, update to the MacDonald criteria, uh, is, uh, again, that you can, um - you can have, uh, uh, these enhancing and non-enhancing lesions, and you can consider that, uh, uh, dissemination in, uh - in time, even at the first, uh - the first scan.

Now, um, the, uh - the last thing to say, uh, which I think Stephen was discussing them, right, but I just want to add is that, uh, it's important when looking at these things to, um, look at, uh, both sagittal and axial section with the best technology possible in order to really get a, uh - a good look at, uh, where these things are – are located and give you some sense of the morphology of – of the lesions.

Dr. Freeman:
So Dr. Yeung, what are some challenges that clinicians face when interpreting MRI scans for potential diagnosis of MS?

Dr. Yeung:
So, uh, some conditions or diseases certainly can mimic MS on, uh, MRI scans. I think, uh, one kind of, uh, classic, uh, example to talk about is, uh, migraine, uh, uh, patients. So migraine, uh - migraine patients on MRI, they could have nonspecific small punctate, um, hyperintensities, usually clustered. Uh, they're not very discrete, but they're found at - in the subcortical white matter, and these are very kind of, um, characteristic of, uh, changes that are often confused. Uh, they previously were referred to as, uh, unidentified bright objects, or UBO's, on MRI. Uh, but, uh, certainly we -with more understanding, you know, this is a, you know, very consistent pattern. Um, there are other diseases like, um, uh, age-related changes that, uh, you can typically see in, um, vascular patients or, uh, stroke patients that, uh, similarly have white matter changes that, you know, may be, uh, uh, confounding or confusing for MS changes.

Dr. Freeman:
Additionally, Dr. Yeung, can you tell us about some of the common patterns or themes on an MRI, uh, that are MS mimics or – or lead to a question of demyelinating disease, uh, as a part of the differential?

Dr. Yeung:
Um, yeah, so I think that, um, uh, certainly, when you're talking about, um, different diseases that are often kind of, you know, referred for rule-outs, you could have kind of, you know, um, uh, diseases such as, uh, neuromyelitis optica. Uh, this is a series of, uh, pictures here that, uh, kind of, you know, represent, you know, changes that, you know, uh, are, um, not typical, uh, for MS diagnoses. So you would see kind of, you know, involvement and other regions of the brain. You would see kind of, you know, uh, as you can see on the bottom right, you would see kind of, you know, more U-fiber involvement.

Dr. Freeman:
Thank you. And how about you, Dr. Stankiewicz? What are – what are your thoughts on either rare presentations for, uh, potential MS

or - or those diagnoses that are sort of on the MS spectrum, uh, and what you might find on MRI?

Dr. Stankiewicz:
Yeah, so in some ways, I'm going to repeat what you just said. But there are really two different categories that you need to consider. One is demyelinating disease, uh, spectrum. And the second is, um, other, uh, diseases, uh, as Stephen already discussed, uh, uh, things like, uh, migraine related or like a hypertensive, uh, sort of appearance, where you have these, uh, punctate nonspecific lesions. But then, um, outside of the MS spectrum, there's our, uh – or the demyelinating disease

spectrum, there's also - there are also autoimmune diseases that you have to consider, uh, such as sarcoid, or, um, uh, lupus, Behcet's, many different things. Uh, and - and those have their own characteristic appearances. And there are certain red flags that, uh, you want to look for.

Um, and, uh, the other thing would be like infectious diseases, like Lyme is a common one that we think of that tends to look nonspecific on MRI.

Uh, and then there's the MS, uh, spectrum, or - or I should say demyelinating spectrum of diseases, and that ranges anywhere from, um, uh, sort of, uh, taking really into account the clinical presentation, things like acute disseminated encephalomyelitis that, uh, can look very much like a - an MS, uh, MRI, though, typically, uh, there's a deep, uh, gray matter involvement, uh, and maybe, uh, oftentimes more prominent spinal cord involvement. But you can also, uh, see more fulminant presentations like a Marburg's, uh, variant of MS, uh, or something potentially like a Balo's concentric sclerosis, which on T2 imaging, on axial imaging, you have this characteristic sort of rind-like almost onion-like, uh, uh, look in the brain that - that is, uh – it's kind of pathognomonic in a way.

And then, um, the last one I think that is more top of mind, which becomes very tricky is a tumefactive MS, which can look very much like a, um, uh, a tumor like a glioblastoma. And as you can see, uh, on this, uh, scan here, uh, you can - you see that on T2 imaging, there's this like, socked-in area of, uh, inflammation, and then – or, you know, this - the solid mass like thing, I should say, this, uh - this very dense T2 hyperintensity, surrounded by, uh, what looks like ed – edema. Uh, and you don't see really, uh, it - it projecting out to the cortex, it's really more related to the, uh, uh, white matter and U-fibers, but you can see the enhancement is also this, um, mixed sort of appearance. And so, um, that can become a very, uh, tricky clinical conundrum. But, uh, it's - it's, uh, uh - you have to think carefully, uh, through that and you don't want to mistake it one way or the other, and, of course, you want to make the right diagnosis.

Dr. Freeman:
For those just tuning in, you're listening to ReachMD. I'm Dr. Jason Freeman, and here with me today to discuss potential challenges when reading MRI scans and the potential for misdiagnosis is Dr. Stephen Yeung and Dr. James Stankiewicz.

Dr. Yeung, uh, once you have confirmed an MS diagnosis, what are your next steps?

Dr. Yeung:
So after confirming the diagnosis with the patients, certainly I think that, uh, a - a huge importance is educating that patient, making sure they leave that office, uh, that first encounter kind of, you know, with a good understanding, um, and comfort with the disease. I think that a lot of the unfortunate pitfalls of – of the, um, aftermath or the patient journey subsequently is because of, um, you know, lack of understanding or kind of, you know, this, uh, initial kind of, uh, connection with that doctor. So, you know, I think that, um, you know, I take the time to, um, you know, make sure to press upon them the importance, uh, of treatment, um, and what treatments today can really do.

Um, so then after discussing kind of, you know, MRIs and what the disease actually is, and what the, you know, what is happening, then certainly, you know, you talk about treatments and, you know, um, you educate patients on what to expect from the treatments and that's, you know, that's - that's, you know, the - probably the most exciting part about kind of, you know, being an MS treater because, you know, there's fantastic, uh, drugs available today that, uh, certainly can, you know, change the trajectory of these patients. So, um, after starting a patient on a disease-modifying therapy, then certainly then, you know, um, you schedule kind of, you know, uh, regular follow-up. Um, you know, I personally would, you know, uh, bring them back in shortly after to make sure that they're comfortable with the medication, that there's no any kind of, uh, unintended or kind of, you know, uh, side effects that, uh, are not, um, I guess that the patient is not able to tolerate. But then yeah, MRI, um, does become a regular kind of, uh, tool that, uh, we can use to monitor for treatment, uh, response, and then also to, uh, uh, monitor treatment or disease progression, I should say.

Dr. Freeman:
And about how often would you do a follow-up scan?

Dr. Yeung:
Um, typically, uh, I would kind of obtain a MRI scan about three months after starting or initiating, uh, uh, therapy after diagnoses. And

then after that, uh, usually, I would actually recommend a patient to do an annual MRI subsequently after that until, you know, uh, perhaps, you know, they demonstrate kind of treatment, uh, success or stability - disease stability.

Dr. Freeman:
Thank you, Dr. Yeung. Now, we're just about out of time for today. But before we go, Dr. Stankiewicz, what are key takeaways you have for our audience?

Dr. Stankiewicz:
So I think this, uh, relates to what I emphasized before, which is that this is ultimately a clinical diagnosis and that the MRI is a tool and to –to get the best your hands on the best tool that you can in order to, uh, make the best decisions and to use that tool in the best way possible. So again, looking at sagittal section, uh, an axial section and to try and use them to come to the best possible interpretation. But ultimately, it has to, uh - a diagnosis has to rise and fall with, uh, the clinical history and exam, as well.

Dr. Freeman:
Dr. Yeung, any additional thoughts you'd like to share?

Dr. Yeung:
So I think that, um, you know, it's important as, uh, MRI is, um, understanding the utility of this powerful tool, you know, what it can mean to help, you know, make a more, uh, rapid diagnosis, a more accurate diagnosis, this is just kind of, you know, one of the, um, uh, early steps in helping patients, um, but certainly kind of, you know, reducing kind of, uh, um, kind of time to achieve disease control. Um, yeah, as Dr. Stankiewicz kind of alluded to, although it's just, uh, one tool in many that we have, uh, it is certainly an invaluable, uh, tool that we do often kind of, you know, drag patients back in to, uh, undergo. It's incredible to me how many patients I've seen that have actually never, uh, been given the opportunity to view their own MRI. So I would kind of urge, uh, uh, clinicians that have - still have that ability to - to kind of, uh, take pride in the, you know, that opportunity to share that, um, um, MRI with patients.

Dr. Stankiewicz:
And I agree with Dr. Yeung.

Dr. Freeman:
Yeah, so those are great practical takeaways to consider as we end today's program. I want to thank my guests, Dr. Stephen Yeung and Dr. James Stankiewicz, for helping us better understand MRI scans for the diagnosis of MS. Dr. Yeung, Dr. Stankiewicz, it was great speaking with you both today.

Dr. Yeung:
Great to be here.

Dr. Stankiewicz:
Thank you.

Announcer Close:
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