#16 — DEEP DIVE SERIES: Hypertension Transcript

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Introduction to Integrative Medicine

[music] Welcome to the trip lab kitchen table [music] conversations about integrative medicine and psychedelics. I'm your host and attending physician Dr. Mariela Wood. Hi everyone, welcome back to another episode in our deep dive series. In this series, we are going to look deeply into the pathophysiology and the root causes of some of the most common medical conditions. Then with that understanding, we can better learn how our traditional medications and alternative integrative therapies work to treat those disorders. If you're new to this podcast, integrative medicine is a field of medicine that combines evidence-based alternative or eastern practices with our traditional western model. So rather than only subscribing to one view or the other, we combine both in an evidence-based way to offer our patients more treatment options. And when I say evidence-based, I mean that these traditionally quote unquote alternative practices are being studied so that we can determine which ones are actually efficacious and which ones are not. If you want to learn more about how this divide between modern medicine and alternative medicine happened and how that is changing, check out the intro episode to this series, episode number 15, called how big pharma led us to call Eastern medicine alternative. But today for our first deep dive episode, we're going to talk all about hypertension or high blood pressure. Hypertension is one of the leading causes of the global burden of disease. It increases your risk for heart failure, coronary artery disease, strokes, renal failure, and a whole lot more. It actually accounts for greater than 7 million deaths annually.

Blood pressure levels naturally increase as we age. So in one sense, it is a disease of aging. Similarly, the number one risk factor for developing a heart attack or a stroke is actually age rather than any other factor. This is because our blood vessels start to change as we age, stiffening as a result of our bodies just slowly breaking down. But let's break that down a little bit more.

Why Hypertension Matters

While we say aging causes high blood pressure, what we really mean is time. As time goes by, we have repeated insult to our blood vessels in all of the following ways I'm going to talk about today. So really it is just a numbers game. Sure as you age your body will inevitably start to break down but here is specifically how and we will see that lifestyle choices are directly correlated to how fast and how severe this happens. So going back to the very basics blood pressure is a measure of the pressure of the blood running through our blood vessels. Our blood vessels have muscles and specifically vascular smooth muscles that give us the ability to dilate. we call it vasoddilation or expand which in turn lowers our blood pressure. They can also constrict which we call vasoc constriction or shrink which would increase our blood pressure. So to put it simply bigger diameter for the blood to flow less pressure smaller diameter for the blood to flow higher pressure.

Okay, great. So we understand blood pressure but why is high blood pressure so bad? Having a chronic high pressure system running through our body actually can wreak havoc. Liken this to a high pressure pipe.

Eventually the pressure is going to cause wear and tear on the pipes and in weak places the pipe is going to burst. What happens in the body is similar but a little bit more complex. With high blood pressure, the blood vessels get damaged over time. The inner lining becomes less elastic and starts to stiffen. Then eventually we have less blood flow which means less oxygen and less nutrient delivery to every single cell in our body.

Other than just having less oxygen and nutrients which is very important. Weak parts of the blood vessels can turn into aneurysms. So aneurysms are essentially a very thin bulge in your blood vessels. Can happen anywhere that can burst at any time which can lead to bleeding and strokes if it happens in the brain. So this narrowing and stiffening of the blood vessels can also happen in the coronary arteries which are the arteries of the heart eventually leading to arrhythmias or heart attacks. Then eventually after that the heart starts to remodel to try to accommodate this change and then eventually we get heart failure. Taking this back to the brain, we already discussed how this can lead to strokes. So this is either because a blood vessel is narrowed so much that it stops supplying blood to one part of the brain or there's a rupture of a blood vessel causing bleeding into the brain.

Narrowed arteries can also cause dementia over time because just slowly reducing the blood supply slowly causes the brain to deteriorate. Similar things happen to the kidneys which we will definitely talk about later, the eyes and a whole lot more. >> [snorts] >> So all that is to say high blood pressure can severely damage the body.

How Blood Pressure Works

So let's look at how the high blood pressure actually happens in the first place. Recall again that more narrow blood vessels equals higher blood pressure. Opened up blood vessels equals normal blood pressure. Low blood pressure can also happen for a number of different reasons. Uh but that's definitely a talk for another day. It is usually caused by shock due to infections or severe heart failure or different mechanisms completely. So totally different topic from high blood pressure.

So back to high blood pressure, how do the blood vessels dilate, open up and constrict or clamp down? Well, first we produce chemicals in the body that allow them to do so to maintain homeostasis which is a balance between where our blood pressure should be. We have molecules like nitric oxide or prosttoycline which can open them up aka vasoddilate lower the blood pressure. On the other hand we produce substances like endothelin which shrink or vasoc constrict the blood vessels which will increase the blood pressure.

Additionally an excess of reactive oxygen species or free radicals will also cause vasoc constriction. And furthermore, these free radicals actually also inactivate nitric oxide, the molecule we use to dilate the blood vessels. So this is a double whammy mechanism for high blood pressure. A quick note on free radicals and reactive oxygen species. So you probably have heard of free radicals before. A lot of the times when people talk about antioxidants, they talk about free radicals. So what are they? So free radicals are unstable molecules that get produced with specific chemical reactions in our body. The most common chemical reaction that happens naturally in our bodies is when we turn glucose into fuel, which is happening virtually 24/7. And during this process, these free radicals as reactive oxygen species get produced in very small amounts.

Blood Vessel Damage and Complications

But not to worry, our body also creates other molecules to neutralize and stabilize them. However, we actually produce a lot of free radicals through lifestyle choices as well. So processed foods, excessive alcohol intake, excessive sun exposure and smoking are some of the big ones. So bringing this back to what free radicals do to our blood vessels, again these molecules actually clamp down or vasoc constrict the blood vessels, increasing the blood pressure and they turn off our ability to dilate or lower the blood pressure. So again like I said earlier, double whammy mechanism of raising our blood pressure.

So right out of the gate, we have one example of how diet and lifestyle increases our blood pressure and in turn increases our risk for heart attack and stroke. So that means eating less processed foods, drinking less alcohol is already going to start helping us prevent high blood pressure by not creating an excess of these reactive oxygen species in the first place.

Additionally, we also do have antioxidants that combat this process. So, we do produce a few antioxidants naturally in our bodies like I mentioned earlier, but there's a lot of antioxidants that we can actually consume. And of course, they're found in very nutritious foods. So, any naturally occurring, very colorful food like grapes, red bell peppers, other colorful fruits and veggies are going to have a lot of antioxidants in them. So, these antioxidants neutralize these bad free radicals. If you're really curious about the science, what they actually do is they donate an electron to these free radicals so that they can't damage the body. One example being clamping down our blood vessels. So going beyond the molecular level or the molecules that play a role in dilation or constriction, we also have our autonomic nervous system. So this is our peripheral nervous system that gets divided into the sympathetic branch which controls our fight orflight response when we respond to stress and our parasympathetic branch which controls our rest and digest response and brings us back into homeostasis as we relax. When we have more sympathetic activation again fight or flight we release epinephrine or adrenaline and norepinephrine and this causes our blood vessels to clamp down increasing our blood pressure. Now, this is great temporarily so we have increased blood flow to places that will help us get away from a stressor.

What Raises Blood Pressure

Then what's supposed to happen is when we relax, we we switch over to more parasympathetic activation. Then acetyloline gets released and causes our blood vessels to relax and open back up again, decreasing our blood pressure.

So basically, all that is a fancy way of explaining that chronic stress leads to chronic high blood pressure, which will eventually damage your kidneys and lead to a heart attack or a stroke. Then this leads us to inflammation. So inflammation also damages the blood vessels. But first, how does our inflammatory response get turned on in the first place? Well, when our body recognizes anything as foreign, it releases inflammatory cytoines to kill them off. However, these cytoines also damage our bodies in the process. And these quote unquote foreign substances that our body recognizes can be a bacteria or a virus. probably what we might first think of, but also processed foods and mental stressors actually trick your body into thinking that there's a foreign invader and that also turns on the inflammation response. So again, needless to say, our modern lifestyles are ripe for chronically activated stress response and inflammation and thus high blood pressure. Next, let's bring the kidneys into play. So to put very simply, the kidneys are very complicated, but to put simply, our kidneys are responsible for filtering our blood and then we excrete any waste products through our urine. So this means that our kidneys are working intimately with the blood vessels and they have a lot of mechanisms in place to actually control our blood pressure too. However, damaged kidneys can throw this blood pressure control system all out of whack and can cause chronic high blood pressure. On the other hand, chronic high blood pressure can damage the kidneys. And then we've just created a vicious cycle. So, let's break that down a little bit. First, what can cause damage to our kidneys other than high blood pressure, which we'll get to. So, medications, specifically overusing insaids like ibuprofen, processed foods, chronic dehydration, smoking, poor sleep, diabetes, also a disease of lifestyle, and of course, autoimmune disorders, cancer, and other medical conditions that we'll definitely get to later in this series. So, the kidneys can get damaged, which can cause high blood pressure, but also remember that high blood pressure damages the kidneys as well. So, how does this happen? Well, when the arteries become smaller, we get reduced blood supply to the nephrons, which are the functional unit of the kidneys. This means that they're getting less oxygen and nutrients, and that eventually causes them to get damaged and then not filter blood as well. Eventually, this causes high blood pressure because the kidneys stop responding to a hormone called eldoststerone, which helps us regulate our blood pressure. So to recap again, damaged kidneys from other sources can cause high blood pressure. Then high blood pressure can also damage the kidneys. So not good all around.

We'll definitely talk about chronic kidney disease later in the series, but briefly once someone develops chronic kidney disease, it is irreversible. You can slow down the progression, but you can't reverse the disease.

And as chronic kidney disease progresses, it can cause heart disease, nerve damage, life-threatening electrolyte imbalances, anemia, metabolic acidosis, and a whole lot more. Just for reference, once you have reached stage 5 kidney disease, and you're on dialysis, you can only expect to have 4 to 10 years of life left because sooner or later, one of those complications of the disease is going to kill you. Very grave, I know, but it's very important, especially when we're talking about high blood pressure. So that was the kidneys. We'll go over a couple more areas of high blood pressure. So related to the kidneys is the fluid content in our blood.

Kidneys, Salt, and Genetics

When we consume a higher sodium or salt intake, our bodies try to correct this electrolyte imbalance by increasing water retention. And our kidneys are what allows this to happen. So essentially to have the proper balance of electrolytes in the blood, our bodies pull more water into the vessels to maintain the appropriate water to sodium ratio. Very simply speaking, this means that our fluid volume increases, which increases our hemodynamic load, essentially the amount of blood that our heart has to work to pump. And eventually this causes our blood vessels and our heart to remodel to accommodate this change. So once again, we have another lifestyle root cause aka high sodium intake, eating a lot of salt, the development of high blood pressure. So last, we do have to round out our pathophysiology section by talking about genetics. Some people unfortunately carry genes that accelerate all the processes that we just talked about, meaning that the blood vessels will get damaged at a faster rate due to specific genes being turned on. And we initially thought that this might be the one aspect of the disease that's not caused by lifestyle.

But we are now finding out that that might not be totally true either. As we're learning more and more about epigenetics, we're finding out that lifestyle actually does cause certain genes to turn off and on even if you have a genetic predisposition for developing high blood pressure. So that's also a fascinating topic for another day that we won't dive too much into here. So ultimately to wrap all that up when we look at the pathophysiology of high blood pressure we find that it's a disease of lifestyle and time. So how do we treat high blood pressure then? Well fortunately lifestyle interventions are now actually the first line approach to treating hypertension. Physicians are guided to recommend diet and exercise for 3 to 6 months before starting a medication in patients with only grade 1 hypertension and no other coorbidities or other diagnosises.

The problem with this is doctors don't often have the time to explain what dietary changes or exercise regimens this means. More than that, lifestyle interventions primarily with diet and exercise should be totally unique to each individual. So following a low salt diet might work really well for one person, but that only gets to one root cause of hypertension, the fluid part we talked about earlier.

Maybe your high blood pressure is more of an autonomic dysfunction due to too much stress. Then in that case, working on stress management might be the only thing that you need. So we're going to look at management now. including lifestyle interventions, integrative techniques, and pharmacological treatments. But before we talk about that, let me break down our blood pressure goals. In 2017, the American College of Cardiology and the American Heart Association redefined blood pressure classifications.

So they said that normal blood pressure is less than 120 over 80. Elevated blood pressure is somewhere between 120 to 129 over again less than 80. Stage 1 hypertension is 130 to 139 over 80 to 89 and stage 2 hypertension is anything above 140 for systolic and anything above 90 for diastolic. So I bring up these numbers because when I talk about the following interventions I'm going to give point values when available. For simplicity I'm going to stick to just systolic blood pressure which is the top number just so we don't get all lost in the numbers. This is not to say that diastolic blood pressure, the bottom number, isn't important. It definitely is. And in fact, what's even more important than both the top and the bottom number individually is the pulse pressure, which is [clears throat] the difference between the two, and the MAP or the mean arterial pressure, which actually measures perusion. However, this definitely takes things to the next level and out of the scope of this podcast. So, today I'm just going to talk to you about systolic blood pressure, the top number to keep things simple. So to recap again just using systolic the top number a normal blood pressure is anything less than 120.

Stage one hypertension is when the systolic is in the 130s and stage two hypertension is when the systolic is in the 140s and above. So with that in mind as I go through all these interventions you'll find that each one can lower blood pressure anywhere between 2 to 20 points.

Lifestyle Treatment for Hypertension

So this means if your blood pressure is in the 130s, again class classifying you as stage 1 hypertension, if you can lower your blood pressure 15 points, that will bring you into the 110s, which would mean your blood pressure is normal.

So first, let's look at the primary lifestyle modifications that can help bring your blood pressure into a healthy range. First, we got to start with diet. And again, everyone will have an individual diet that will work for them, but there are a few that are generally accepted as beneficial for lowering blood pressure. So, we have the DASH diet, which actually stands for dietary approaches to stop hypertension, and the Mediterranean diet. So, both of these diets have a lot of overlapping properties, but the key point in both of them is a big emphasis on eating more fruits and vegetables and whole grains. All those have anti-inflammatory and antioxidant action. Then reducing salt content. Recall back to the fluid level of pathophysiology earlier. And reducing saturated fats. Unsaturated are great and okay, but saturated fats need to be reduced. And fatty red meats and sweets which are all inflammatory to the body. So following a DASH diet or Mediterranean diet has been shown to reduce blood pressure by just a few points in the first two weeks and with long-term adherence up to 14 points.

That's huge. You'll see that that's way more than any of our blood pressure drugs when we talk about those in a little bit. Next, following diet, we have exercise. So studies show that 40 minutes of aerobic exercise 3 to four times

a week can lower your blood pressure by 5 to seven points. And they define aerobic exercise as any activities that increase your heart rate like biking or dancing, running, jogging, tennis, swimming, that's all listed on there. And putting those two together, we have weight loss, which of course comes about with diet and exercise.

So, losing about 10 lbs can lower your systolic blood pressure six points. Next, to round it off, tobacco sessation can lower your blood pressure 10 to 20 points. And there's also limiting excessive alcohol consumption, but the data is tricky with that with the point number, so we're not going to go into that today.

All right, so that was lifestyle. Uh, now what about herbs and supplements? So garlic has actually come out a winner in multiple randomized control trials likely due to its anti-inflammatory properties. So taking it in high amounts daily can reduce your solid blood pressure by 7 to n points.

We also have cocoa supplementation less effective but can still lower about 2 to three points. Next we have larginine and lcituline. So both of these molecules are substrates for nitric oxide synthesis. Essentially they help you make nitric oxide. And if you recall from earlier nitric oxide is our naturally produced molecule that helps vasoddilate or open up our blood pressure our blood vessels which lowers our blood pressure. So these supplements have shown to reduce blood pressure about five points.

Next we have co-enzyme Q10 which I feel like a lot of people are talking about this nowadays. So what this is, this is a co-actor that's actually found naturally in our bodies that is involved in our process for making ATP which is our primary energy source. So co-enzyme Q10 is the antioxidant that prevents free radicals in this process that I talked about earlier. And you can actually take this as a supplement form. Studies show that supplementing with co-enzyme Q10 can lower your blood pressure as much as 17 points.

And a study from the American Heart Association also revealed that it reduced blood pressure so much that 37% of patients who were on a blood pressure medication were able to discontinue their drug with just taking co-enzyme Q10. One key point to mention though about co-enzyme Q10 is that it does have some antiplatlet activity. So if you take it with another antiplatlet or an anti-coagulant, it can increase your risk of bleeding. It also gets excreted in the bile.

Supplements and Mind-Body Therapies

So patients with hippatic impairment or biliar obstruction will also need lower doses. So with that being said, this would be a good time to mention that everything that I'm talking about here is just a presentation of the data. This is not an individualized treatment plan for you. Always talk to your primary doctor before trying any herbs, supplements, or medications. So with that, to round out our supplement portion, we have flax seeds. So these contain omega-3 fatty acids and fiber and they've been shown to lower blood pressure around 10 points.

Next we have mindbody techniques like meditation, yoga, acupuncture and bof feedback. Now the tricky part here is that these practices do require practice and consistency but the studies are showing that incorporating them into your life daily can reduce your systolic blood pressure up to 10 points. So these work by primarily working with your autonomic nervous system. So they help decrease the sympathetic tone which again that's your fight or flight that increases the blood pressure and increases your parasympathetic tone which is your rest and digest which in turn lowers your blood pressure. So that was all our holistic integrative approaches. Now let's move on to our pharmacological interventions aka our high blood pressure drugs. So first we have our thazide diuretics.

So examples of these are hydrochloroioide or chloralone and these work by helping the body get rid of excess sodium or salt which then in turn decreases water retention which ultimately lowers your blood pressure.

So these have been shown to reduce blood pressure by 7 to 10 points. Side effects of these drugs include low potassium levels sometimes actually to dangerous levels. So your provider should definitely check your levels if they do start you on this medication. They can also increase your risk for gout impetence and diabetics may have some increased blood sugar levels.

Next we have the beta blockers and examples of beta blockers being carvdal or co-regol or lowressor. This one

isn't the best for hypertension but it does have some activity and ledol. So the lols. So beta blockers work by reducing your heart rate and thus the heart's workload and output which will lower your blood pressure. So these drugs have been shown to reduce blood pressure by 7 to 11 points.

Side effects of beta blockers include nightmares, constipation, fatigue, depression, dizziness, sexual dysfunction and heart block. Next we have the ACE inhibitors or the angotensin converting enzyme inhibitors and our ARBs which are angotensin 2 receptor antagonist. So I lump these two together because they work in the same chain of chemical reactions just at different points. So they have virtually the same activity.

Blood Pressure Medications

So example of ACE inhibitors are leinopril and analopril or basotch. [snorts] Examples of arbs would be loartin and valartin. And both of these drug classes work renally so in the kidneys. So ultimately they reduce the amount of angotensin which is a chemical that narrows or constricts the arteries. So blocking this will block that action which will block narrowing of the blood vessels which will in turn open up the blood vessels and reduce our blood pressure. And these have been shown to reduce systolic blood pressure by 7 to 12 points.

Side effects of these include potassium imbalances, chronic cough and the ACEs, not the ARBs, kidney damages, and for some people, life-threatening angioadema. Again, also with the ACEs, not the ARBs. And this life-threatening angioadema is most common in black patients, which is why I never prescribe them for black patients. Last, we have our calcium channel blockers. So examples of these are amloopene or norvasque, deltaazam or cardism, nicardipene and netapene or procardia. So calcium channel blockers work by preventing calcium from entering the muscle which means that the muscles cannot contract or constrict the blood vessels. So if they can't constrict then they'll be more open and your blood pressure will be lower. So these have been shown to reduce systolic blood pressure by 5 to 11 points.

Side effects of these medications include swollen ankles, constipation, headaches, and dizziness. So there are a few more classes of blood pressure drugs, but those other classes are more often used if you have hypertension and another disorder or if you're taking all of those classes of drugs and they're just not working and you need more. So there are third, fourth, fifth line options for very uncontrolled hypertension. So I'm not going to get into that too much today. I'm also not going to go into too much about how you choose one agent over the other because some are better if you have diabetes while some are essential to be on if you have heart failure. So your physician will work with you to find out your best regimen. But what I do want to point out is that all of these drugs work on one specific chemical reaction which does indeed lower the blood pressure, but it doesn't cure the root cause of how high blood pressure developed in the first place.

So let's take a second to compare our drugs to our lifestyle interventions. On average, we see that each drug can lower blood pressure between 5 to 12 points. Looking at lifestyle interventions that improve whole body health, I might add, not just specifically lowering blood pressure, [snorts] we see that those can lower blood pressure anywhere from 5 to 20 points. And I will also add that all the drugs and all the lifestyle interventions do work cumulatively. So you can combine them and get even bigger increases in your blood pressure lowering abilities.

So again, we have a max of 12 points with each drug and a max of 20 points with each lifestyle intervention and integrative therapy. So right off the bat, lifestyle interventions can be more effective if done consistently. And they also get to the root cause of the disease rather than just targeting one specific chemical reaction that only just lowers the blood pressure.

>> [snorts] >> And aside from some of the herbs that we didn't mention today, these lifestyle interventions have no side effects. In fact, they have a whole slew of health benefits for your entire body.

So, this isn't to say that blood pressure drugs are bad. Using them may not treat the root cause of hypertension, but they do lower your blood pressure, [snorts] at least enough so that you don't continue to damage your kidneys and your heart and other organs that could potentially lead to heart attack, strokes, kidney disease, and more.

Lifestyle vs Drugs and Closing Remarks

But if you really do want to treat the root cause of a lifestyle diagnosis, you need to work on lifestyle. However, some people truly do try all these lifestyle interventions, but they might still need a little extra boost with drugs. This also gets more complicated when people have other chronic health conditions with their high blood pressure.

Alternatively, some people just have a really difficult time sticking to lifestyle interventions, or some people are just not interested in changing their lifestyles at all. And in my opinion, it is not our job as doctors to force people to cut out cheeseburgers if that's truly what brings them joy in life. What we can do is recommend everything in moderation.

And what is our job is to educate our patients so that they can fully understand how hypertension developed in the first place. so that they can offer both the lifestyle and integrative therapies as well as pharmaceutical options. Our job is to give you options. Ultimately, it's your choice. So, if you made it this far as we dove into the science and all the nitty-g gritties of hypertension and high blood pressure, I hope you enjoyed or at least got some benefit out of this this first episode of our deep dive series. So, stay tuned for more. We will dive into the pathophysiology of some other common medical conditions and discuss how both integrative and pharmacological interventions work to manage them. If you have any suggestions about other medical conditions you would like to learn about, shoot me an email at the triplab podcast@gmail.com.

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