

Dr. John Marinelli:

Hey, everybody. It's John Marinelli from ENT in a Nutshell. Just want to make sure you're aware of our website, headmirror.com, where each podcast is keyword searchable, and the content along with our Surgical Video Atlas is systematically organized by subspecialty. All right, time for the episode.

Dr. Linda Yin:

Hello there, and welcome to another episode of ENT in a Nutshell. I'll be your host, my name is Linda Yin. And today I have the pleasure of being joined by Dr. Jonathan Fillmore, who is an oral and maxillofacial surgeon. Dr. Fillmore thanks for coming on the show.

Dr. Jonathan Fillmore:

It is a treat to be with you Linda.

Dr. Linda Yin:

Perfect. Today we're going to be talking about temporomandibular joint disorders, otherwise known as TMJ disorders. This is a class of diseases that's really made up of several degenerative disorders that have significant functional consequences for the patient, but we'll start in our usual fashion with the presentation. Dr. Fillmore, how does a patient usually present to your clinic with the TMJ disorder?

Dr. Jonathan Fillmore:

Great question. Most of the people that come into our clinic have already been triaged by a primary care provider, or even more often a dentist, but their main complaint usually is pain and it can be immediate preauricular pain, or it can be pain in the muscles of mastication. Often that's accompanied by some other symptoms like noise in the joint or limited range of motion.

Dr. Linda Yin:

And how about the epidemiology of this disease? I understand that it's quite common, but what does your typical patient look like in terms of their demographic?

Dr. Jonathan Fillmore:

That's a great question as well. This is something that actually is evolving and changing. And by that I mean there haven't been really great studies about this although TMJs have been in people since the dawn of time. Nobody's really done a tremendous amount of prospective cohort studies. There's one that has been going on since 2005 called the OPPERA Study. It means orofacial pain prospective evaluation and risk assessment study.

The studies have shown up to 25% of people can experience some symptoms, but the incidents is all over the board. And so what we're seeing in this cohort study is that things are changing a lot in terms of what we understand. So it can be a tremendous amount of the population, but only a small, five to 10% of people, who have symptoms and seek treatment.

Dr. Linda Yin:

I've often heard that this is a disease that impacts young females. Is this true or is it not necessarily true?

Dr. Jonathan Fillmore:

It is true and it's more often seen clinically in females. It used to be thought that this is 8:1 or 9:1 or more. Again, this OPPERA Study has shown us more and more that males are getting it a lot as well, but the treatment seeking behavior is different and the persistence of disease is different, but yes, the classic temporomandibular disorder presentation is somebody in their late 20s, early 30s to mid 40s or early 50s. Beyond the 50s, we're not talking as much about the click and limited range of motion and we start getting more into degenerative joint disease. And then we still see plenty of teenagers and individuals in their early 20s with painful internal derangements and other symptoms.

Dr. Linda Yin:

Got you. And how about risk factors? Are there any known risk factors for developing this disease?

Dr. Jonathan Fillmore:

There certainly are. So the greatest risk factor to having temporomandibular joint pain or any facial pain really is going to be the presence of any number of comorbid diseases. The most prominent are going to be other pain conditions. So does someone have a headache disorder like migraines? Does someone have irritable bowel syndrome? Does someone have fibromyalgia, chronic pelvic pain, or interstitial cystitis? Those kinds of things. When we see that, individuals are set up for this temporomandibular joint pain as well, but we see our share of patients with a traumatic arthritis, osteoarthritis. We know that depression and anxiety and other psychiatric comorbidities can certainly amplify some of these symptoms similar to other areas where people experience chronic pain.

For every standard deviation from normal with a sleep disorder, you increase your risk very significantly of having a temporomandibular disorder. And then certainly we see a number of autoimmune disorders like rheumatoid arthritis, lupus, psoriatic arthritis, things like that.

Dr. Linda Yin:

All right. When you're evaluating a patient in clinic with a potential TMJ disorder, what aspects of the physical exam are you focusing on?

Dr. Jonathan Fillmore:

We'll talk a little bit more about this later. There's a diagnostic criteria for TMD that specifies an exam that we try to follow generally, but the most simple aspects are, we're looking for range of motion of the mandible, so how wide can you open? And I usually will look for pain-free range of motion, painful range of motion, and then I will stretch the patient to see how far I can go. You have to be careful about that. You know, hopefully you've established some rapport with your patient before you get to that point, because that can be quite distressing, but also side to side excursive movements and protrusion of the mandible are important.

I usually check what their occlusion looks like, are they normal occlusion? They have a malocclusion like an anterior open bite, that can show you maybe there's condylar resorption or something going on. Is there class II, class III? Now the contribution of the occlusion and the dentition to temporomandibular joint issues, and we can talk about this later as well, is controversial, but it's important to look.

Just a good exam of the oral cavity is important, dental pain can masquerade as temporomandibular joint pain. It's good to check for salivary flow if you have parotitis, that can be preauricular pain, that could masquerade as temporomandibular joint pain. So there's a number of things like that, that we look for. Oral cavity cancer and other things also can present as head and neck pain that it's important to check for. And then certainly we look at the muscles of mastication. The

biggest players there are going to be your temporalis muscle and your masseter muscle. And those are the most commonly effected.

A lot of people advocate for examining the temporalis insertion at the coronoid process, which is really easily felt. Most people are pretty sore there. So it's not too high yield in my opinion. And then feeling the lateral pterygoid muscle, which I think is hard to do reliably. And I don't think it gives you much good information personally, but I think the masseter and the temporalis are where it's at from that standpoint.

And then of course we feel the joint just on palpation for clicks and crepitus and things like that. And some people will auscultate the joint, I don't do that. Your mileage may vary.

Dr. Linda Yin:

All right. I think this is a good segue into my next question, we've kind of touched upon this. The TMJ lies kind of in this area that's in very close proximity to some other structures on the face and the ear. When you see a patient that comes with these signs and symptoms, what are some other things that you're keeping in mind on your differential diagnosis?

Dr. Jonathan Fillmore:

I think if someone's coming in with facial pain, the most important thing is to have them point out where that is. I usually just have them point with the tip of one finger, where is your pain, or where is the area of pain that it seems like things are coming from or the area that's most distressing. You may get somebody that has very non-focal pain, you may have somebody who has a very precise area that they can show you. That's super helpful and that will help you narrow things down.

So if they point to the preauricular area, they may point to the muscles, so you want to rule out myofascial pain and things like that. But like I said, an oral cavity exam will help you from a dental infection or dental caries that can certainly, especially in the mandible, be perceived as preauricular pain, or you can have referral to the preauricular area.

Very common to have people come in talking about jaw pain that have myofascial pain that also presents as a headache disorder. And so taking a good history about headaches and then referring for a headache treatment and evaluation can be very important. We do get people with a sharp shooting pain that makes you think of neuralgia, or if you hear burning pain you're thinking about some kind of neuropathic pain or neuralgia or centralized pain disorders. If people have widespread facial pain that is not as focal, that can be a red flag that it's not just confined to the temporomandibular joint.

Again, parotid gland issues can arise, whether it's sialolithiasis or sialadenitis. Certainly I see that pretty regularly. And then the temporomandibular joint and the ear are right next to each other and we get plenty of patients who have ear-related problems that are perceived as temporomandibular joint problems and vice versa. So we're constantly referring back and forth to try and figure things out. And as you probably know, sometimes we still can't figure it out, but lots of people with overlapping symptoms. And tinnitus and eustachian tube dysfunction and things like that, it's very common.

Dr. Linda Yin:

I want to talk a little bit about disease pathophysiology and what exactly causes TMJ disorders, which I understand is somewhat controversial and not exactly understood. Before we get into that even, I think it's important for us to define the anatomy of the TMJ?

Dr. Jonathan Fillmore:

Yeah. It's an unusual joint. It's this sliding hinge joint, right? So you have the temporal bone, forms the glenoid fossa, and then you have your mandibular condyle. Those are the articulating surfaces, but you have this inner positional disc. Some will refer to it as a meniscus, although it's different than a meniscus, say in your knee, where that's a ring around the outside, where this entirely covers, or in normal conditions will cover the condylar head. And it's basically this biconcave disc that helps these two convex surfaces negotiate that movement.

It's a, like I said, a sliding hinge, so that the word of the day is going to be ginglymoarthrodial joint. You heard it here first maybe, but ginglymus just means hinge and arthrodial just means sliding type of joint. And then there are limits to how far it can move that are based on joint anatomy and the tightness of the ligaments and the retrodiscal tissue. So behind the disc you have this agglomeration of synovial tissue and then lots of blood vessels and nerves called the retrodiscal tissue that normally we don't function on that tissue. And then you have fibrocartilage on the load-bearing surfaces of the joint specifically on top of the condylar head and then on the articular eminence.

So the condyle will slide down that articular eminence as it's pulled forward. And the majority of that sliding motion is made possible by the superior head of the lateral pterygoid muscle. So it pulls the condylar head and the disc with it, and it pulls it anteriorly and medially. And so when a disc becomes displaced, it's usually in the anterior, medial direction.

Now you have your regular muscles of mastication like the masseter and the temporalis that contribute to the motion by closing. And then you also have your suprahyoid muscles like the digastric and others that are going to be kind of peripheral or kind of help our muscles that contribute more to that rotational portion, which is usually about the first 20 to 25 millimeters of opening. So you have a little bit of a rotation, maybe 20, 25 millimeters, and then a slide, which is going to be the rest of your opening, which normally is going to be about 40 millimeters, 40 to 50 millimeters of opening.

Dr. Linda Yin:

All right. We'll go into some details about some derangements and functional consequences that can come from distortions of this anatomy, but for us, for ENTs maybe we're not seeing those subtle things as much. How about some larger human traumatic distortions that can happen with this anatomy that certainly every ENT should know about?

Dr. Jonathan Fillmore:

Well, you worry about a joint dislocation. A lot of times people will say, "My joint's dislocated," or they see that on an MRI. Usually it's going to be the dislocated disc, but you might see a joint dislocation where the condyle is actually out of the fossa. In that case, usually you'll see a gross malocclusion. If it's bilateral people will be wide open or pushed straight forward, pretty dramatically. If it's unilateral usually their jaw will be pushed over to one side or the other, and that would require some reduction. Otherwise crazier things that happen are a traumatic dislocation of the condylar head into the middle cranial fossa or something like that, although that's fairly rare.

Dr. Linda Yin:

You can't talk about anatomy really without talking about the development and embryology. How does the TMJ form and what are some common congenital abnormalities that we can see with this joint?

Dr. Jonathan Fillmore:

It's formed from the first and second branchial arches. And we talk often about the condylar head being a growth center, although it's not necessarily the growth center for the mandible, because the mandible

grows down and forward. What happens is as the mandible grows down and forward, the condylar head is forming bone basically to make up the gap and fills in that area, and grows superiorly and posteriorly with appositional bone.

There are some abnormalities that we see congenitally. The most common would be hemifacial microsomia, which is the second most common cranial facial problem after cleft lip and palate. So that's actually fairly common, although certainly there's variable expressivity and some joints are going to be only mildly affected and may not show anything, where some are going to be quite severe and have essentially no joint. And then Treacher Collins or other similar syndromes, we certainly can see the joint affected.

Dr. Linda Yin:

The joint is in such close proximity with the ear canal, which I understand also comes from the same branchial arches. Are there any deformities that might involve both of these structures that would be particularly relevant to our world of otology as well as to you?

Dr. Jonathan Fillmore:

Yeah, sure. Every once in a while we see a patient who's got this patent foramen tympanicum, it's got several different names, but yeah, every once in a while we'll see that where that doesn't close and there's some communication between the one space and the other. And we'll see basically synovial otorrhea, which is surprising and unpleasant to many people. We can treat that pretty simply, but we definitely see that.

Dr. Linda Yin:

Yeah. I bet that can be even confused for CSF leak and such too. Let's talk about function now of the joint. Under healthy conditions, what is the function of the TMJ?

Dr. Jonathan Fillmore:

Sure. It's a joint that's used more than any other joint because we're constantly communicating and eating, swallowing, chewing. Anytime you're opening, you're moving your face, you're breathing. It's certainly will receive the most load on the joint when you are eating, or if you're clenching down your teeth you're going to apply a greater load, but really anything you're doing with your mouth and jaw is going to cause some changes or function within the temporomandibular joint.

Dr. Linda Yin:

You do use it for everything. What about when things go wrong? How are these functions compromised in the case of TMJ disease?

Dr. Jonathan Fillmore:

Essentially, if you have pain in your joint that can present as spontaneous pain or it can present as pain with function. Usually our patients are having problems with openings, so they can't open wide, so they can't eat some of the things that maybe they would want to. A lot of patients complain about not being able to bite into a big sandwich or hamburger because they can't open, but the biggest issues really have to do with chewing.

Patients will be forced into kind of a soft diet because it's painful to bite down on things. When that joint is inflamed or if things are out of place and you're functioning on tissue that's not a disc, that

can be quite painful. I have a lot of patients who I use a survey called the Jaw Functional Limitation Scale that is helpful, but it basically helps people to identify the things that they can and can't do.

The majority of things have to do with whether or not they are able to open and whether or not they're able to eat things. Most people talk okay, but I do see many patients that will say, "At work I start out okay, but then I talk a lot at work, and then towards the end of the day it really becomes painful in my joint and I need to give it a rest." That's also pretty common.

Dr. Linda Yin:

All right. Let's move on to the tough question now. How does TMJ disease develop? What is the etiology?

Dr. Jonathan Fillmore:

That's a great question. I think that the main concept that is important to understand is pathology of the temporomandibular joint. And I don't mean pathology like synovial chondromatosis or osteochondroma. I mean, the classic, what we see all the time is about balance and adaptation. As we talk about these things, you will see that these things are some of the things that we say, "Oh, this could contribute to this," but not everybody has temporomandibular joint problem who has X, Y or Z factor. So why is it that these people develop it and some don't?

And we don't have a lot of great answers to those, although you may remember from your med school buzzwords like biopsychosocial and multifactorial, which often feels like a little bit of an excuse, but is really a tremendously important concept with regard to temporomandibular disorders. So yes, there are anatomic issues, yes, there are a host of other issues that play into development of temporomandibular disorders. And so I want to establish that as a baseline for this discussion.

A lot of patients, and I would say most of the patients that we see in our clinic, are going to be patients with some anatomic change. And usually that will present as some kind of displacement of the articular disc. And usually it's going to be displaced forward, and it can be a painful click where you can open and click back onto the disc and then you close and it clicks off. And so you might find that on your exam as they open and close it clicks and clicks again, and they have a relatively normal range of motion, but that click may be painful.

You may eventually have somebody who loses that click or never had a click, but all of a sudden can't open very wide and still doesn't have a click. And that's because the disc is pushed forward and they're stuck behind it. So they only have that rotational movement of that first 20, 25 millimeters and then they don't have the sliding movement because they can't push past that disc, and so they're stuck. And we call that closed lock. Those are very, very common.

And then you can have Frank arthritic changes where there's a perforation in the disc. You might see that with some crepitus or things like that, but essentially those are the main things that we look for from an anatomic standpoint. Many patients will still present with temporomandibular joint pain or preauricular pain, I should say, that we don't see any disc change or things like that. So it doesn't mean that you have to have some kind of disc perforation or displacement to have temporomandibular joint problem, but that's the most common.

There are osteoarthritic changes that we see that similar to other load-bearing joints like your hips and knees and elbows, you could have had some trauma to your joint, usually pretty easy to find because we don't always have great answers of, why did this happen to my joint? A lot of people really fish and look for, "I do remember that when I was 12, I fell down the stairs." And so many people are

like, "That must have been it." That comes up a lot. You know, people really searching for an idea of why this can happen.

But we also see a lot of patients who have inflammatory arthropathy. So it could be rheumatoid arthritis, lupus, psoriatic arthritis. We see patients with connective tissue diseases like Ehlers–Danlos or mixed connective tissue disease. And then we have this so-called idiopathic condylar resorption, which is this, I wouldn't say it's controversial, the etiology is controversial, but the fact that it happens is not, but we see usually in young women in their teens and 20s this seemingly spontaneous resorption of the mandibular condyle. Usually that will present as progressive retrognathia and anterior open bite malocclusion with or without pain in the joints. We generally refer to that as idiopathic condylar resorption.

Dr. Linda Yin:

Yeah. It's definitely a tough question to answer. I think that, like we talked about at the beginning, we should be thinking of these disorders really as a class of disorders. And when we go into talking about the diagnostic criteria later, it'll be a little bit easier for us to kind of think about this and classify this. A couple more questions here about etiology. Bruxism teeth grinding, does that cause TMJ disorders? Patients ask me that all the time.

Dr. Jonathan Fillmore:

I can give you a solid maybe on that. And again, you got to think about this balance and adaptation. If you have some preauricular pain and your disc is displaced and you've got maybe some anxiety, maybe you are a bruxer, all those things may play into that, but there are plenty of anxious bruxers out there who have an articular disc displacement who do not have pain and who function normally. So again, it's this balance and adaptation. So yes, bruxism is going to increase the force or the load that's put on the joint. This para-functional habit introduces a load on the joint that's not normal, and that pressure is so high, way higher than the little capillary perfusion pressure within your joint.

If you're doing this for a period of time, you're introducing a greater hypoxic state within the joint than it normally has. And then you quit doing it and then you have this, again, free radical related reperfusion injury. A lot of people feel like that is kind of the mechanism, but not everybody who grinds their teeth is going to have a temporomandibular joint problem. And why is that? Well, presumably a lot of these people who do it and don't have a problem are able to adapt, or maybe they have a little bit of discomfort but it's not bothersome to them enough, maybe they don't catastrophize their pain as much, and they don't seek treatment for it because they just say, "Okay. Well, my knee hurts sometimes too."

Dr. Linda Yin:

I think that's a pretty good explanation, a good way to think about it. And that kind of brings me to my next question. There's all these staging systems that we can have for this disease in terms of how much pain people have and their imaging and their exam. And we don't need to get too much into the details of that, but if patients don't seek any treatment or if they don't go through with any treatment for this disease, what is the natural course? Does it just get worse and worse or does it sometimes get better on its own?

Dr. Jonathan Fillmore:

Yeah. Great. I'd have to go back to the OPPERA Study again and point it toward that. If you just even Google search O-P-P-E-R-A Study TMJ, you'll get there. It's free and you can read all about it. As far as we see the natural history seems to be that between a third and half of people who do not receive

certainly any surgical, but even no treatment, seem to do better spontaneously over a few years. And usually the time course is much shorter.

Usually it's this kind of small episode where they'll have some pain or limited range of motion. And like I said, maybe your disc is displaced and you're functioning on the synovium behind the disc. That's really painful. And then over time, you softened your diet and you took some NSAIDs, and over a couple of weeks, that tissue kind of thickened up or firmed up, it's no longer painful. Your tissues stretched out and maybe your disc displacement didn't improve, but it adapted and you're able to move on with your life. So it usually is going to be episodic from that standpoint.

And there are also, we have pretty good long-term studies, most of those out of Western Europe, but pretty good long-term studies about natural history, where we see that most people do pretty well with time. There's the Wilkes Classification named after Clyde Wilkes, a Minnesota man. It can be helpful. I don't like to use it for diagnosis, for diagnosis I would just say, "This patient has arthralgia," or maybe you want to say, "This patient has anterior disc displacement with reduction with arthralgia."

Dr. Linda Yin:

All right. How about the other end of the spectrum? To me, ankylosis is a term that seems like that would be kind of a more severe form of this disease. Can you help us define it and understand it in the spectrum of TMJ disorders?

Dr. Jonathan Fillmore:

Yeah. Ankylosis is usually going to be when they have, we say either a fibrous or a bony ankylosis. Sometimes you can see a marked difference on a CT scan, but essentially they can't open it all and usually they're just able to open five, 10 millimeters. A lot of times if it's a true ankylosis the only amount that they can open is how much their mandible is flexing as those suprahyoid muscles and that anterior belly of the digastric is trying to pull down the anterior mandible in that rotational movement. So you'll see that in ankylosis, and it's just fused to the skull base.

And that can come from trauma, it can come from inflammatory arthropathy, it can come from infection as a child or... That can be a huge problem, right? You have somebody who can't open, you understand certainly about airway, makes for a scary airway. It makes it so that routine oral cares or even a good oral exam is not very possible. So ankylosis is a big problem. Thankfully not super common, but it can be a big problem. Those patients also usually don't have a ton of pain in their joints, so it's a little bit of a different beast.

Dr. Linda Yin:

All right. Let's talk now about the diagnostic criteria. We've already alluded to them. Are these required for the diagnosis of the disease and how exactly are you using it clinically?

Dr. Jonathan Fillmore:

So, because I'm here at Mayo, I try to use it as much as I can, but I would say most clinicians are not using it either out of lack of awareness or lack of time. It can be a little laborious to go through the diagnostic criteria for TMD. The basic way that you want to think about a workup is get a really, really good history. Again, just because someone points to their preauricular area doesn't mean that, okay, this patient's got a TMJ problem. But a good history, good exam like we talked about, range of motion, clicking, occlusion, oral cavity exam. Try to rule out some other things like parotid gland disease, or other sources of otalgia. So if you have a good exam and a good history, you're ruling it, get a good



family history, all those kinds of things, you're going to be in good shape. I think those are really important.

I do use the diagnostic criteria for TMD or DC/TMD. If you look at the full thing, I want to say it's like a 119 page PDF, so it's not the best for pleasure reading or something, but it's actually really great. If you look through there, they have all kinds of data about the sensitivity and specificity of exam maneuvers. Basically you need to think about what is there in the realm of muscle disorder? What is there in the realm of an intra-articular disorder?

There's this kind of false dichotomy that a lot of people will say or make, and that's, well, is it muscle or is it joint? And it's not an either or, it's how much of one and how much of the other. I would say the majority, vast majority of patients, there is a muscular component and there's an intra-articular component. And I think it does a patient a huge disservice to ignore the complexity of the temporomandibular joint and its associated comorbidities and symptoms, and also to boil it down to muscle or joint and be like, "Ah, you're a muscle person. Sorry, I can't operate on you." It doesn't mean you have to operate on everybody, but I guess my point is you want to address everything that's going on.

So it's important to identify whether or not they have myofascial pain or if they have myalgia from a bruxism habit or something like that. It would be important to say, "Is your pain worse in the morning or the evening? Is there a certain time of day when your pain is getting worse?" So maybe they say, "Well, yeah, every morning when I wake up I feel pain right here," and they point to their masseters. Then you would really suspect that there's potentially a bruxism or clenching issue going on at night while they're unconscious that they can't control.

It's good to rule out those things or identify those, and it's very common for people to have muscular pain in the periarticular area when there is an intra-articular source of pain. That's very well born out in animal and human studies over and over again. So it is common to have muscular pain with joint pain although we can't always say that's the source of your muscular pain, but then obviously we want to identify, is there something going on in the joint with regard to where the disc is? What level of arthritis do you have? Et cetera. That's the way that I think about kind of a basic workup.

Dr. Linda Yin:

No, I think that's very helpful. That's kind of the workup from the exam and the history perspective. How about imaging? You already talked about the fact that it's sort of unreliable and not always correlating with symptoms, but what are the different imaging modalities you have available to you and how do you think about the joint on each of them?

Dr. Jonathan Fillmore:

Yeah. So being a dental specialty, I've got panoramic radiographs all over the place. So super easy to access for us. It's a decent screening tool. It's going to show you if there's some gross abnormalities, definitely can add some false positives where you might think, "Oh, that looks really weird," and then you get a CT scan, it looks totally normal. It's okay for screening, it's going to help you rule out major sources of dental pathology. If they've got something that's like a small carious lesion or something like that, or a tooth that needs a root canal, but it's not super obvious, then you'd have to have them just see a dentist for some kind of more up-close classic dental imaging, but that's going to help you for really gross abnormalities.

I wouldn't recommend ultrasound. There are a bunch of studies about this. I wouldn't do it. It's just not helpful for making clinical decisions in my opinion. So I wouldn't give any more thought to that.

A CT scan, as you know, is going to help you with regard to hard tissues. So for your patients where you're thinking, "Oh, this patient probably has pretty bad arthritis, or I'm worried that there could be arthritic changes," that's going to be your go-to for that. You'll see some flaming of the eminence and the condyle, you'll see some sclerotic changes in the condylar head, and in the eminence you'll see some erosive changes. So those are the things that you're looking for.

Sometimes especially in a lot of dental offices or oral surgeons, they use a cone beam CT scan. Some people really love that. Everything depends on your quality of your scan. So if you can get great scans, great, if you can't, just get a medical-grade CT.

And then an MRI is going to be what you use if you're suspecting some kind of what we call internal derangement, right? That's all about where the disc position is. So do you have a disc displacement? Are you able to recapture that disc when you translate? So when you slide down, are you clicking on and off? What does it look like? The MRI can be helpful because you can have a number of sequences that are going to help you to identify inflammatory arthropathy sometimes. It's also going to help with some pathology like synovial chondromatosis where you're not going to see that as much on a CT unless it's really, really heavily mineralized at that point.

The MRI is going to help you to identify the disc position, disc abnormality, and things like that related where it is. You can also get kind of these cinematic open and closed images that can help you with that. Kind of the best all around sequence is going to be a proton density sequence, but usually people get a proton density and then T1, T2, and then you can add like a post-gad sequence if you're worried about inflammatory arthropathy.

But you got to remember the correlation with pain symptoms and the imaging is not that great. So you might have stone cold normal imaging, and you might have somebody complaining of a lot of pain, and then you might have terrible imaging where it looks like, "Holy cow! How do you even function on this?" And the patient's like, "Oh, I just kind of hear a grappling noise every once in a while, but otherwise I'm fine. My dentist said I should get this checked out." You know? So we're treating patients and not just images.

Dr. Linda Yin:

All right. What about arthroscopy? Is there any role for diagnostic arthroscopy for TMJ disorders?

Dr. Jonathan Fillmore:

Yeah. I don't do that very often, but I would say there is a role and that usually is in somebody who has arthralgia despite normal imaging. And probably the diagnostic maneuver I would do before that is a diagnostic joint injection where I'll just take some bupivacaine and inject up into the joint. Don't try this at home.

Basically, the idea is if you're blocking nociceptive input from the joint, does it resolve your symptoms? And so if I say, "Well, you've got normal imaging findings, your exam's not too bad. I can't be sure what's going on if it seems like it's your joint," often we'll do a diagnostic injection. And so I probably do this once or twice every day I have clinic because it's so helpful. And if they find, oh my goodness, all of a sudden you did the injections, bupivacaine, so it's going to last for a few hours, and I was able to go out and eat X, Y, or Z that I normally can't eat and I feel great, then that gives you some reassurance that, okay, there could be something going on in the joint. If you still have normal imaging findings, you might consider a diagnostic arthroscopy under anesthesia. That can be helpful.

Dr. Linda Yin:

And how about in terms of other traditional workup, things like blood work or labs, is that helpful at all?

Dr. Jonathan Fillmore:

It can be super helpful in patients who don't have really clear cut osteoarthritic changes. So a lot of times if we're worried about some kind of inflammatory arthropathy or other issue, you could order a CRP, ESR, ANA, CCP, rheumatoid factor, often I'll get an HLA-B27. You can even check a vitamin D or some people will check an estradiol because those have been associated with arthropathy as well, but the mainstays are the others.

Dr. Linda Yin:

Now, let's move on to treatment now. I think in reality as ENTs we're not going to be surgically treating most of these disorders, but I think it's important for everyone to have a good understanding of what conservative options you can even talk to patients about or send them to before you're referring them to an oral surgeon. We said that the seeking of treatment has varied between people, and maybe only a certain percentage of people who really have symptoms or even seeking treatment, but what different treatment options are available that you're counseling patients on?

Dr. Jonathan Fillmore:

Yeah. Great question. Like you said, not everybody's going to need surgery and so many people will do well with even conservative things, so the treatment, basically we try to do least invasive to most invasive, and there's some super straightforward easy things. And remember, most of these are managed by a primary care provider or a general dentist, but if they come to your office with a complaint of otalgia and you're suspecting a temporomandibular disorder, and you've kind of screened that out, it's going to be the same kind of easy thing.

So the first is really clear education. You're going to say, "Here's how the joint works, this is why you can't open, or this is why probably why it is painful. However, it's a multifactorial thing. You have maybe these factors that are playing into this that are going to contribute to this." Maybe you'll say, "I can't treat your bruxism, but you could go see a dentist, and maybe they can make you a little occlusal appliance, a little mouthpiece, or sometimes called splint." Or you might say, "I'm not going to be treating your anxiety, although that can be amplifying your symptoms, but we need to coordinate with your primary care provider and they can help you with this."

Really educating them on the factors and the anatomy that you suspect I think is super important because it's very empowering to patients also to know what's going on, and it takes a little bit of the mystery out of it, at least.

Then behavioral modification, super important. So are you clenching during the day? Are you grinding during the day? Those are just habits that people can reverse with some training. Are they saying, "I've got a lot of pain," and then you say, "Are you softening up your diet?" And they say, "Well, yeah, I used to eat beef jerky 10 times a day, now I just eat it five times a day." You just have to say, "That's not going to cut it. Like you got to lay off bagels and beef jerky and pizza crust and carrot sticks."

You cannot cheat. You can't say, "I tried it for a day, and I do a day off and a day on." I say that because I hear that, but like you got to do it for at least a couple of weeks. NSAIDs, super common, but the behavioral modification is important. Think of it like a sprained ankle, right? What would you do if you twisted your ankle and hurt it pretty bad? You'd rest it, NSAIDs, rice, right? You'd ice it, you'd elevate it. So, you have to be careful.

You want people to move even though they're on jaw rest. It's a synovial joint, so the lubrication, remember that weeping lubrication in a synovial joint, is really important for joint health. So you want them to move, but you want them to rest their jaw in terms of the load that's put on it. So you can do some physical therapy and have them stretch their jaw a little bit either just with their fingers or other ways, but those are the most important things.

The splint or the occlusal appliance is... obviously you guys as ENTs would not be providing that, I don't like to do that and I don't do that very often in my practice either, when made properly, they can be beneficial in enough patients that it warrants usually a trial of an occlusal appliance. And usually the dentist should be the one that makes that. A lot of people will go try one that they got at the grocery store or the drug store. I would not recommend that. So unfortunately they're usually going to be overpriced and stuff, but I think it's worth a try for most patients.

Dr. Linda Yin:

Let's talk a little bit about physical therapy and stretching, because I think this is not only relevant to TMJ disorders, but to a lot of our patients who have trismus from other causes like prior radiation or surgery. What sort of exercises do you tell folks to do to stretch their jaw?

Dr. Jonathan Fillmore:

If I see them first off, I just say real gentle stretching exercises just with their fingers. I just say, "Put your thumb under your front teeth, your maxillary incisors, and your index or middle finger on your lower incisors, and just push gently usually about four times a day for 10 to 20 repetitions, and hold it for a few seconds." But honestly, I don't advocate for a ton of physical therapy. Some people will go through formal physical therapy where they can go to a physical therapist and get massage and trigger point releases. Those can be helpful too. Evidence is a little dodgy. I wouldn't withhold other treatment because I'm still waiting on them to undergo a long course of physical therapy.

Dr. Linda Yin:

We talked about rice, NSAIDs, for acute pain. What about kind of long-term management of these patients? Are you referring them to psychiatrist? Is there a role for antidepressants and things that have been shown to be beneficial in other chronic pain syndromes?

Dr. Jonathan Fillmore:

Right. Long-term you have to get back to the thought that this is multifactorial. If you are successful in identifying that multitude of factors, that makes it multifactorial, then you're in a good position to help that person get the help that they need. So there may be a component that is surgical, but there may be a component where they benefit from working with a psychiatrist or just a counselor.

I use a survey called the Pain Catastrophizing Scale, as well as the Grade Chronic Pain Scale when I see patients. And that really gives me a bead on where we are with how disabling this is and the level of kind of coping mechanisms. So some people might be in severe pain and they score very low on the Pain Catastrophizing Scale, and they're like, "Yeah, this hurts like crazy, but I just kind of deal." And then some people that are like, "Yes, this hurts and I cannot go on."

There's definitely a role in helping people from a psychiatric standpoint. If you're not careful, it can be offensive to a patient when you say, "I'd like for you to see a psychiatrist or a counselor or whomever. I'd like you to attend this class in our pain clinic." You have to be tactful, but it's also important to say, "These are factors. I'm not saying this is causing your pain, I'm saying this is a contributor to your pain." It's like if you had a patient who needs vascular surgery or cardiac surgery,

and that patient is a smoker and a diabetic, and you said, "I'm just going to treat your heart or your aorta in isolation." No, of course, you're going to try and get their diabetes tuned up and you're going to help them with their smoking. You know that those things are factors in their outcomes. This is the same thing. It would be foolish to not address all the different factors.

From a medication standpoint, we use NSAIDs pretty commonly. People can use tricyclics. Nortriptyline and amitriptyline are the most common. Some people use a short course of clonazepam. That's probably the best thing for helping, what I mean by best thing is most effective short-term for reducing sleep-related bruxism, but of course you don't want to be on that long-term because it's habit forming.

People use muscle relaxants for kind of bruxism. Sometimes if people have a bruxism habit that's not very well controlled, then you could consider Botox injections in the masseters and temporalis muscles. Those are kind of things that can help, but long-term again the question is, are you going to adapt or not? And so you try and do these things like an occlusal appliance, you try and give them some NSAIDs, you soften the diet. And the hope is that they're going to be able to adapt. And if they can, great, and they're going to get over that hump and they're going to move on. If they can't, then you're probably going to need to escalate care.

Dr. Linda Yin:

All right. Now, let's move into the things that you are the most specialist at, I suppose, more invasive therapies. Let's start with the minimally invasive therapies and that's mostly arthroscopic procedures. Tell us a little bit about that.

Dr. Jonathan Fillmore:

Yeah. There's kind of two categories of minimally invasive, and one is going to be arthroscopy and one is arthrocentesis. Arthrocentesis is usually people will be either sedated or under general anesthesia. It's a procedure where you use two needles that you insert in the joint and you basically flush the joint out and you can decide whether or not you want to inject saline at the end, i.e. nothing, or if you want to inject some steroid at the end or some hyaluronic acid or something like that.

That's pretty effective, especially in an early onset patient or a recent onset, that's probably the best way to say that. If you just started having a problem and your joint is locked or you're having some locking issues, your joint's really inflamed, it's a super common procedure. Most oral surgeons can do that in their office under some sedation, and patients do pretty well by and large.

The other option is arthroscopy, which obviously is not blind, but gives you visualization within the joint so you can make additional diagnosis, whether or not the disc is perforated. Is there a lot of synovitis? Is the disc dislocated? How badly is it dislocated? What's the condition of the cartilage within the joint? That only goes in the superior joint space or the space between the fossa and eminence and the articular disc, so you don't actually see the condyle unless there's a perforation, but it can be helpful.

And in both cases of arthroscopy and arthrocentesis, you flush out the joint usually with at least a couple hundreds CC's of saline, and then again you can decide what to inject. There was a recent study for arthrocentesis that showed there was no benefit to injecting anything. Saline was just fine. But we don't know about arthroscopy. The advantage to arthroscopy is, in addition to the diagnosis, you can also insert other ports and there can be more advanced arthroscopy, whether it's with lysis of adhesions or even taking the disc out, if you need to arthroscopically, or even repositioning the disc. So it was an anteriorly displaced disc, and you can reposition it.

Some of those are a little more controversial, but those things can all be accomplished arthroscopically with some, well, with a lot of practice, I should say, but it works pretty well.

Dr. Linda Yin:

And finally surgery. What are the different sort of flavors of surgery and then what does it involve?

Dr. Jonathan Fillmore:

Yeah, great question. There's kind of two flavors in general. One is going to be an open, they're all open, but one is an open joint surgery, and one is going to be what's called a modified condylotomy. I'll start with the condylotomy. That's a surgery that is done actually through the mouth where you make an incision, like a sagittal split osteotomy, you go up to the ramus and you basically use an oscillating saw to cut from the sigmoid notch, inferiorly down near the angle of the mandible. You want to stay behind the nerve because obviously you don't want to cause an injury to the inferior alveolar nerve. And then you wire the patient shut after you let the condyle just sag, maybe three or four millimeters.

And the idea behind that is it decompresses the joint and creates a space within the joint so that you're not compressing those painful tissues, and it gives them more of a space to heal and adapt. The studies for that are pretty good. Patients don't like to be wired shut however, it turns out.

The other open joint surgeries are going to be anything from a disc removal or discectomy or disc repositioning where people will anchor it or tie the disc back to a total joint replacement, which is a prosthetic joint with both the fossa and the condyle prosthesis.

Those are all surgeries that have their place. You know, I think the total joint replacement surgery is that easiest call in most cases, because you're doing it for real bad arthritis or somebody who's lost their ramus, condyle height, maybe an idiopathic condylar resorption patient, or if there's something traumatic or something where you need to reconstruct height, those are particularly effective. And they have great outcomes in the vast majority of patients.

The disc replacement, or excuse me, repositioning or disc removal, disc removal is probably the most well-studied long-term. We have good 30 year follow-up studies on those. People tend to do pretty well. You run a risk of increased arthritis later on, maybe a little bit of malocclusion, people will have some joint noise, but by and large people do well.

And then the disc repositioning surgery is a little more controversial in terms of long-term outcomes compared with different treatments. We don't really have anything good although we have tons and tons of case series about that.

Dr. Linda Yin:

I've sometimes seen in patients, I'm not sure if this is a disc replacement or considered a partial joint replacement, but sometimes alloplastic things that have been put in there like silastic and such. Can you talk a little bit about alloplastic materials that are used and what's been shown to be successful?

Dr. Jonathan Fillmore:

If you're talking disc replacement, there were a lot of things that used to be used, whether people use long-term silastic sheet or silastic block, or people might use, there used to be these Teflon-proplast implants. In general, I will say alloplastic disc replacement's not a good idea, and there are lots of studies showing why. So don't do that. People do take out a disc, and I'll do air quotes here, "replace it with fat." I don't know how fat replaces a disc because your condyle kind of just will push right through it, but it does fill a dead space and probably helps in terms of minimizing heterotopic ossification and some bone

remodeling later, but people also will use like a temporary silastic sheet for maybe a month or two, and then they'll pull it out.

So there's some options from that standpoint. We don't have any tissue engineering disc replacements or anything quite yet, but there are definitely lots of people working on that. So from a disc replacement, people that do that are either using something temporary, some people will use temporalis myofascial flap, some people will use like a dermis flap, obviously you want to get the skin off there so you don't have an epidermal inclusion cyst or something, but those are things that people do, whether or not there... there's not a great study saying, "Do this, not that," in terms of one of these things is better than the other. There just isn't that study.

When it comes to materials for a total joint prosthesis it's the same materials that we generally use for most orthopedic prostheses like a knee or hip using chrome-cobalt for the condylar head and using ultra-high molecular weight polyethylene for the fossa. It's fixated in a different way like a knee or a hip, but it works just great.

Dr. Linda Yin:

Okay. I think those are all of the main tough questions that I had about TMJ disorders. I think we've covered a pretty vast amount of material certainly basics that any ENT would need to know in terms of referral or some conservative treatments or anatomy and pathophysiology. Anything else that we've left out that you feel is really important?

Dr. Jonathan Fillmore:

I think that about sums it up, but if you ever want to know more or... read the OPPERA Study.

Dr. Linda Yin:

All right. Thanks for being here, Dr. Fillmore.

Dr. Jonathan Fillmore:

You bet. Take care.

Dr. Linda Yin:

Okay. We'll move on to our summary section now. So here are the key points from the talk. TMJ disorders are most common in females usually in the third or fourth decade of life, but as Dr. Fillmore alluded to, recent studies have shown that this may not necessarily be the case, but just in fact that these are the patients who are most likely to present with this set of symptoms.

It can actually affect up to a quarter of the adult population, but again, most of these people are not necessarily seeking care. Patients typically present with joint pain and sometimes just generalized facial pain. Sometimes they have complaints of joint locking or sounds with jaw opening. In the most severe cases there can be limitations in their range of motion as well, which can impact functional status including chewing or other activities that require jaw opening.

It's important to perform a careful physical exam and to keep a really broad differential diagnosis during evaluation, as other disorders can have symptoms that mimic TMJ pain. And this includes, headaches, otalgia, which may come from a number of otologic etiologies, and of course, dental disease.

Under healthy conditions, the TMJ is a really complex joint that is special in its movement, it can perform a hinge and slide movement, which is to say downward and the forward sliding motion to allow the mouth to open and allow for mastication.

While the exact etiology of disease is not known, there are some causes that we believe can contribute. Some of these are inflammatory causes like rheumatoid arthritis and other habits that can put stress and increase load on the joint. These are called parafunctional activities, and bruxism is one of the more common ones. This is teeth clenching or grinding. Of course, that can happen during the nighttime or the daytime.

Workup for TMJ disorders can include a basic panorex and a CT scan, which is really the main modality to look for any bony changes. MRI can also be useful, but the important thing about imaging to keep in mind is that patients can have changes on imaging that do not necessarily correlate with exams and vice versa. A good workup for a patient with a TMJ disorder includes understanding them as a whole and identifying any behavioral psychosocial factors that might be contributing to their pain and the functional deficits they're experiencing that impact their quality of life.

Treatment ranges from conservative therapy to surgery. Conservative therapy can really be provided by any provider. And that just includes patient education, some tips for behavioral modification, any referrals or treatment of conditions, underlying conditions, that might be contributing to their pain like chronic pain conditions or psychiatric conditions.

And finally, for surgery, this can range from minimally invasive procedures like arthrocentesis or arthroscopy to more invasive ones like up to a total joint replacement, which is really reserved for the most severe cases.

Moving on now to the question section. For this exercise, I'll be providing some questions followed by a brief pause so that the listener can have time to think, and then I'll provide the answer. So what does the typical patient that presents with a TMJ disorder look like in demographic?

The typical TMJ patient is young and female. Although again, as we've talked about many times, just because this is the type of patient most likely to present to healthcare, it doesn't necessarily mean that other populations are not impacted, and that there may be some biases here with who is seeking treatment.

Next question. What type of range of motion describes the movement of the TM joint? The temporomandibular joint is a hinging and sliding joint, so it can be responsible for downward motion as well as forward sliding motion of the mandible.

Where does the TM joint derive from embryologically? The TM joint comes from the first and second brachial arches. And therefore when there are congenital anomalies associated with the TMJ, it's important to look for other aspects of those brachial arches as well, including deformities of the ear canal.

What is the best medical therapy for temporomandibular joint pain? NSAIDs are the first line of therapy for any acute pain that stems from the temporomandibular joint.

That's our show. Thank you for listening, and come back soon.