

Patrick Kiessling:

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Dr. John Marinelli:

Hey everybody. Welcome back for another episode of ENT in a Nutshell. My name is John Marinelli, and today we're joined by neuroradiologist Dr. Greg Basura to talk a little bit about approaching tinnitus. So Dr. Basura, thank you so much for being here today.

Dr. Gregory Basura:

Well, thank you, John. I appreciate the opportunity to chat with you today about a challenging clinical and a challenging research problem.

Dr. John Marinelli:

Just by way of introduction for our listeners, I just wanted to start out by saying broadly tinnitus is often broken down between pulsatile and non-pulsatile or tonal or subjective tinnitus. Today, we will chiefly be focusing on tonal or subjective tinnitus and leaving pulsatile or objective causes of tinnitus out because that's covered in other podcasts in different episodes, like Glomus tympanicum for example. But Dr. Basura, could you tell us a little bit about how you like to define, or what you think of when someone says tonal or subjective tinnitus?

Dr. Gregory Basura:

Yeah. So as you mentioned, the field kind of describes an objective versus a subjective form. Objective, as you mentioned, is kind of what the provider or the evaluator can appreciate. And usually that's pulsations. So whenever I see a patient that comes in, I ask them about subjective, is it subjective? Is it something that only they can hear? And so really the field respects a definition that essentially states that tinnitus is really phantom perception of sound in the absence of a bonafide sound stimulus. So really it's only the tinnitus suffer that appreciates it. The evaluator, clinician, they cannot hear that.

So, really it's isolated to the patient themselves. And then it comes in a lot of different flavors in terms of the qualitative components of it, where someone may describe it as a buzzing, ringing, hissing, air being let out of a tire or a balloon, ocean sounds, music. So it comes in all kinds of different flavors, but the qualifying component there is that it's isolated to the patient.

Dr. John Marinelli:

And how are these patients presenting to your clinic when you see them?

Dr. Gregory Basura:

So they can present in all kinds of different formats. Some will describe very specific onsets. They'll describe very specific locations. Meaning, "I heard a loud crash and or there was a gun blast at the gun range and now my left ear is ringing like mad." Or, "I just progressively have noticed that I've got this ringing in my head over the last six months." So it behooves us as providers to really dig into the details and ask them so they can present in all kinds of different formats. And a lot of patients may not even know they have it. So I bring it up, if it's not the chief complaint that the patient's coming to see me for, I will ask them about it if they're coming in for something like, say hearing loss, for example, I say, "Oh, so

do you have tinnitus?" And some people may not even know what that is, some people may know. So there's a lot of variability in what patients already know and how they present.

Dr. John Marinelli:

And from what I understand, this is a pretty common problem, isn't it?

Dr. Gregory Basura:

Oh, it's very common. Absolutely. So I always say, I always joke with the patients that you can throw a rock in a crowd, you're going to hit somebody that's got tinnitus. And the estimates, they're at least 10 to 15% in the US, and maybe higher across the world. And then that gets sub-stratified into those folks that might have more disabling variants. And as a result, we've come up with things like the tinnitus handicap index to sort of begin to classify or sub-classify the severities of these because it's subjective. So we have to take the patient's word at face value about exactly how troublesome or bothersome it is.

Dr. John Marinelli:

And just touching on bothersome, you mentioned how bothersome it is to them. What are the key areas of the history that you like to elucidate when talking to the patient?

Dr. Gregory Basura:

Yeah. So it's always important to know, first of all, is it pulsatile or not? So I always definitely ask that because as you mentioned, that can take you down a whole different path if it's subjective or pulsatile. So I always want to know when did it start, and was there an inciting event, because most tinnitus is related to hearing loss. And typically within that realm, sudden hearing loss, and usually noise exposed sudden hearing loss is usually the primary driver for this, for the etiology.

But I'll ask about the location. Is it one ear or is it both ears? Is there anything that, other than an inciting event, is there anything that makes it better or worse? Is there anything that they do that mitigates it, head, neck movements, masking noise at night, these types of things. I'll also ask if they had any changes in their health at the time of the onset. Did they start a new medication? Did they have a systemic illness? Did they have a surgery? And then you always got to touch base on their otologic history. Have they ever had ear surgery or an ear procedure? Do they have chronic ear infections? And I always ask them because a lot of infections, they may not know what that means. So I say, "Have you ever had blood or pus coming out of your ear canal?" May portend an acute otitis media, perforated drum, cholesteatoma. Then always asked about ear pain. And I always ask about vestibular symptoms. Did they have any vertigo attacks, or anything like this?

And then, because we'll talk about it later, there's a somatic variant, which we've learned in the literature that people with bad necks or jaw dysfunction, temporomandibular joint, malocclusions, or any kind of head-neck traumas, for example, they can have tinnitus that is modifiable with head neck movements. So I always ask about those predisposing conditions. Did you just have dental work done before it happened, for example?

So there's a lot of questions you need to ask and really dig into it, to get those details.

Dr. John Marinelli:

And from a pathophysiology standpoint, I know there's work being done in understanding it, but what do we think it causes tinnitus?

Dr. Gregory Basura:

This is where the research is becoming more promising, but it's still not completely well known. As we know, there's a lot of things that can cause tinnitus. It can be systematic. It can be pharmacologic as we know with high dose aspirin. But what the field had recognized is that tinnitus is typically thought to be an aberrancy in the central auditory circuits. And what's happening is because it's really usually related to hearing loss that the inputs into the circuit are lower than what the central circuit would expect. Therefore there's a release of inhibition. And so this idea of central gain that goes all the way from essentially the brainstem dorsal and ventral cochlear nucleus all the way through the midbrain thalamus up to the cortex, have shown increased activity.

And so the field has started to recognize from an electrophysiologic standpoint, a couple of neural correlates of tinnitus, at least in animal models, that would be thought as increased spontaneous neural firing rates, and increased neural synchrony. These neurons are not only firing faster on their own, but they're firing in harmony or together. And so it's these neural correlates that are thought to be in response usually to some kind of peripheral aberrancy, whether that's hearing loss or some other problem, that releases the inhibition and causes this hyperactivity within the circuits.

Dr. John Marinelli:

And so when you're seeing a patient that has tinnitus, how do you like to work these patients up typically?

Dr. Gregory Basura:

So again, it's really important that you get into the location of their perception. And fortunately, a lot of folks that come to my institution, by the time they see me in the clinic, if they're coming in for a complaint of tinnitus, we usually like to get an audiogram. So at the very baseline, you want excellent history, comprehensive head- neck exam, and you definitely need audiometric data because a lot of people may have an undisclosed hearing loss that they can't really tell you about. And tuning fork testing does have its utility, but oftentimes it doesn't give you a specific enough data to really hang your hat on.

And so when I work these folks up I always get an audiogram, and I like to look at what their hearing loss is because and again, it depends on if we think that hearing loss is the primary driver, that with a good head and neck exam and their history will tell you a lot about where things are going. Plus it may disclose something, as I mentioned, that they may not be aware of, an asymmetric hearing loss, which would then warrant an MRI or some other workup.

Now, if someone comes in with just unilateral tinnitus, one-sided tinnitus, that's an immediate red flag right there, because as the field knows one-sided tinnitus can be indicative of a retro cochlear or intra cochlear pathology. So therefore that's pretty much, at least in the US, that's going to mandate an eighth nerve or an inner ear protocol MRI to make sure there's not some form of a gadolinium enhancing lesion, to include but not be limited to say a vestibular schwannoma. So it's important to talk about sidedness, and then to get an audiogram, at least at baseline.

Dr. John Marinelli:

What do you think about the, we touched a little bit on role for imaging and unilateral tinnitus. I know it's an important topic in pulsatile tinnitus, any other reasons you might get imaging in these patients?

Dr. Gregory Basura:

Yeah, I mean, if again, so the audiometric testing, if, if someone says that they have bilateral tinnitus or tinnitus aurium is what the field would name that. And I get an audiogram that shows either a pure tone average that's asymmetric, which the field would recommend three contiguous frequencies of 10 to 30 DBs or more. If we see a word discrimination score that could be greater than say 10 or 12% difference between the ears. And then certainly, if there are acoustic reflexes are either elevated or absent, or they show some kind of reflex decay, that would tip you off to want to get an MRI scan.

And it depends on what other symptoms they might be describing. If there's concurrent, say facial numbness, if there's facial weakness, if they've had any other histories of cranial nerve neuropathies, then you might be wanting to again think about other options there too. Now, if it's a dental source or some kind of head-neck trauma, for example, an old trauma, or if you see something on the exam, that might warrant a different modality, maybe like a CT scan of the temporal bone. But again, it really depends on what you're looking for.

By far and away with tinnitus and the concerns that we have for the inner ear, we're thinking about schwannomas, we're thinking about meningiomas and then you have a whole host of things that could occur like lipomas, or even condor sarcomas or things that might be more ominous. So it depends on what you see on the audiogram. It depends on what the patient is describing. Then of course, the clinical findings.

Dr. John Marinelli:

And any role for lab testing here?

Dr. Gregory Basura:

I usually don't. I usually don't on the first visit unless someone describes some other concern. Of course, if there is a concern about infectious disease, then of course, that you may warrant labs if you find something. But by and large, I usually don't get labs. I know with sudden hearing loss, people have done full workups, for auto-immunity say Lyme's Disease, these different things. But for tinnitus itself, and usually if it is tagged to say hearing loss, then you might work something up, but people are coming with tinnitus and kind of a classic hearing loss without any other concerning physical findings or history, lab testing really is not indicated.

Dr. John Marinelli:

Transitioning a little bit to treatment, now that we've talked about presentation, pathophysiology and workup. Obviously there's a number of different treatment modalities that people will pursue, but maybe if we could just start with lifestyle, behavioral lifestyle modifications, could you tell us a little bit about different routes people might try with that?

Dr. Gregory Basura:

Yeah, certainly. So, as we mentioned, there's a lot of things that can cause tinnitus. And so I always try to be very comprehensive with the patients. And I say the goal here is if we can find an underlying cause, or at least something that's contributing to it, then that behooves us to address that first. So I always look at medications. So I always want to look at meds. So people that are on a high dose aspirin or the nonsteroidal anti-inflammatories, we know that those can cause tinnitus, some forms of diuretics, even some antibiotics, for example, there's some recent literature about maybe reflux medication as well. So I always try to time and look at medications, first of all, as an inciting event. Can you change that?

Other things we look for are things that are natural stimulants, things like caffeine, nicotine, they're weaker in terms of the literature suggesting that they're outright causes of tinnitus, but like my balance patients, I always try to have patients keep some kind of a subjective log, if you will, like a tinnitus log and say, "Okay, are there things that you do day to day diet, sodium, caffeine, alcohol, nicotine? Is there anything that exacerbates or mitigates the tinnitus?" And I think it's important that you start at first look at that. Look at the hallmarks of good health. I look at sleep. I ask them always about is the tinnitus keeping them awake, because that might portend that there's anxiety or depression. And that's very important to ask how tinnitus is affecting these patients, because the rates of anxiety and or depression are higher than people will admit. But yet can be devastating because the links between tinnitus and suicide are well-known.

So it's important to ask about how it's affecting sleep. Are you sleeping well? If they're not that increases stress. And we know that that can, in the literature it's clear that stress can exacerbate tinnitus. The diet thing we talked about, are they dehydrated, are there are other issues that may or may not exacerbate blood volume and different things. And then exercise, which would be also following the realm of stress reduction. I always ask about those types of things and how that's affected their life.

But I really empower the patient to try and start to make associations between the level of the tinnitus, whether it's good or bad. And based on the things that they're doing day to day.

Dr. John Marinelli:

Another treatment I've heard a bit about in this context is cognitive behavioral therapy. Could you tell us a little bit about how that is employed in this context?

Dr. Gregory Basura:

Well, cognitive behavioral therapy that really was born out of the psychotherapy literature. And the idea was that the goal of that is to try to recognize some kind of maladaptive cognition or result of something that's happening and how that's tagged to some kind of effective behavior. So the idea since this is used since like the 1980s with cognitive behavioral therapy, and it's been shown that actually can control some tinnitus. And the idea is that you're trying to re-educate the mind to apply it to dampen, if you will, some of the anxiety and associated depression, even insomnias, that may be related to the negative perception, in this particular case, tinnitus.

And so most CBT or cognitive behavioral therapy studies, they consist of about usually eight to 24 weekly sessions. These can last an hour to two hours at a time. So it's very labor intensive. Typically you're working with some kind of a therapist face-to-face, or it could be even a group type session. And these types of treatments can involve concurrent psycho-education, cognitive restructuring, different kinds of mindfulness, stress relief. And so as we know that tinnitus can exacerbate these things, cognitive behavioral therapy is not basically geared to remove the tinnitus, but it's geared to sort of tamp down some of the associative negativities that are surrounding it that may be affecting the whole body.

Dr. John Marinelli:

And previously you mentioned somatic tinnitus, are there specific treatment modalities for that?

Dr. Gregory Basura:

Well, this is an emerging field and it's very exciting because the basic science has really driven a lot of the current clinical trials that are going on. And just in brief somatic tinnitus is the idea, and many

researchers have found that in response to say, for example, an animal model of tinnitus, which is usually a noise-induced animal model, that the brainstem, and as I mentioned at the outset, many of the central auditory circuits become hyperactive. Well, interestingly at the brainstem it's been shown that some of the trigeminal inputs into the central circuits, including the spinal trigeminal nucleus, these will actually increase their inputs in to the brainstem dorsal cochlear nucleus.

So it's been shown then the somatosensory inputs into the central auditory circuits right at the level of the brainstem are heightened in response to noise trauma and in animals that show behavioral evidence of tinnitus. So, interesting data further suggests that when you stimulate with some kind of a delay between auditory and somatosensory, whether it be vibrotactile or what have you, that you can change neural firing rates across the central auditory circuit. So this idea of spike timing dependent plasticity, or at the macro level, stimulus timing dependent plasticity, shows that central neural activity can be harnessed and controlled simply by changing the flow of information, sensory information, into the circuit.

In humans, Levine has shown nicely that they're up to maybe 60%, maybe two thirds of people can actually modulate their tinnitus to a degree. And what does that mean? Well, if they open and close their jaw, they protrude the tongue, if they rub their face, they move the head-neck to the side, by stimulating some of these vibrotactile and some of these somatosensory inputs, they're actually modulating the central auditory circuit.

And so some recent work, Susan Shore and others, have demonstrated nicely that by pairing auditory and somatosensory inputs into these circuits that you can mitigate, oftentimes the tinnitus sufferers perception. So ongoing trials, using device development that simply harnesses pairing tones with vibrotactile stimulation to the face, as well as other groups in the UK that are doing tongue stimulation, are showing very promising data, that it's not just an auditory circuit, that there are other non auditory sensory modalities that have a capacity to potentially modulate tinnitus perception. So it's very exciting going forward. And we'll see if those touted somatic treatments will actually treat tinnitus in sufferers who can't mitigate or exacerbate their tinnitus with head-neck moments.

Dr. John Marinelli:

When we talk a little bit about, another thing you mentioned before was masking therapy. Can you describe that as a potential option as well?

Dr. Gregory Basura:

Yeah. So I think this is kind of the workhorse of tinnitus treatments. There's currently no FDA approved drug for it. And so it's really important that when you talk to a patient, you are very frank with them about expectations, about what is currently available, what is not currently available, because Google.com is a good thing for a lot of things, but unfortunately for tinnitus treatments, it can be dangerous because there's a lot of anecdotal things that people have tried and that aren't necessarily tried and true. They haven't gone through the appropriate studies.

But one of the things that we've shown that has high success rates is the use of masking noise. And so the idea is that you're overlaying sound, usually broadband noise, over someone's tinnitus. So it's the idea of white noise at night, and hearing aids, as we mentioned, most people that have tinnitus, they have hearing loss. And so there's a real opportunity there to rehabilitate the frequencies that they're missing, assuming they're in human speech frequency and they have excellent word discrimination to rehabilitate hearing, but then some hearing aids and simply by amplifying those frequencies, but also have built in maskers, meaning the idea is that you're trying to find, pitch match someone's tinnitus at a certain frequency, which you can do that using pure tones, and then try to target that by giving sound to

that, to mask that area. Or turn up volumes next to it. So some of this masking, they call it notch therapy, where you're actually turning up sound next to the tinnitus frequencies to basically drown that out in a way.

So most audiologists and most centers have a capacity to fit somebody and try to possibly place masking components as well, or to try to pitch match the tinnitus, which is helpful, but in a lot of folks this again, it's not a curative, obviously. And so it behooves us to continue to look for those folks that have tinnitus, but they don't appreciate any masking benefits from that.

And certainly the other problem is that when you take the hearing aid off or the masking device off, for those folks who have excellent hearing, and they just want to wear a masking device, the tinnitus recurs. So it's really not a permanent fix, but for many it can create periods of relief, which for them would be, that itself is beneficial.

Dr. John Marinelli:

Another treatment modality I wanted to ask you about was cochlear implantation. I think sometimes it gets overlooked, obviously because there's a smaller subset of the population that can get a cochlear implant, but could you just touch on tinnitus outcomes surrounding cochlear implantation?

Dr. Gregory Basura:

Yeah. So this is an ongoing field too, and it's a challenging one because most up until more recently, to get a cochlear implant you had to be bilaterally deafened. And so a lot of folks, interestingly, that are cochlear implant candidates by the traditional measures, a lot of them if you ask them, a lot of them don't have tinnitus, which is another big enigma about this problem is that most tinnitus is caused by hearing loss, but not everyone who has hearing loss has tinnitus. So it's an interesting finding, but in those that do have disabling tinnitus along with it, this does kind of help us to choose which ear, especially if they say, "Well, it's my left ear more than my right." For example. And there's data that suggests that it actually does help. I mean, there's an ongoing evidence in one of the more recent studies by Pimm Bendeich, they looked at some, they implanted about 44 people, and they used the DHI after the fact. And they found that while a bulk of people had some tinnitus after their study, about a third of those patients had some relief from that.

The problem with this is that you still have the other ear. And so they still could have disruptive tinnitus in the non-implanted ear. We know that circuits were crossing. We know that that could be incomplete, for example. And what's fascinating is that as we're starting to implant more and more single-sided deafness folks, we're not seeing a lot of tinnitus in single-sided deafness folks. So the implant itself is really more for rehabilitation than tinnitus, but in those folks that do have single-sided deafness and they do have disabling tinnitus, it does help us to get them approved, because a lot of these people can have very disabling tinnitus, and they actually can have a big improvement with the cochlear implant.

So the data is still emerging on this, but the bottom line is in some of the people that have published work and showing what the outcomes are with tinnitus and cochlear implantation, they found that a shorter duration of the tinnitus prior to the implantation lent to a better outcome. More non-fluctuating types of tinnitus, which would suggest that maybe this is just a static onset of hearing loss, but in associated tinnitus versus some kind of fluctuating, maybe auto-immune condition or something else, they had better results as well.

Those that had a higher tinnitus handicap prior to implantation also did as well, for whatever reason. And there may be some basic science behind that that we could talk about, and then they found, interestingly that those who had a round window surgical approach, maybe less cochlear trauma

or some hearing preservation with a here with a shorter electrode or soft surgery and younger patients typically had a better outcomes.

So the data's not clear, those are not hard and fast. But those are some characteristics to suggest who might benefit from cochlear implantation with regard to their tinnitus alone. But this, as we go forward, we'll continue to better understand the role cochlear implants have with ameliorating tinnitus.

Dr. John Marinelli:

And kind of transitioning to the last portion I wanted to cover with you in the podcast. If you've determined that there's no underlying other etiology behind the patient's tinnitus, like a vestibular schwannoma or something like that, what does your followup typically look like for these patients?

Dr. Gregory Basura:

Well, one of the interesting findings is that you can get an audiogram on someone and they have normal hearing, and maybe they've had an MRI if it was a unilateral loss, or unilateral perception, for example. What's happening with these folks, is that number one, is that we haven't discussed the idea of hidden hearing loss. Hidden hearing loss is also a new concept. The idea is that you're having synaptopathies or cochlear insults, that that are not quite disclosed on a generalized booth audiometric testing. So it's really important to think about that patients could have hidden hearing loss, and you'll have to follow that because the idea of ribbon synapses that are being pruned back, maybe with noise exposures, but yet because there's such an overabundance of those synapses, they haven't reached that magical threshold where you're seeing a detectable loss on booth testing. But, nonetheless, they've had a synaptopathy which tells you that there could be some underlying cause for the tinnitus.

So for those folks, I continue to follow. I will see patients back usually annually to check in. A big reason I like to see them back, if I haven't disclosed some other treatable cause, medications, head or neck traumas, dental issues, is simply because I want to see how they're doing. I think it's really important to ask how this has bothered them and to provide them some kind of resources. The placebo effect of the body is very powerful, and the mind is very powerful. And the idea that by simply telling someone that they don't have a tumor will ease them and actually will drop some of their perception down just knowing that. So a lot of patients will, once you've told them they don't have some ominous finding on an MRI scan or some other finding, it almost relieves them to a point where they say, "Well, yeah, I can hear but it's this isn't too, it doesn't bother me."

And another area that I find fascinating is the kind of the personality predispositions to how people respond to tinnitus. I have many patients that when I ask them about their tinnitus, they say, "Oh yeah, I've had that for years. That doesn't bother me at all." And then the other people that they may be more Type A driven people or versus the Type B's, this is all anecdotal, by the way, they key on it. They can't escape it. And those are the ones that I really worry about that have anxiety and they can develop depression.

So even if you haven't found something bonafide, I think it's really important to continue to follow up with these folks, to see how they're doing. Plus number one, not just to see if they're developing anxiety or depression or mental illness, but number two is to see some of the things you've recommended, are they helping? Lifestyle changes, tinnitus masking, any cognitive behavioral therapies, any tinnitus retraining therapies, which is more kind of a subconscious idea of kind of retraining central circuits. Are those helping? And so it's really important to get that feedback because I think for us to contribute to the field going forward, we need to collect more data to understand what is helping these folks.



Dr. John Marinelli:

Awesome. Well, before I move into the summary, is there anything else that maybe we didn't mention that you'd like to add before we close up?

Dr. Gregory Basura:

I think tinnitus, as we all know, is a challenging clinical problem. And I think tinnitus patients really need to be, you need to spend time with them, that you really have to develop a rapport with patients, and you really need to be thorough, because there's so many things that could be causing someone's tinnitus that can go overlooked. And I think if providers are too dismissive too quickly to say, "Oh, there's nothing we can do about it. Just go mask it and go away." I don't think that we're doing patients a service at all.

I think there's a lot of subtlety to the disease that does not fall under the categories of generalities. I think like a lot of things in medicine now it's becoming individualized. And I think tinnitus is a very similar individualized problem. And so I think it really behooves us to dig into their history and all the variables we've talked about today. And to explore options and to provide them with resources. At my home institution, we have a tinnitus clinic where our audiologists will go through them and educate. I think that simple education itself does so much good, and it points patients to at least empower themselves to pursue things. And then again is the power of data collection and multi-institutional studies that will help us down the line to better get a handle on this disease, it cannot be overstated.

Dr. John Marinelli:

Well, awesome. Thank you so much, Dr. Basura for joining us today.

Dr. Gregory Basura:

Oh, I appreciate it. Thank you very much.

Dr. John Marinelli:

All right. Well, in summary of today's discussion, tinnitus is a very common problem, up to maybe 15% of the general population experiences bothersome tinnitus within the last year. And the symptoms patients can describe is oftentimes very vast in terms of the qualitative nature of them. Everything from ringing, buzzing, ocean waves, music, hearing them like Dr. Basura said, like air coming out of a tire. It's important when you're seeing these patients to get a very detailed otologic, as well as just systemic medical history. In terms of otologic history, get an idea is there a sidedness to their tinnitus? Is there any subjective hearing loss, ear fullness, vertigo, and then get an idea of their medical comorbidities, any cardiovascular disease, auto immune disease, and then being mindful of their medication list, as obviously numerous medications have been associated with tinnitus.

In terms of workup, physical exam, obviously a complete head and neck physical exam with otomicroscopy is important, but workup typically also involves formal audiometric testing, helps you to identify asymmetric sensor neuro hearing loss, which may require further imaging to rule out retro cochlear pathology. There's other imaging modalities that depends on patient presentation, but that's kind of the chief thing to be mindful of. Lab testing is typically not routinely performed in most centers.

And then when we think about treatment for most patients, the treatment will surround lifestyle modifications, CBT and or masking therapy. Depends a little bit for patients with somatic tinnitus as Dr. Basura mentioned, there's multiple areas of ongoing research, but even things related to

for instance TMJ pain or bruxism, there may be a dental implant that they could use or being evaluated by an oral surgeon to look at potentially TMJ surgery. Those are all things that are important to consider. And then one last piece that is often overlooked as is the utility of cochlear implantation in patients meeting an audiometric criteria for cochlear implantation, that actually a significant proportion of the population does experience benefit, or at least reduction in their tinnitus symptomatology, although this is an active area of ongoing research.

All right, last portion of the podcast here, I'll just ask a couple of questions. I'll pause for a couple seconds to allow you to think about the answer and then I'll give the answer. So, first question of the day, when seeing a patient in clinic with tinnitus, what is the primary initial differentiator that is important to elucidate during history taking?

So when seeing a patient who's complaining of tinnitus, the primary differentiator you need to be mindful of is the tinnitus pulsatile or non-pulsatile? You can ask about can it be modulated with head and neck movements, jaw movements, or manipulation, and then it's always good to get an idea, is this bothersome? Meaning does it have a negative effect on their quality of life? Get an idea of their chronicity? Is it greater than the six months for example. Laterality as well as associated symptoms, like hearing loss, as well as symptoms that are things that they've found that might exacerbate or improve their tinnitus.

Next question. When is it appropriate to get imaging in the workup of tinnitus?

So in patients with unilateral tinnitus, pulsatile tinnitus, neurologic abnormalities, such as other cranial neuropathies or asymmetrical hearing loss, it's all appropriate according to the most recent clinical practice guideline released from the Academy. Of note, though, if a patient is presenting with unilateral tinnitus, typically the workup will initially proceed with audiometric testing before going straight to imaging.

And last question, which therapy or therapies are approved by the FDA for the treatment of tinnitus?

Trick question. No therapies are approved by the FDA for the treatment of tinnitus. The treatment modalities chiefly surround lifestyle modifications, CBT, masking therapies, such as the use of a white noise, or even a hearing aid cochlear implantation for those who qualify from a hearing loss standpoint. And then identifying patients with somatic variants, such as TMJ, bruxism, or dental issues that may benefit from dental devices or TMJ surgery.

Alrighty, well that will wrap things up for today. Thanks so much for joining us and we'll catch you next time.