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Dr Kendal Williams (Host): Welcome everyone to the Penn Primary Care Podcast. I'm your host, Dr. Kendal Williams. One of the more common challenges we have in primary care are issues involving the nasopharynx and the larynx. Of course, we see a lot of colds, we see a lot of sinus disease, we see a lot of allergic rhinitis, and then folks come in to see us with things that maybe aren't so common.

And so, because we're really inundated with issues in this portion of our anatomy, it seemed wise to bring on some experts to talk about it. So, on here with me today are Dr. Kevin Leahy of the Division of Otorhinolaryngology. Dr. Leahy is an Associate Professor of Clinical Otorhinolaryngology, and he is a specialist in Laryngology specifically. Kevin, thanks for coming.

Dr Kevin Leahy: Thanks for having me.

Host: Dr. Jennifer Douglas is an Assistant Professor of Otorhinolaryngology. She is the Associate Director of the Rhinology and Skull Base Surgery Fellowship. Thank you, Jennifer, for coming.

Dr Jennifer Douglas: Happy to be here. Thanks, Kendal.

Host: So, you know, I decided that we'd take sort of an outside-in approach, that we would start with the upper tract going from the nose on down. So, Dr. Jennifer Douglas is probably going to be talking the most early on here and then, Dr. Leahy, towards the end as we get down to the larynx. But I wanted to just talk about this anatomy. You know, we start with that.

So, we're talking about, obviously, you breathe in air through your nose and you capture smells that are then passed through your nose and, of course, down into the larynx where we make sounds. It's really a marvelous system. And I don't have the advantage of doing NPLs, right? So, our ability to see things up there is really limited. We can see a little bit in the nose with what we have on hand, but we don't see what you see when you do an NPL. So, Jennifer, when you do an NPL, what are you looking at? And by NPL, I mean nasopharyngeal laryngoscopy.

Dr Jennifer Douglas: So, the nose and kind of the paranasal sinuses are really a fascinating structure, and I'll let Dr. Leahy talk a little bit about the larynx as well. But starting from the outside of the nose, we want to look at kind of the

external structures and make sure there's no concerns from a skin standpoint. But then, once we really are focusing within the nose, as you said, we look just inside the nose, we see the nasal septum dividing the nose into two sides. And then, probably the most prominent structures we see on first looking in the nose are what are called inferior turbinates. And so, those are structures that, in the primary care office, you would be able to see with either an otoscope in the nose, or with a nasal speculum. And those will be pink fleshy structures that will kind of be oriented towards the bottom of the nose and towards the outside of the nose up front. So, that's important to know. Those are normal structures. You'll see those in everybody.

And then, as you get a little bit more inside of the nose, like I said, you'll see more deep structures of the nose and the paranasal sinuses. There are two additional sets of turbinates: middle turbinates and superior turbinates. Those of course wouldn't be able to be seen without an endoscope. But you'll see those as you pass towards the back of the nose. And then as you extend even more posteriorly, you'll approach the nasopharynx. But, importantly, surrounding what I've just described, which is the nasal cavity, are the paranasal sinuses. And those are paired structures, one on each side, four different sets that are mirrored side to side: the maxillary, ethmoid, frontal, and sphenoid sinuses. And those are the air-filled cavities that surround the nasal cavity. And so, you'll see those on endoscopy, or I should say, you can see the drainage pathways for those sinuses when you're doing your endoscopy, assuming a patient hasn't had prior surgery. Then, you'll see the nasopharynx in the back of the nose, and you can actually see the eustachian tube orifices, which is where the middle ear drains into the back of the nose, and that gets us to the back of the nasal cavity towards the larynx and voice box.

Host: So, Kevin, the larynx is a fascinating structure, right? I mean, this is a muscle effectively? That controls the flow of air and allows us to do extremely subtle things with our voice. Can you talk about that?

Dr Kevin Leahy: Sure. The larynx and the surrounding structures are a fibrocartilaginous muscular area that controls airflow, as you said. Three things I tell all my patients, it's important for breathing, for swallowing, and for voice. So, the proximity to the upper esophageal sphincter requires during deglutition to have the epiglottis come over, have the vocal folds close, so that protects your airway. When you're breathing in, the cords have to open. When you cough or you phonate, they close. So, there's a lot of muscles involved, a lot of nerves involved, so the sensation of the larynx is very important. And we can talk later when I take over my part about how aberrations in that nerve setup can

lead to dysfunction in the larynx. But there's two vocal cords, or we call them vocal folds, because they're an infolding of the muscles and skin of the airway.

One of the unique properties of the vocal folds is that they're a three-layered structure. So, that layered structure gives it the ability to vibrate, and that vibration is what comes out as sound. Voice, as we hear it, is kind of that sound. It resonates in the back of the throat, the lips, and the tongue actually form the words. So, one of the things that come up when patients come in to see me is, you know, they're like, "I'm hoarse," but they could have dysarthria, which is a completely different set of problems than someone who has dysphonia, which is more a dysfunction of the larynx.

Host: I'm reminded of the swallowing aspect of this. You know, one underappreciated fact is that, you know, dysphagia that leads to aspiration is one of the most common reasons of people die in the world, especially as you get weaker, and it's a phenomenon that we see all the time. So, let's go back and start at the front of the nose here and start to talk about some of the pathologies we see. Jennifer, I wanted to start with something that's been interesting as of late, having to do with COVID, and that is the loss of smell. Other than COVID, I'm not sure I ever even thought about this, but what's going on in the nose that causes smell, number one, and what are some of the pathologies that can cause people to lose sense of smell?

Dr Jennifer Douglas: Yeah, absolutely. It's an incredibly timely topic of discussion. I think smell, as someone who does smell research, has always been interesting to me, but I think from a general population standpoint, people really are just now realizing how important it is in terms of quality of life. Our sense of smell is really a multi-step process. So, smell actually is a chemical compound. Smell starts in the form of a chemical compound in the air, which then has to make its way through from the external environment, into our nose, and all the way up to what's called the olfactory groove. And at the olfactory groove, there are these very small, very sensitive nerves that actually penetrate the bone of what's called the skull base, or just the roof of the sinuses at the junction of the brain. And those little tiny nerves feed back to a larger nerve, the olfactory nerve, cranial nerve number I. And then, of course, they go to the brain where sensation in the olfactory cortex is perceived. So, you can imagine anything along the entire course of that pathway can really cause changes in smell.

Of course, in the setting of COVID, which was a particularly smell-pathogenic virus, we still don't fully understand it, but we think it's due to a lot of derangement in the neuroepithelium itself at that junction that I described up the

skull base to the nerve. But again, we don't fully understand, but there's a lot of different reasons that people can lose their sense of. You can imagine someone could have an anatomic blockage of their nose, distal to those smell nerves, and that can limit the chemical transmission through the nose. And that can be in the form of sinus inflammation, nasal polyps, other reasons for severe nasal obstruction, deviated septum, although much more uncommon, but anything that blocks that conduction can block the sense of smell.

As I said, those smell nerves are also very small and very sensitive, so anything that disrupts that neuroepithelium can cause smell loss, and that can come in the form of head trauma. So, we see that a lot in car accident victims and posttraumatic-type patients. And there's also different neurodegenerative conditions that can cause it. Anything that can cause a particular degeneration in the brain, so that could be a specific lesion in something like MS. You also tend to see it as an early sign in Parkinson's disease. And then, of course, there are specific tumors that can involve that area, the smell nerve, something quite unusual, like what's called olfactory neuroblastoma. So, a lot of different things can cause it.

I think it's also important to note that while we think of COVID as perhaps the most common It's kind of the biggest viral cause of smell loss. All of the common cold viruses can also cause smell loss and really can have significant implications on quality of life.

Host: Is the COVID smell loss permanent?

Dr Jennifer Douglas: It depends. Some patients will have persistent smell loss. We typically define persistent smell loss as smell loss greater than about a year. But we're still learning. It's been an evolution, of course, with the growing numbers of vaccination and that has made a huge difference in terms of the severity of disease. Even if patients do get infected with COVID, they don't tend to manifest as much smell loss if they are vaccinated. But most of the time, I will say it will recover, but there is a small subset of patients who do have persistent smell loss.

Host: My father's passed away now, but he was a veterinarian and he went to Penn Vet School actually. And when he was in the Penn Vet School, doing a lab experiment, he got exposed to a high dose of ammonia. And for that reason, all of his life, he had impaired smell. And he would always put so much like vinegar on the food, you know, and all of these things to try to get some taste out of his food. It was a real issue for him.

Dr Jennifer Douglas: Yeah, absolutely. I think the other thing just to your point is that a lot of what we think of as taste is actually retronasal olfaction. So, smell going to the back of the throat up to the nose and then being perceived as smell. And so, there are huge implications. Patients with smell loss have increased rates of depression, overall significantly reduced quality of life, so a really important lifestyle factor.

Host: So when I went into internal medicine, I thought I would be doing Cardiology and managing lung disorders and so forth. I would say to 40% of my practice has to do with the next thing I'm going to talk to you about, and that is the nasopharyngeal tract with the sinus congestion and everything else. And of course, all of that is colds and URIs and allergic rhinitis and everything. But I think it's helpful to kind of understand this on a little bit more basic level. So as those structures in the nose and in the nasopharynx get inflamed from a viral infection or allergies, as I understand it, there's mucus production. The mucus production is, I assume, also in the sinuses as well, that then need to drain out. And those openings get blocked, and so you get more sinus congestion, and that's where a lot of the discomfort comes from. But you can correct me on that. Am I thinking about that right in terms of what causes these folks that have these rhinosinusitis symptoms that are so uncomfortable? And we've all had them, of course.

Dr Jennifer Douglas: You're absolutely right. So, it's multifactorial and it's almost a multibody problem. So just as you said, the nose and the sinuses are lined by what's called mucosa. And the mucosa has multiple different jobs, but chief among them is the production of mucus. So even in a normal nose, healthy, functional, no other issues, your nose makes about a quart and a half of mucus per day. And that's at baseline, then you can imagine if you get an infection or some sort of inflammation, and that can either be a viral infection, a bacterial infection, it could be pollution in the air, it could be exposures to allergens that an individual's mucosa is particularly sensitive to. And the nose only has a few ways of responding to things, and it will make more mucus, and that mucosa, that skin lining of the nose will swell. And so, that mucous overproduction is what people can perceive as a runny nose either anteriorly with anterior rhinorrhea or as postnasal drip, which sometimes can then cause cough. And then, the swelling component of things, just as you said, it can mean that that extra mucous production can get stuck within the sinuses, which are normally air-filled. And if it sits in that warm environment and is moist, then that fluid can get infected. And that's how sometimes what would be a routine viral sinus infection can become more of a bacterial sinus infection requiring antibiotics.

Host: It seems so much of the pathology here has to do with the fact of getting fluid in a balloon-like space through a small port, that is not easily allowing fluid to come through because of the swelling of the tissues around the opening.

Dr Jennifer Douglas: And to that goal, the mucosal lining of the nose actually has what are called these little cilia on the surface. And these are hair-like projections that extend over the entire surface of the mucosa. And they actually beat in an incredibly coordinated fashion, depending on their location, to propel mucus out of their respective sinus. And what's interesting about the sinuses is that some of them drain with gravity. But some of them, and in particular the maxillary sinus, the drainage pathway is actually at the top of the sinus. And so, the nose and the sinus is really reliant on the healthy functioning of those cilia to get mucus out of the nose and any other pollutants, particles, pathogens, that sort of thing. And so, anything that can impact that ciliary function can really cause significant problems.

Host: So, in terms of the tools in our toolbox to improve the drainage out of the sinuses, which is, I think, a large part of what makes people feel better when they have viral rhinosinusitis or even bacterial or allergic. So, we have decongestants, which are effectively causing vasoconstriction around those areas, reducing swelling. I presume that then is opening up the port and allowing things to drain. We have antihistamines, we have nasal steroids, and then, of course, we just can use irrigation itself, as a tool to kind of loosen up tissues and get things out. How do you think about those tools and how do you use them in your practice to deal with the uncomfortable patient?

Dr Jennifer Douglas: So, it depends a lot on the etiology of the obstruction and the congestion. So, some patients will come in complaining of nasal congestion and runny nose, and they really fit in the class of patients who have something called allergic rhinitis. And essentially, what that means is that their nasal mucosa is sensitive to something in the environment. And that could be a seasonal allergen such as tree, grass, weed, pollen, that sort of thing. Or it could be something that's present year round, such as dog or cat dander, et cetera. And so if that's the etiology, a lot of the inflammation is down low in the nose. And then, these nasal sprays will work really well to treat that.

Oftentimes that can be initially done with a nasal topical steroid, such as Nasacort or Flonase. And those are good because they treat the inflammation down low in the nose on the inferior turbinates. And so when you reduce the amount of inflammation there, the patient gets increased airflow and that generally can help to solve some of their congestion and obstruction. Sometimes patients will need additional therapy on top of that depending on their

symptoms. If they have a little bit more itchy nose, runny nose, they can benefit from topical or oral antihistamines. But then, if it's more of a diffuse inflammation throughout the sinuses, we typically think that irrigations are better at managing that. And the first step is typically using something like a saline irrigation, which you mentioned. We like that because you get, number one, both the mechanical cleanse, enhancing the function of the cilia to clear things out of the nose. And then, you can imagine the irrigation also is distributed more diffusely throughout the nose and the sinuses than something like a nasal spray would, because there's a higher volume and kind of a more vigorous irrigation to the area.

Host: I have not used steroid rinses in my practice. But recently, I've seen others use them. Can you comment on those budesonide rinses and so forth?

Dr Jennifer Douglas: Absolutely. We use a lot of topical corticosteroid in irrigation in our practices. We find the ability for that medicine to be dispersed throughout the sinonasal cavity and the desired anti-inflammatory effect is significantly improved over nasal sprays, more typical traditional ones, such as a Flonase or a Nasonex. As we all know, there's a lot of side effects of oral steroids, which work really, really effectively to treat sinonasal inflammation. But of course, there's a lot of side effects of those, so everyone always asks kind of about the side effect profile. There have been actually quite a number of studies done that have investigated this. And overall, the systemic absorption and systemic side effects of steroid irrigations is quite low, but not zero.

But the benefit is that there are some newer steroids that can be used in the irrigations. We typically will use mometasone, which studies have shown have a slightly reduced absorption even compared to the budesonide, which is already quite low. And in our practice of many, many patients within our division, we really don't see that being of significant clinical relevance day to day.

Host: So, drugs like Flonase, as I understand what you're saying, get more anterior. But if you really want to get deep and help improve sinus drainage, and a lot of those openings, I think, are more posterior, you need the steroid rinses, so those will be helpful to you.

Dr Jennifer Douglas: Absolutely. There have been some really great studies where they tagged both the spray installation and the irrigation installation, and it's quite profound how different the distribution is depending on the mechanism of application. So, really, if you want to treat the sinuses, you want to think about irrigations. If you want to treat some of the lower, more anterior

structures in the context of allergic rhinitis, then it makes sense to think about this phrase.

Host: So, all of that we can potentially do in primary care. And the challenging patients for us are the patients who come back consistently. There's a couple of different common profiles. One of them is a patient who asks for an antibiotic because every time they get a cold, they say it leads to a sinus infection, which does at least sort of clue us into the fact that they may have an issue, possibly a structural issue with their sinus drainage. And then, you have folks who are just always uncomfortable on some level with chronic sinusitis, either it's just so frequently recurrent, or they're just always having trouble. And those are the folks that we send to you. When you do that NPL, what do you see that clues you into what might be going on?

Dr Jennifer Douglas: So, there's a number of different things. I think we really put emphasis on both the history, you know, which you just nicely described, and the physical exam. So from a history standpoint, we're looking to classify patients into two general groups, just as you did. Are they someone who's more of an acute sinusitis-type picture, or a chronic sinusitis-type picture?

And you can have occurrences within those groups, but the big difference being that the acute patients will have symptoms for the short term, typically on the less than one month timeframe. But their symptoms will fully resolve between episodes, so it's possible that they could have more than one episode, but they may have an episode where they feel very symptomatic, symptoms completely resolve. And then sometime, down the line, next season, et cetera, they have complete recurrence of symptoms, but they do have full resolution between episodes.

Patients we classify as chronic sinusitis really have symptoms ongoing for greater than three months' duration. And they may have exacerbations above their baseline symptomatology, but their symptoms really never go away completely. And those are two fundamentally different groups of patients. So from a history standpoint, that difference is really important. Acute sinusitis patients, we typically think more as infectious type pictures. There are patients who will typically do well and respond to oral steroids and antibiotics in the short term. But then of course, if it becomes quite recurrent, you have to think about is there another reason that they're having recurrent infections? And that's when it makes sense to refer to an ENT. And sometimes it's important to think about, is there some immunologic derangement that's making them at greater risk of recurrent infections in that regard?

And then, from a chronic sinusitis standpoint, as I said, their symptoms are always present in some form. And those are patients who we think of as less of an infectious issue. They may still have infections, but more so they have fundamentally some derangement in how their immune system is working from an inflammatory standpoint that they have a lot of ongoing chronic inflammation. And so, we have to think about ways to modulate that outside of or in addition to the typical antibiotics and steroids.

Host: If you have recurrent sinus infections, do you get scarring such that you mentioned the mucociliary clearance mechanism can be impaired so that folks are just set up because of what has become a physiologic problem or just an anatomical problem due to scarring.

Dr Jennifer Douglas: Absolutely. So if you have enough infections, your mucosa can become so edematous that it may fully scar off as it's trying to heal itself after the infection. It may in fact scar off the normal drainage pathway for that sinus. So, you'll see sometimes patients who've had a lot of recurrent infections, their body has actually formed what we call an accessory os, or a supplemental drainage pathway somewhere where they have such a severe infection that sort of an additional drainage hole opened up to drain that sinus. We see that typically, most often with the maxillary sinus. So, that's absolutely possible and, you know, increases the risk that that patient may have recurring issues and ultimately may require surgery.

Host: Symptoms of sinusitis are usually fairly straightforward. I think the most sensitive or maybe it's specific features of history are teeth that are hurting, suggesting maxillary involvement; potentially frontal sinusitis, patients feel it in that area above the eyes. I've been fooled in the past by ethmoid and sphenoid sinusitis, because sometimes it doesn't have as much symptoms. I actually had a patient who kind of had just nonspecific fevers and chills for a few weeks until we did a sinus CT and really determined he just had ethmoid sinusitis, and it wasn't really manifesting that much symptoms in the nose, because it's kind of a deeper structure. I don't know. I'm just curious if you see differences in the clinical presentation, or there's any pearls to be taken from that.

Dr Jennifer Douglas: You're right. It can be challenging to diagnose. We typically think of four cardinal symptoms being nasal congestion or obstruction, nasal drainage, headaches, and that could also manifest as more of a facial pain and pressure-type picture, and then changes to sense of smell. But you're right, it can really vary between the individual. It can vary depending on their anatomy. And as you said, it can vary depending on the sinus involved. So, sometimes we'll see patients who have a lot of disease on their imaging or have

a lot of inflammation when we look in their nose, but because their sinus have been opened up before either from surgery or recurrent infections where I kind of described that they may have formed alternate drainage pathways, they may not feel as symptomatic anymore. So it, can be hard to predict, and it's something certainly important to keep on the differential when you hear any of those different symptoms.

Host: How do you use CT nowadays, CT of the sinuses? I assume you're not doing plain films anymore. You're probably just going right to CAT scan of the sinuses. I think about the mucosal edema that you can see, and then there's some other findings that may be suggestive, but how do you use them in your practice?

Dr Jennifer Douglas: It's really helpful in our practice. You know, symptomatically, as we've said, there are a lot of different symptoms that we think of with sinusitis, but those also overlap with a lot of other conditions. So, to really be diagnosed with sinusitis, you need to have a sort of a typical symptomatology, but then you either need to have inflammation that can be diagnosed on endoscopy or on a CT imaging scan. And so, we find CT to be very helpful.

As I described earlier, your sinuses are normally filled with air, so that should, if you're looking at a CT, be nice and black. And sometimes you can see a thin white or gray line lining the sinus, and that's just the mucosal lining. But when you look at the CT scan of a patient with significant sinusitis, you get a lot of gray in that area that should be black. And that's all mucosal inflammation. It can be inspissated secretions. It can be purulent secretions. Sometimes you can get a little bit of inspissated fungus, such as a mycetoma with a fungal ball. And so, those are all things that will help corroborate the history that you have obtained in the clinic and provide that confirmation that there is in fact inflammation in the sinuses.

Host: So, the ubiquitous question, I can't leave this subject without asking about antibiotics, you know, because there's so much about the overuse of antibiotics. And I had the issue today. I mean, we're constantly in dialogue with patients about the role of antibiotics and treating these conditions. And my rule is you give it 10 days before you even think about it. I remember years ago, I was reading probably a review article that said that one-quarter of all colds, of all URIs last more than a month. And so, for folks to have symptoms out that long, it's not necessarily all that unusual. So, I try not to pull the trigger on antibiotics. I think whether it's a myth or true in the community, there's an idea that Z-Paks in particular have benefit even beyond their antibacterial properties. But

technically speaking, if you're treating sinusitis, Z-Pak is not one of the top-line agents. I mean, you're looking at Augmentin or the cephalosporins or doxycycline, and so forth. Well, I just threw that all out there on the table. Can you put it together in something that makes sense?

Dr Jennifer Douglas: It's challenging. I think there is always this push. Understandably, patients want to feel better. We want to make them feel better. And so, there is this push towards antibiotics. In general, we recommend avoiding antibiotics until that 10 to 14-day mark. It's challenging because there's a lot of different complicating factors. Patients could have pulmonary symptoms as well, laryngeal symptoms as well. But again, really if it's within that 10 to 14-day period, we advise avoiding antibiotics. But if symptoms persist beyond that, we do agree that antibiotics make sense.

And typically, the first line, as you said, for a sinus infection specifically is something like an amoxicillin or an Augmentin. I think historically it had been amoxicillin. But again, to the point that patients have been getting a lot of antibiotics over the years, really Augmentin in our practice is typically the first line. So, we'll start there for someone who doesn't have an allergy. Other good therapies can be something like Bactrim, but we really do encourage our patients early on to do the irrigations. And I think from a primary care standpoint, the things that you can offer patients before that 10 to 14-day mark are things like nasal irrigations, a short course of something like Afrin to decongest the nose. Again, you don't want to use that more than three days in a row, but patients can use that symptomatically if, for example, they're getting on a flight and are really worried about being uncomfortable. So, that's something that you can offer them in the interim, understanding that if it does reach that, 10 to 14-day mark, we would agree that it would be reasonable to consider antibiotics.

Host: So, we see that so often and, you know, I wanted to spend a little bit of time on that whole structure and some of the pathologies we see there. I want to make sure we have enough time to go further down into the larynx and get Dr. Leahy involved. So, Kevin, I'm going to bring you in now. I mean, as we sort of travel down into the larynx, there's a lot of pathologies there that we also see in primary care, having to do with some of the after-effects of URIs or even the acute effects of URIs with laryngitis and so forth. But we're also managing patients with GERD, chronic cough, where we're trying to sort things out, and other issues. So, there's a lot to talk about here. What are some of the more common pathologies that you see in your practice?

Dr Kevin Leahy: Well, it can range anywhere from cough, hoarseness, throat clearing, throat pain, throat soreness, postnasal drip. That's one of my favorites because everyone's like, "I got this mucus, it's dripping down all the time," and maybe they have allergies, maybe they don't. But trying to take a step back and think about the upper aerodigestive tract, as Jennifer mentioned, kind of has this epithelium that covers the entire thing from trachea up to the front of the nose. So, anything that affects that is going to cause some issues somewhere, so kind of the unified airway theory.

So, I think when people come in and they've had a cold, they have this lingering cough, and they got the mucus. So, that's probably one of the biggest things that people come in with. They're like, "Doc, I got the mucus," and it's my job to figure out where it's coming from. Is it coming from the nose, dripping down the back? Is it coming up from the larynx or from the trachea? Or is everything clear? And in fact, there's no mucus and it's something else. So, that's kind of what I do pretty routinely, using my scopes and other tools.

Host: Let's talk about postnasal drip, because I have to tell you, I'm a little suspicious of postnasal drip. I've had I've had some mild to moderate allergies, allergic rhinitis, most of my adult life, and I have refused to take anything for it. I tried Flonase for a few days, I said, "I don't want to do that." So, I just kind of deal with it. So, I have a lot of postnasal drip, but I've never coughed as a result of postnasal drip. And I know though, as I'm thinking about chronic cough, I'm supposed to think about postnasal drip as causing cough. But what's really going on there? I mean, first of all, is it really a cause of cough? Which I'm sure it is, just not in me. And how does it cause cough?

Dr Kevin Leahy: So, when you're thinking about postnasal drip, is the patient allergic? Do they have allergies? Have they ever been tested? Seasonal allergies or environmental, pet, food? So, that's one thing. Have they had many infections like upper respiratory infections, chronic sinusitis, have they had any sort of imaging to support some of those findings, you know, sinus CT, chest x-ray, that sort of stuff?

So basically, if you think about what is in postnasal drip, so the body's fighting off something, it's got leukotrienes, it's got all the cytokines, it's got histamine. So, all that does stuff to tissue, in addition to the stuff that the body's trying to fight off. So when the pathogen or the process has resolved and you're still creating some of that inflammation and drip, it's going to irritate and it's that irritation as it kind of hits the larynx, which is a very sensitive structure, that's what leads to that irritation. So, people coming in with a cough, one of the first things we ask them is, is it a dry cough or a wet cough? So if it's wet, you may

think that it's more related to some acid reflux perhaps, bronchitis, actual thick mucus sitting on the cords, So, you have to think about how they're swallowing. Or is it like this dry, irritating thing that actually may be more as a throat clearing a cough, and then you're thinking in line with irritants, inhalational or otherwise.

Host: So, well, postnasal drip, I assume that would cause a wetter cough, right?

Dr Kevin Leahy: It can. If it's like during an acute infection or just that post-infectious phase where you're still making a lot of mucus out of the front of the nose, it will drip down the back. So yeah, people will have kind of that gurgly wet cough that they bring up. Later, if someone who has allergies or maybe asthma or something, kind of reactive airway, that can be a more dry, irritating cough.

Host: My first step when I'm evaluating chronic cough, you know, of course, I'm going through the process with making sure they're not on an ACE inhibitor. Asking questions to sort of figure out a direction, keeping in mind what I learned in my training, the three most common causes are asthma, postnasal drip, and GERD. And in some ways, two of the three can be best identified by you as ENT physicians. So, I usually send patients to the ENT before thinking about pulmonary. And I have this idea that when you do an NPL, that you sometimes can kind of get a good sense of what might be going on. I mean, are there findings on NPL that lead you in a particular direction and how sensitive or specific are those?

Dr Kevin Leahy: The NPL is an amazing tool. So, we're placing this small camera down the nose into the back of the throat. So, as Jen mentioned, if the sinuses are draining, we can see that. I tend to have mine connected to a video. So, I record it, I'll play it back to the patients. They're like, "I don't have any sinus complaints," but you can show them streaming yellow pus coming out of their maxillary sinus. And it's like, "Oh, actually, I do." You treat them with antibiotics, maybe steroids, and they get better, and job done. You get past the nose, you're kind of looking at the structures of the larynx, so you look for redness, you look for swelling, you look for the presence or absence of mucus. He can actually look through the cords a little bit and see the subglottis and the upper trachea. Many times, I'll have someone come in and they won't have much going on, but you put the camera down and you'll see mucus below the cords. And you're like, "Well, this may be pulmonary or bronchitis or something like that." So, it can be helpful.

I think kind of the nebulous thing, and I know you sent it out in the outline, it's GERD. We call it LPR, laryngeal pharyngeal reflux. And I say nebulous, because there's no great way to test for that. If you look at the GI literature, they have a lot of numbers that they can generate as far as how often someone refluxes, there's a cutoff for that; how many times or what percentage of those reflux events are correlated with the symptom, so they give you a number for that. With ENT and LPR, there are a few tests we can do. They're somewhat invasive, more invasive than our NPL, but you're kind of using your eyes, you're using your camera. And you're hoping that the things you're finding, erythema, edema, mucus, you know, pseudocelcus, some of the other things we use will tell you that there is or isn't reflux. And I can't say it works all the time, so we kind of use that in conjunction. Well, I do, we use it in conjunction with the presence or absence of reflux symptoms. Heartburn, sour brash, burping, those classic things. And the two together gives me a stronger sensation for, "Yeah, what you have is reflux or probably you have reflux. Let's investigate that."

Host: So if you have a patient, as you do the NPL, they don't have a lot of mucus, so you don't think it's the postnasal drip, but they do have a lot of inflammation, as you described, around the larynx and the pharynx and that's obviously coming from somewhere and maybe they have some other symptomatology, that would lead you to reflux. Somehow, I always thought that there was some specific finding on NPL that would seal the deal on reflux being the cause, but I guess it's not. It's just a combination of factors, right?

Dr Kevin Leahy: Yeah. There's something called the reflux finding score, and you can count up things on your exam. And if you reach a certain threshold, then someone theoretically has reflux based on that. Those numbers coupled with previous studies showing dual pH probe acid exposure in patients. So, it's technically validated. But I still think the challenge that we run into is someone either is coming from a GI doctor or maybe going to a GI doctor, or they've had an endoscopy and they tell them, "Oh, your esophagus is clear. You don't have reflux." It's like then for us to tell them, "But your throat looks like you have reflux." So then, you're kind of like battling the two specialties and the GI can quote their numbers for this, and we don't have anything to back it up except these cool pictures. So, that's a challenge.

But I tell all my patients that when it comes to reflux to the throat, it's not going to always cause heartburn, it's not going to always cause esophagitis, because these are quick, short bursts of acid that somehow make their way up to the larynx. The larynx is a much more sensitive structure than the esophagus. So if you get a little bit of acid on your throat, it's going to cause more symptoms

than if you get a little bit of acid in your lower esophagus. So, regardless of what the GI doctors tells them, I say, "Let's not completely rule it out. Let's see if there is some evidence of reflux." So, we may do a barium swallow, right? So, you may find that they have a hiatal hernia and they are having reflux events on that. You may send them for a pH probe, impedance pH testing, or they've had a Bravo. The nice thing about impedance pH testing is they can tell how high up it goes. And visually, you can see that on barium studies sometimes. So, someone comes in and they're like, "I've never had heartburn in my life." And you show them the barium where it refluxes up to their cricopharyngeus, that's not normal. And a little bit of that is okay, but day after day after day, so then we talked about strategies.

Host: Barium swallows are very underrated tests.

Dr Kevin Leahy: Yeah. I love it. Patients need it, but...

Host: I had one myself years ago, and I was impressed by the amount of information they could get off that test. It's simple and easy to do, or easy to order at least. I wanted to ask about laryngeal polyps or vocal cord polyps. You know, this comes up oftentimes in folks that are singers. But I'm sure that happens in other folks. What's happening there?

Dr Kevin Leahy: So, just kind of distinguish their nodules and polyps. So anatomically, they're a little bit different. If you were to take a nodule out of someone and a polyp out of someone, send it to the pathologist, they might tell you it looks exactly the same. So, this is chronic and acute inflammation, some myxoid stroma, some extracellular matrix deposition. But in someone who is a heavy voice user, it doesn't have to be a singer, doctors, lawyers, teachers, they all can get nodules on their cords. And if you think about how voice is produced, you've got this specialized epithelium that vibrates anywhere from 50 to 800 hertz, maybe sometimes higher, right? So, that's cycles per second. So, that vibration creates friction. And in someone who maybe isn't using proper technique or has exacerbating factors like reflux, asthma, allergies, postnasal drip, that friction leads to inflammation. Inflammation, the body tries to heal it. It brings in the extracellular matrix components. And it's like a callus. It then forms this bump on the vocal cord that effectively diminishes vibration and leads to voice changes.

Host: If you remove them, is that curative? I know there's potential downsides of that.

Dr Kevin Leahy: Nodules by themselves, they're not pathologic, in the sense that they turn into anything dangerous. They just cause hoarseness. And surgery is definitely an option, but it can lead to scarring, which can permanently change the voice. So, it's really trying to modify the behavior if there's abnormal voice use. Try to modify the environment that the larynx is in. So if someone is drinking a gallon of iced tea a day, you got to have them stop drinking the iced tea, because it desiccates the larynx, it creates reflux, it doesn't hydrate, it dehydrates. So, modification, behavior modification, lifestyle modification, improving hydration, these are all things that are kind of like step one. Someone comes in, they want to get their voice changed immediately, it is a process. It takes years for those nodules to form, they're not going to go away instantaneously. And surgery is not going to fix it if they're not going to change those behaviors or the environment.

So, that's kind of where I start with all patients that come in. And some people don't want to hear it and they just don't do it. Other people are quite receptive. So, we have great speech pathologists that will work with patients on how to breathe properly, how to not talk to the end of their breath, how to use to correct muscles when they're speaking so that they're not constantly having that glottal attack or glottal fry, and then working on simple things like drinking 32 to 64 ounces of plain water a day, that some people come in and they're like, "Oh yeah, I drink a lot." And you ask them what they drink, it's like, "I drink two cups of coffee. I have two Diet Cokes. I have a glass of wine with dinner." That's definitely not hydration. That's going to add to the problem. So, simple, but hard things. Trying to avoid eating late at night, trying not to do heavy strenuous things after you eat to promote reflux up to the throat.

Host: I don't want to leave without talking about tracheal stenosis, and partly because you and I have shared a couple of patients that I can recall in the last year or two. I think both were post-intubation, and that seems to be fairly common. But these folks are really quite limited. And one of them got surgery, the other seemed to improve with other measures, but I couldn't walk across the room. So, you're seeing a fair amount of that, Kevin. I think that may be something you have a little bit of an expertise at Penn in that area. So, what can we offer those people?

Dr Kevin Leahy: Well, it's a challenge, because it's a small group of patients across the broad spectrum who have very severe symptoms. So, research dollars aren't funneled towards laryngotracheal stenosis. Obviously, there's a lot of other important things out there, but this does have a big impact on people's lives. It depends on the cause. So, there are inflammatory causes. Wegner's is probably the most common one that people know about. But things like

sarcoidosis, amyloidosis, they can create problems with narrowing in the airway. You've got traumatic issues. Prolonged intubation can cause damage to both the glottis, causing posterior glottic stenosis; to the trachea, causing tracheal stenosis; to the subglottis, causing subglottic stenosis. So, many times patients are coming in with a trach, and my job is to try to get the trach out. So, that's a big one, but at least they're breathing safely. So with the trach, most people can kind of get by, and then you can do things in a less stressful environment.

But patients who, say, classic scenario, someone gets intubated after a stroke or after an MI or some event, tube is in for two-ish weeks, a little longer, which definitely increases the risk for stenosis, they go to rehab, they're doing okay, they're in rehab for about two weeks. So now, we're about four to five weeks post-injury, and they start having shortness of breath and starts off with a little bit of struggling, a little bit of wheezing, and then next thing you know they're in the ER and they can't breathe at all. So, that's generally posterior glottic stenosis. So, you get this fibrosis that occurs between the arytenoids and it just kind of slowly pulls them together, which closes off the airway. If they don't get an emergency trach, and they get like, you know, racemic epi and some nebs and some steroids, they can squeak by until they come in and see me. But that posterior glottic stenosis, I think is probably the hardest to treat because you have to make the biggest sacrifices.

The vocal cords do those three things, airway for breathing, they do voice, and they do swallowing. So when the cords are really closed and you have to enhance the airway, you have to open them up. And if someone doesn't have a trach already, that process typically involves doing a little cut in the back of one of the vocal cords called the chordotomy, which helps their breathing immediately. They come out of surgery, they're breathing great, but their voice goes from normal to talking like this. And I can't tell you how many patients have come in and they're like, "I don't care about my voice. I just want to breathe better. You do the surgery." Two to four weeks after, like, "I feel great." And then, six months later, they're like, "When can I get my voice back?" And you're like, "We talked about this and how that's probably not going to happen."

So, I think prevention is the biggest hurdle because most people, when they come in, in extremis or EMS intubates them in the field, it's like, "I'm taking any tube I got and I'm getting it in there and then airway secure. Now, we can fix the real problem." Problem is most patients get too big of a tube. So, someone who is Jennifer size, I know people can't see us, or my size, we're kind of average size to small to slim, someone would probably put in a smaller tube based on that. But if I was my same height, same internal shape, but I weighed a

lot more and I was a bigger person, they would assume that I had a bigger airway, and that's not always the case. So, that misconception about body habitus and the size of your airway is something where education could help. And I think it's out there and it's getting better. And then, the timing of leaving a tube in and when to decide to get a trach to prevent these sort of things, damage starts pretty soon after the tube is in, hours even. But if it's in there a week, you're going to have about 10 to 15% chance of getting posterior glottic stenosis. If it's in two weeks, you're up to probably 70 to 80%. So, that's why from an ENT standpoint, we're always pushing for earlier trach to try to prevent this complication.

Host: And of course, the emergence of non-invasive ventilation I think has probably saved a lot of people from this and being able to just avoid it in the first place, yeah. So, I feel like we've taken a superficial tour from nose to larynx and there's a lot more to be talked about. And we can talk about more. Before we close though, I do want to give you both an opportunity to say something, some last comments, if there's a condition that you wish we treated better or just any closing thoughts.

Dr Jennifer Douglas: I guess I can mention AERD. A relatively new condition we've come to understand that is on the spectrum or kind of a particular type of chronic sinusitis is a condition called aspirin-exacerbated respiratory disease, which is a unique subtype of chronic sinusitis. Patients have really profound polyps. They also have asthma, and then the unique feature is that they're actually allergic or sensitive to aspirin and other non-steroidal anti-inflammatory drugs. So, these are really complicated patients to manage. We have a dedicated center here at Penn. And so, a helpful thing to keep an eye out for is the combination of both asthma and chronic sinusitis in the same patient. It probably makes sense to refer to a quaternary, tertiary rhinology provider for evaluation for that condition.

Host: And you'll see nasal polyps when you look up in there with a speculum, right?

Dr Jennifer Douglas: You can, if they're severe enough. And these patients tend to have quite profound followups. So, sometimes they're even coming out of the nose. It can be quite impressive.

Host: Yeah. When I was younger in my career, a young man came in to see me and just chronically congested and uncomfortable. And, you know, I looked up in there and like, "Oh my Lord!" You know, I had just read about these in

books, but there it is. And I started a nasal steroid and sent him to someone like you, I'm sure. It was a long ago. Kevin, any closing thoughts?

Dr Kevin Leahy: Just a couple. One, for patients who come in with hoarseness, if it's lasting more than three weeks, they should get a scope by someone. It doesn't have to be a laryngologist, but any otolaryngologist can take a look and see if there's some abnormality that needs further workup. And a patient who is not responsive to asthma medication with, you know, wheezing and shortness of breath should get a scope, because they may have idiopathic subglottic stenosis. So, it's a common thing that patients will come in and they'll be like, you know, "I was treated with that for asthma for over a year, and didn't get better until either someone got flow volume loops and saw that there was flattening on inspiratory and expiratory limbs, or they send me to see an ENT." So, don't treat asthma that's not getting better.

Host: I actually want to follow up on that because, a few years back, we kind of became aware of vocal cord dysfunction, which is a more dynamic obstruction, right? And I actually saw a woman that was manning an OBS unit at Presbyterian, and this lady kept coming in and had been there multiple times and the overnight hospitalist who signed out to me said, "You know, I think she's stridorus. I don't think she's asthmatic." And we determined that she actually had vocal cord dysfunction. But you probably see that quite a bit.

Dr Kevin Leahy: Maybe more than I want to, because it is a challenge to treat. So yeah, these are patients, when I was referring to the other component, the idiopathic subglottic stenosis, they're breathing, they sound like Darth Vader, they don't come in extremis. They can't go up a flight of stairs. They just like can't breathe. Vocal cord dysfunction patients are pretty functional most of the time until something triggers their reaction, let's call it. They get around a smell that bothers them, dust. They have reflux come up and hit them in the throat, something that like causes their cords to get close to one another, and you feel like that patient needs a trach instantaneously. Their O2 sats are typically fine. They're breathing very quickly. They do have stridor, that kind of vibration of the cords because they're close. But you listen to their lungs, there's no wheezing, there's no ronchi, it's all kind of upper airway. And if they unfortunately get intubated, which does happen, the problem is gone. They're the easiest ventilation. There are minimal settings on the vent. They can typically get extubated in an hour or less. Some of them respond to steroids for some reason, so they're called asthmatics, and inhalers can make them feel a little better, because they feel like they're doing something. But it's really a disconnect between the abductors of the larynx and of the diaphragm. They're kind of working out of sync. So, cords are closed, diaphragm's firing, trying to

pull in the hair, and it's like they can't breathe. So, they panic, so there's respiratory retraining for that, which works for some people. There's Botox into the vocal cords to prevent them from closing. And then, of course, in ultra severe cases where you can't treat them with those other ways, you do a trach or something so that at least they have a safety valve so they're not constantly in the emergency room with that sensation.

Host: I think anxiety plays a role in the causation, but it's also extremely anxiety-producing to have this experience. And so, there's this dynamic, relationship there.

Dr Kevin Leahy: Bit of a conundrum. Yeah.

Host: Thank you both for coming on and talking about these conditions. These are things that we see quite commonly. And, you know, sometimes it's good just to hear an expert go over how you manage, especially when it comes to the rhinosinusitis, Jennifer, that you talked about, and some of the more common chronic cough stuff that you see, Kevin. It reassures me that I'm not missing anything to some degree, but also gives me some pearls on how to think about it. And I've definitely derived that from our discussion. So, thank you again.

Dr Jennifer Douglas: Thank you for having me.

Dr Kevin Leahy: Yeah, this was really great and always nice to help out our colleagues.

Host: So, thanks to the audience again for joining the Penn Primary Care Podcast. Please come back again next time.

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