Blood Chemistry Intro: CBC - Complete Blood Chemistry and Anemia

Transcript

Welcome back, and now we're going to talk about the part of the complete blood count that deals with anemia, that gives us markers for what's going on in our blood and the various kinds of anemia. This is not to replace a one-on-one relationship with a qualified healthcare professional, it's not a medical advice. When you're dealing with anemia, you do have to make sure that you rule out the red flags because some of these markers can indicate that there's something serious going on, a serious pathology or internal bleeding, or something like that. Really know this and allow the person to say, if you see some things that are off and you're not really sure, send them off to their doctor to make sure because you don't want to get in a situation where you're preventing them from looking for something like an internal bleeding or something like that.

This is our CBC. The CBC is broken into two sets of components. One set are the anemia markers, and the other set is immune system markers. On the anemia marker side, we have the red blood cells which carry oxygen through the body. The hemoglobin which transport the oxygen and gives the red color to the blood, so hemoglobin is a component in the red blood cells. The hematocrit which measures the percentage of the blood that's made up of red blood cells. The MCV also known as mean corpuscular volume is basically the size of each blood cell. Are they the right size? There's a normal range. Are they too big, or are they too small? We'll go into what each of those means.

There's the mean corpuscular hemoglobin, that's the average amount of hemoglobin in the red blood cells. Then there's the mean corpuscular hemoglobin concentration which is the average hemoglobin concentration in the cells. We'll look at that. It's percentagewise versus the actual amount. Then we have RDW which is a variation in the size of the RBC's so the red cell distribution width and that should be within the narrow range. If that range is too wide, it says that there's some abnormality going on in the production of the red blood cells.

On the other side of the spectrum, we have the immune system markers which are the white blood cells. The what blood cells are the defense against disease. They're the ones that produce all the antibodies and the things that actually keep us safe in the light of disease. What I want you to know there is that these other things listed below WBC on here and the way they're listed in your lab are types of white blood cells.

We also call it the white blood cell differential. It'll tell us what percentage of the white blood cells are neutrophils which are often elevated in bacterial infection. What percentage of the white blood cells are lymphocytes which are often elevated in viral infection. What percentage are monocytes which are kind of a second line of defense. They'll be elevated in a recovery stage and also in a chronic infection stage.

If you see the monocytes elevated, I always ask somebody, did you just get over a cold or a flu? Have you been sick? If they say no, then my red flags go up as far as looking for some sort of low-grade chronic infection. That could be something like an H. pylori infection. It could be something like some kind of gut overgrowth. That's just chronically happening, and we want to know that.

The basophils are related to histamines and allergy production and sometimes parasites. The eosinophils are related to parasites and allergies. With these two, we're looking at, "Oh, what's going on here. Does this person have allergies?" Eosinophils are usually more specific to the allergies. If you have high eosinophils, there's some kind of an allergic reaction, the basophils could go either way but it's histamine being produced, not necessarily allergy, but it could be being produced as a result of some imbalances genetically where your body can't handle and break down histamines that are naturally occurring in foods.

That's our complete blood count. That's the overview so we're always going to do this overview and then drill down, so let's drill down. Let's talk about anemia and anemia is what we look at with the red blood cells. There's a lot of symptoms that could show up as anemia and a lot of these symptoms could mask and mimic other conditions. A lot of times, you may not realize it's anemia if they don't have severe fatigue. We always think of anemia as fatigue.

In the olden days, whenever somebody came to the doctor complaining about fatigue, they say, "Oh, you must be anemic. Take some iron," or "Check your iron." There's a lot more to anemia than just iron deficiency. There's all kinds of types and we're going to go into them but here are some of the symptoms that you might be seeing that tell you that there's some anemia going on. Fatigue, weakness, headache, shortness of breath after exercise, they just can't keep going, they don't have the stamina. Pain in the chest, pounding in the ears, brittle nails, pallor. Their face gets really pale. Palpitations, dizziness, and then cold hands and feet.

There's lots of different causes of anemia. It's not just a matter of iron deficiency like in the olden days. Oh you have iron deficiency, take J Geritol. They're old commercials on TV back when I was a kid. We all learned that, anemia, we take Geritol because it was some kind of iron supplement. Much more than just iron, it can be a deficiency of the B vitamin folate. It could be a deficiency of the B vitamin B12 or it can be an autoimmune disease resulting in poor absorption of vitamin B12.

It could be a malabsorption that's going on, so they're not absorbing any of these nutrients and it could be a combination anemia, iron, folate and B12, not uncommon, and we'll talk about how to differentiate that. You can have essential fatty acid deficiency that contributes to anemia. You can have low stomach acid that contributes to anemia. Heavy menstrual bleeding and premenopausal women, internal bleeding, and this is where you have to be really aware if somebody has really low iron levels and ferritin levels. They have to rule out that there's some kind of bleeding going on by ulcers, polyps, hemorrhoids, inflammatory bowel disease or even cancer.

Pregnancy often causes anemia especially in a mother that's not really that well-nourished before she jumps into the pregnancy, having worms and parasites were they gobble up your nutrition that can lead to anemia. Autoimmune diseases, especially autoimmune of the stomach which affects the absorption of vitamin B12 but there's others as well like Crohn's and ulcerative colitis where you're actually losing blood. Heart disease can cause anemia, chronic viral and bacterial infections, your body's just working so hard that it doesn't have the capacity to deal with the oxygenation of the blood. Medications like NSAIDs, non-steroidal inflammatories and others, they can actually cause internal bleeding and they can lead to anemia. Kidney disease and then some serious illnesses.

I want to help you to be able to differentiate what's going on, what's causing your anemia but know that there are a lot of cases so if you're dealing with an anemia, you get it on the blood test, you deal with it, you go ahead and watch it again in three months and you don't see a serious change. Then you want to look for some of these more serious causes. Getting back to anemia is a decrease in the oxygen-carrying capacity of the blood.

Here's the chronic, the different types and what we would call them. This looks very similar to the previous slide. This has some diagram so you can see that there's something called … Well, iron deficiency we talked about B12, pernicious, folic acid, folate deficiency, and even vitamin B6 deficiency that can contribute to anemia and some of the serious diseases. Sickle cell anemia is one type of anemia where there's change in the shape of the blood cells and it causes damage and internal bleeding within the endothelial linings and it blocks the blood flow. Sickle cell is kind of … There's a genetic predisposition in certain types of heritage and that's something you want to ask as part of your history taking.

Hemolytic anemia is a bleeding type anemia. Aplastic anemia which is where the blood cells production stops. We have a decrease in the body's ability to make that the blood cells and that's often seen in leukemia when there's changes to the bone marrow. Aplastic anemia could be temporary, it could be something that actually last a long time.

Protein deficiency can lead to anemia, liver disease, polycythemia. Well polycythemia and hemochromatosis are not really anemias per se but they have symptoms that are similar even though you have high iron and high ferritin. We're going to look at those in more detail. Still on the overview just to see the variations here, it's not just about iron. It's not just about B12.

Let's take a look at some of the markers for anemia in the blood. We have our red blood cells. The red blood cell ranges for females. This is the ideal range. It's not the ranges on the blood test, 3.9 to 4.5 for female, 4.2 to 4.9 for male. If they have something significantly over that, it's a red flag to start thinking about something called hemochromatosis or polycythemia, and we'll talk about those in another slide. Hemoglobin is the oxygen-carrying capacity of the cell that should be in a tight range between 13.5 and 14.5 in a female, 14 to 15 in a male.

If you see these above it by slight amounts and you see consistency like red blood is a little high, hemoglobin is a little high, hematocrit's a little high, you might want to think dehydration, so you get the person to hydrate, make sure they're hydrated really well before the test, not over hydrated and then do it again in 6 weeks, 6 to 8 weeks. The hematocrit is the percentage of red blood cells in the serum. If you see the hematocrit, it's 37 to 44, that's going to be the same whether you're on standard international units or whether you're on the US units.

The cool thing about it, let me just take a step aside here, that you mentioned this in the intro and I want to mention it here is that when you go to some of the books that I recommended especially the Dicken Weatherby one, and especially if you've used the software, you're going to see both the international and the US ranges and you can choose.

It turns out the US is the only place that uses these ranges. However some of these are going to be the same. Hematocrit is a percentage so percentage doesn't change from one unit to another. The percentage, you see that your blood cell, your blood is composed of a lot of red blood cells, 37 to 44% of your blood is actually red blood cells. If it goes lower, then you have a different kind of anemia than you would have if you just have smaller cells. That usually happens with blood loss and you see it a lot happening in things like leukemia.

MCV mean corpuscular volume, the range ideally is very tight 82 to 89. The blood test from the labs will usually let you go up to 99 and they'll start at 80 or 75 even to 90. We want to keep it in the tight range for ideal oxygen-carrying capacity. Whenever the MCD goes above 89.9, I'm starting to think macrocytic anemia, macrocytic anemia is when the blood cells are larger than they should be. Microcytic anemia is when the blood cells are smaller than they need to be. Iron deficiency usually results in microcytic anemia. Blood cells are smaller so they'd be smaller than 82. B12 and folate deficiency will usually result in anemia where the blood cells are bigger, macrocytic anemia.

If you're seeing the numbers in the normal range but you're suspicious of iron deficiency or B12 deficiency from the rest of the clinical picture, you can have both happening at the same time and the MCV will look normal. The way that you know that it's an anemia situation, not necessarily a normal situation is you look at this down here below which is RDW, red cell distribution width, and that remember is the range of how wide a range of sizes were seeing. That means that some of them are really small, some of them are really large. There's a normal variation between 11.7 and 13 when we see that number creeping up and I see the MCV normal, I'm suspecting that both macrocytic and microcytic is happening at the same time, but the average is working out to be normal.

MCH is the average weight of the hemoglobin in the red blood cells. That's a calculated number by taking hemoglobin times 10 divided by red blood cells. The MCHC is the average hemoglobin in the red blood cell which is just the hemoglobin divided by the hematocrit. The red blood cell with, I said and I'll say it again, red cell distribution width is possibly the earliest sign. You may not start to see these variations, right because there's a little bit small, large but there's a wider variation. That's got to be one of the earlier signs. Then we have the reticulocyte count and reticulocytes are immature red blood cells. The range on that is .5 to 2.5 for females, .5 to 1.5 for males.

So there's more so in an iron deficiency anemia, these are some of the markers we want to look at. The iron level is pretty wide range 85 to 130. I try to keep it in the middle of that range, but anything below 85, we consider functionally anemic in that the literature and in the lab test ranges, they could go down as low as some of them 30 which is very low. You could have somebody who's exhibiting signs of anemia there, exhibiting exhaustion and the doctor says, "You don't have anemia, we don't know what's wrong with you, take some Prozac," then we have the ferritin. Ferritin is the storage form of iron. It's protein bound and there's storage of that ferritin in the liver but there will be some in the blood.

The range of that should be 40 to 70, where you're going to see on this lab test is as low as 10 and as high as 200. A nice tight range keeps things in the safe range and we'll talk later about what it means when the ferritin goes too high. Transferrin is a protein in the blood that binds to iron and it just carries it around. The total iron binding capacity and the range should be between 250 and 350 is how much transferrin is available to bind the iron when you have a deficiency of iron, you're going to see a high TIBC, total iron binding capacity because not all the transferrin is bound to iron.

When you see an excessive iron or you see a very low total iron binding capacity, the iron tends to be higher. I don't have ranges listed for transferrin because most labs don't measure it directly. They find that it's more accurate to calculate, to measure the total iron binding capacity instead. The transferrin saturation, which is between 12 and 45 in females, 15 and 50 in males, is the iron divided by the total iron binding capacity times 100. So it's how much iron is actually bound to the transferrin. It's kind of the opposite of the TIBC.

I looked it up in a lot of different labs and it's different from lab to lab but very few of them measure the transferrin direct, and the study show that you get a much more accurate measure if you do the total iron binding capacity and the transferrin saturation.

It's not just a matter of measuring the serum iron and determining is this person anemic or not. There's other subtle signs and I'm going to share with you the stages of anemia so that you can be really astute at looking at this. The stages, stage number one is where the stores get low. The normal serum iron, so people who look at the iron alone and don't look at the ferritin are missing the boat on early-stage iron deficiency anemia. When you look in here, you're looking and seeing that ferritin has decreased below the range and it might be at 30 or 20 or 10 or 5 or 3. I've seen it as low as 3. That means that there's very little stored iron. The iron might still be okay, but as soon as we deplete that ferritin too much, the iron will go low.

Generally in the early stages, you're going to see marginally decreased ferritin, usually not very severe depleted ferritin. The other thing to keep in mind is if you're tracking people over time, you're looking at their ferritin and iron. If you're seeing it going lower and lower each year, that's a red flag for the fact that maybe there's some iron deficiency going on and we need to replenish it because they're heading towards anemia.

We want to do predictive nutrition as well as and preventative nutrition as well as interventions for imbalances. In the stage of decreased iron stores, the only thing that's normally low is the ferritin. You might start to see marginal levels on hemoglobin and you'll also start to see if you've been tracking them, that those levels tend to start to go down. The MCV is a hard one to even use because we don't know about their B12 folate status. It's usually normal. You might even see it high if you've got a superimposed B12 deficiency, so keep that in mind. You might see the MCV high even when you have iron deficiency anemia if the iron deficiency anemia is in the early stage.

Stage II would be where the iron in the serum actually gets decreased, so you should see decreased ferritin and iron together. You might see increased transferrin saturation. You might see normal MCV and normal or low hemoglobin, but you also might see variations in the MCV again based on the levels and whether the B12 and folate status is normal. This is the stage II.

Now, one of the things you're going to get to, and this is something that always boggles my mind and we start to look at it, I don't see it very often, is that when there's a decreased ferritin, there's a decreased serum iron but the ferritin is perfectly fine. If the iron is decreased in the blood and the ferritin is really high, you might have an iron storage problem and that's a situation called hemochromatosis. It's always this kind of curiosity to look and it's looking at, well what might be going on in the liver that's not allowing that ferritin, which is normal, to be converted and activated into iron in the serum. That's something to keep in mind whenever you see the ferritin is perfectly normal but the iron is low.

That says to me that there's probably something going on with the liver. Let's look at the third stage. This picture is depicting what your blood will look like in normal, lots and lots of blood cells, nice concentrations and then here's what it looks like in anemia. Let's look at stage III of iron deficiency. This is where everything goes low and not everything might go low, but multiples of these are starting to go low and you're really seeing this clinical picture. I believe that our job as functional practitioners is to catch it in those early stages so we don't get there. But chances are, you're can going to see people coming in your door with this.

If you catch them in stage one, you want to prevent them to go in to stage III because it's a lot harder to deal with. This is where everything is low except the total iron binding capacity which is high and the transferrin because the transferrin isn't going to be bound. Makes sense?

Let's shift gears, and then we'll come back to some other issues related to the total anemia picture. With B12 and folate deficiency and pernicious anemia and I'll differentiate, pernicious anemia is when there's a lack of intrinsic factor in the stomach. The stomach produces this chemical called intrinsic factor which takes the B12 and helps it to go across the blood. This is a little bit misleading in this picture because generally speaking, you're not going to see the intrinsic factor working in the stomach. Intrinsic factor binds the B12 and then it carries it down to the lower part of the small intestine, right by the ileocecal valve right before everything dumps into the large intestine, and right in there is where the absorption of the B12 happens.

If the B12 is not connected to this intrinsic factor, it won't get absorbed. You can be giving somebody all this B12, if they have low stomach acid and they have low intrinsic factor, that B12 may not get absorbed. We call that pernicious anemia when we've identified that the cause of it is not a deficiency in the diet but a deficiency in the body's ability to absorb it due to lack of intrinsic factor. In the cases of B12 and folate deficiency, depending on the state, you might see decreased hemoglobin. But sometimes in early stages, you may not see the hemoglobin decreased.

You also see decreased hematocrit, decreased red blood cells, but again depending on the stage, it's subtle. If you see increased MCV, you start to suspect that there's pernicious anemia going on or B12 or folate. Here's the deal, we can't tell from MCV whether it's B12 or folate or both or some of the other cofactors that work with it. If you just give somebody folate, it'll mask the B12 deficiency so the MCV might look normal because they have normal folate but low B12. Here's the thing with B12 anemia. If you allow somebody's B12 to get too low, you're going to get neurologic symptoms and sometimes those neurologic symptoms are irreversible.

If you've got somebody with an MCV or you're suspecting that they have any B12 deficiency, don't give anybody folate unless you also give them B12.

If somebody's on a vegan diet with no animal products and no visible source of B12 in their diet, you've got to be careful about all the green leafy vegetables and I would give them a safety dose of B12 because we want them to be eating all those green leafies and they're loaded with folate and it can mask the B12 deficiency. That's why it's important to either do some specific functional test for B12 levels which I'll share with you in a bit or supplement with B12.

That said, I have seen people twenty-year vegans with normal levels of B12. So somehow they're getting it, they're getting the bacteria on their food, their body's in good shape and they're converting it. I've also seen vegans with very low levels. Personally, I did an experiment. I said, I'm not going to take any B12 for a year and then I'm gonna test what I'll talk to you about later is methylmalonic acid and see where mine's at. It was perfectly normal after a year of no B12 supplementation, which is kind of surprising because I found out later I have an MTHFR which is really surprising.

However, my body was doing it. However, my son at age 13, he was vegan since birth. We fed him amazing food, all fresh food, never had processed stuff, very little gluten. He did have good gluten sometimes but it was all sprouted. He started to develop these weird symptoms at puberty, that it's your first child and they start to get weird on you at puberty. I don't know what's normal and what's not but I started to suspect that it wasn't normal because he was starting to tell me about hallucinations he was having. He was aware. He'd say, "I think I'm having auditory hallucinations." This was my kid who was always looking to diagnose himself. "I think I'm having auditory hallucinations and this is what's happening," "I think I'm having olfactory hallucinations," he said to me one day because I was walking along the street and I smelled … I saw a dead armadillo on the street. It reeked but everybody was walking past it.

I'm like, "Okay, something's going on here," and he would say, "I think I'm getting paranoid again." He would go to the bookstore and get these books about all kinds of psychiatric pathology. I said I think he's got a B12 deficiency. Then I remembered him saying to me when he was younger, "You know mom, if I sit on the toilet too long, I get numbness in my feet." I'm like, "Well, why are you sitting on the toilet too long? Are you constipated? He'd say, "Well, no. Sometimes I take a book and I read it and I just sit there," so he would share those things with me when he was little. He wouldn't share those when he turned to be a teenager, but it turned out I asked him, I said, "Do you still get that numbness in your feet if you sit on the toilet too long?" He goes, "Yes."

We did a test for him. Turned out he was B12 deficient. Now, he'd been 12 years at that point not without B12. He had been taking from the tiniest little … I always gave them little sublingual B12's once a week, once a month. I was giving it to him but at the age of about 10, he started to get this like, "I don't need to take those vitamins. I should be getting everything from food. I'm fine," and he stopped.

Apparently, his body needed to get that B12. He wasn't getting it from the bacteria in the food. He wasn't converting it in his intestine. He needed it, whereas I went on a whole year and I didn't. I've been vegan for 23 years and I take B12 sporadically and I have been MTHFR, so go figure. You can't just tell by paper what's going to happen but he had this serious deficiency so I got him tested. He had a serious deficiency.

When we look at the MMA which is methylmalonic acid, the numbers on that test, the range should be up to three but really I like to see it in the two range. Mine was 1.5 so that was really good. Methylmalonic acid is a chemical build up product, a toxin that builds up when you don't have enough B12 to take the pathways all the way through. It's a methylation factor which is what struck me when I found out I had all this methylation problems but that's beside the point, so he had this problem. I got him on … His was 5.5. It's way high. I got him on B12 and I got patches at the time. I got the patches and it was even cyanocobalamin in the patches at that time. Now, they have methylcobalamin in the patches and we'll talk about the differences in another lecture on those vitamins.

However, he took the patch and he came to me about two hours later and he said, "Mom, could B12 work that fast?" I said, "What do you mean?" He goes, "I always have this chatter in my brain. I always just think I'm distracted." He said, "This chatter is gone. My brain feels clear. I'm not hearing the voices anymore." It's like, "Oh my God. This kid was on the verge of schizophrenia," and we caught it and got the B12 in him in time. You've got to really be aware of this stuff and it's not just the vegan bias, anti-vegan bias that you can't have good B12.

I mean, if we're really working properly, we should be getting it off the foods we eat. The bacteria that we get off the foods we eat convert and make B12 for us and that works but it doesn't work mostly because people are sterilizing their food mostly because people aren't eating their food fresh. They're washing it and they're putting it in all kinds of kill everything on it chemicals so they're not getting those amazing bacteria that make the B12 for them.

For me, I thought maybe it's just because I don't wash anything before I eat it. I go out to the garden and I eat the food right off the … And I'm getting all those bacteria and the bugs and whatever else are on them that are making the B12. I just wanted to take a side note to say how important it is to really be looking for these signs. If you hear somebody say, "Yeah, if I sit too long, my feet tingle," or they talk about what they call stocking and glove paresthesia, which is their hands and feet go numb, not the rest of them. You start to think that maybe they have some of the neurologic manifestations of B12 and you got to get that B12 in them right away because those kind of things can be irreversible. I had to argue with my boy for a while because he was like, "I don't want to take anything." I'm like, "Honey, this could be irreversible. It can lead to irreversible neurologic damage." Finally, he said, "Okay."

In B12 folate, we'll go back and summarize. You might have decreased hemoglobin and hematocrit in the early stages, maybe not. He definitely might have decreased RBCs, increased MCV, MCH and MCHC so the increase in the size of the cells, increasing the hemoglobin concentration in the cells but less of the cells and that's why those numbers go up. You might have normal iron or it might be low if you have a coexisting iron deficiency and all the other iron things would be normal unless you've got the two superimposed which is actually quite common.

What about anemia in serious illness. Well, you have a pattern that's similar to the iron deficiency anemia. The total iron binding and the transferrin maybe normal, they might be increased. May not be anything useful there but it's distinguished by the signs and symptoms and other findings. They're looking at possibly internal bleeding. Somebody comes in after a car accident and they show super low iron levels. You might be thinking maybe their spleen is damaged. They've got some internal bleeding.

Hemolytic anemia is a type of anemia in serious disease, sickle cells one of them and a bunch of others that it's included. Hemolytic is basically something's killing, lytic means killing. Something's killing those cells. Protein depletion, somebody has very low protein. Maybe they are being depleted, maybe they have cancer and they're in cachexia and in liver disease and kidney failure. If you've got somebody who's showing just kind of red flag signs like super, super low iron levels and they're super depleted and they have any history of things, that would indicate there might be some stuff going on. You have to get them to a medical practitioner to be evaluated. It's very important.

If you're working with somebody and you're dealing with their anemia and it's not responding to iron, it's not responding to iron B12, B6, Vitamin C and all the cool stuff you're going to do with them then you make sure that they get evaluated. All right so now let's look at anemias of excess. We looked at anemias of deficiency which is what we typically think of in terms of anemia, now let's look at excess. These are usually serious conditions and they're going to require attention, proper testing and proper working with the person. I'll explain to you the two different types. One is polycythemia, which is an increase in the number of red blood cells and hemochromatosis which is a really significantly increased iron and ferritin, and I mean significantly increased. I don't mean just like the iron is 150 and the ferritin is 110.

We're looking at sometimes those numbers get up to be in the 800s for ferritin, and 3 or 400 for iron. I know this first hand because my brother has hemochromatosis. I'm a carrier for hemochromatosis. He unfortunately got both genes for hemochromatosis. He does what he does to get to keep it under control is he donates blood very regularly. He just needs to dump it out.

Let's talk about polycythemia and then let's talk about hemochromatosis. Polycythemia, there's more red blood cells than you need, than is warranted. We're not just talking a slight increase, we're talking more. If you have a marginal increase in red blood cells, like I said earlier, that could be dehydration. What you're going to see is red blood cells are high, hemoglobin's high, hematocrit is high, the MCV, it could be normal or decreased so that's not really telling as is the MCH and the MCHC.

Remember the MCV is the size of the blood cells, MCH is how much hemoglobin is concentrated in there and MCHC one is the percentage and one is the actual amount. The iron, you might see it normal. It might even be decreased even though there's more red blood cells, there's still less oxygen-carrying capacity. The total bilirubin, which we'll talk about in the liver section and alkaline phosphatase, again will talk about in the liver section, are both elevated. Basophils, which remember those white blood cells we haven't talked about those in detail yet, but the white blood cells that are going to be dealing with allergy and parasites, histamine reactions, those are usually increased.

The total white blood cell count is usually increased, and the uric acid is increased. If you see somebody following this pattern, this is the time to refer them, not to get them out of your care because they need your nutritional support but they need to find out what's going and why it's going on. On the hemochromatosis side, that's more there's high iron. Remember in polycythemia, you're usually seeing low iron. Polycythemia, lots of iron, lots of stored iron. Body just can't seem to get rid of it. It just keeps building up.

Red blood cells, hematocrit, hemoglobin are often times usually normal unless there's something else going on like the B12 or folate deficiency. The MCV is usually decreased although there is a possibility that if you've got a superimposed B12 or folate deficiency, it would be high, but usually these numbers are very significantly decreased. The serum iron is increased usually significantly. The iron saturation is significantly increased. The total iron binding capacity is decreased. Why? Because most of the iron, most of those transferrin molecules are tied up with holding on to all this extra iron. You may see like very, very decreased total iron binding capacity.

Ferritin is significantly increased in the hundreds. I start to have red flag when I start to see ferritin going in the 200 range. You just want to monitor it. You just want to watch it. My brother's hemochromatosis did not come on gradually. I mean, it didn't come on suddenly is what I want to say. His numbers were creeping up but nobody really paid attention until the lab test came back and said he was abnormal. He could've caught it earlier. He could've kept it under control.

Now he has to go in every month or two for these bloodlettings basically, for blood donation. The other option and sometimes is done in hemochromatosis and they offered it to him was chemo.

He said, “No way, I’m not gonna do chemo, kill of my blood cells thank you very much. Just take my blood.” Transferrin, normal or decreased slightly, we usually don’t measure that directly and SGOT which we'll talk about in the liver section, that's a liver enzyme is either normal or increased. Remember with hemochromatosis, a lot of the issues happening, it’s happening in the liver. The liver is storing so much iron and you’re not able to actually effectively break it down and get rid of it.

These are serious conditions. If you start to see this, this is where you want to consult with another practitioner. It doesn’t mean necessarily that you just send the person away and don’t see them again. One of the things you might do is if you can get a consultation with their primary care doctor and say, “Hey, I’m suspicious that this person has hemochromatosis, could you look?” Now, you’re gonna be doing things differently than that medical doctor because you got your charts and you're going to be looking back if this is somebody that you’ve seen overtime that you’ll say, “Wow this is creeping up. I’d like to talk to you about the potential that this person has hemochromatosis.”

If it’s just starting to creep up but it’s not in the dangerous levels yet, one of the things you might suggest to the person is to go donate blood on a regular basis. It’s a very good thing to do. Let’s go get a couple of cases in anemia. This one is a clear case of iron deficiency. Let me show you why. We look at the red blood cells. They’re pretty normal. We look at the hemoglobin though, it’s an 11. It should be 13.5 or 12 if this is a female. It’s way low. The hematocrit is way low, 32.9%. The MCV is 84 so it’s actually kind of normal. It’s not really low. The MCH and MCHC are actually normal. The RDW though is really high at 14.4.

We know that there’s an anemia even though the MCV, the MCV shows as being yellow and we've changed those ranges to 82 to 89 so the MCV really is normal. All these numbers, the red blood cells size is normal but look at the iron. What I would be guessing here is that there’s also a deficiency of B12 and folic acid but if we look at the iron, it’s only a little bit low, 67. But the hemoglobin is way low.

When I see a big disparity between the serum iron and hemoglobin, I start to think B6 because the body needs to take the iron and turn it into hemoglobin and add the oxygen to it and B6 is important for that. This is how you start to suddenly see some nutrient deficiencies. Now had that hemoglobin been like borderline, I might be suspicious, I may not be suspicious that way but we have borderline low iron and pretty significantly low hemoglobin, it’s in the red, hemoglobin.

We’re looking at things not in isolation. I showed the TIBC ferritin and the transferrin as follow ups but remember we talked earlier, usually when the iron is low, it’s stage II or beyond. We don’t know if it's a stage III, likely it's not at this point but it might be. She may have a superimposed B12 deficiency or folate deficiency.

Let me just review that again. When we're looking at anemia cases, you look at the iron first of all and hers is 67 here. So it's slightly low. It's outside the optimal range but not outside the lab range. On the left-hand side is actually low lab range. So the lab range is 40 to 180 on iron. Wow, that's a wide range. The tight range is 85 to 130 so she's outside the tight range, the optimal range but she's within the lab range. Look at hemoglobin. It's 11. That's outside the lab range which is 12 to 16. The tighter range that we're targeting for is 13.5 to 14.5, so significantly below. We want it to be a 13.5 and it's 11. Marginally low iron and significantly low hemoglobin or normal iron and low hemoglobin in the absence of B12 deficiency, I'm suspicious that there basics needs to be addressed because B6 is needed to take the iron to oxygenate it and make hemoglobin.

Okay, so in this case, I would follow up with the extra step, the TIBC and the transferrin saturation. I would also start working with this person on their B6 status very easy to do. I would look at their iron stores, I get their iron stores up. I probably would do something like yellow dock some kind of really nice organic ionic form of iron that's easy to absorb. I do it for three months and then go back and run the CBC again and the iron. To get back to this, I'm suspicious that B6, possibly the B12, folate thing because the MCV is normal and I would be looking at supplementing their iron, supplementing their B6, going with cofactors so get a really good iron that has some cofactors or to do some other things. There's some good irons like Raw Vitamin Code makes one and I think that *Perque* makes one that's got a lot of other factors in it and those tend to be the best way to support iron or you do the iron like an ionic iron, or yellow dock and then make sure that you've got the B12 and the folate handled.

That's kind of where I would go with this one. Here's another case of anemia. In this case, the iron is super low like 16. This is severe low. We don't have ferritin in on this person so we definitely want to see it. The hemoglobin is severely low at 11.3. The hematocrit is 33. Okay that's severely low. The hemoglobin, I mean red blood cells are 3.79. They're in the red range so everything is severely low here except the MCV. With all these severely low things with the MCV normal, I am super, super looking for B12 and folate especially with an RDW at 16.2 since there's a lot of variation in the red cell size, a lot.

In this case, yes there's an iron deficiency needs to be addressed, needs to be addressed right away. I would look at B6 just because I use that when I'm using iron supplementation, I like to do iron, B6, B12 and folate together. In this case, I'm very suspicious of that because we should see if there wasn't a superimposed B12 or the folate problem, we probably see that MCV in the 75 or even lower range.

Let's look at this one case three, so we're going to start looking at the iron. We have an iron of 125. It's perfectly normal. We have an RDW is 13.2, so that's in the yellow range, that's out of the range. It's slightly higher than we like to see. We look at the MCV and the MCV is 89. It's perfectly normal. We see the MCH, it's 31.

MCHC is a little bit high so we want to look at the other markers. Red blood cells are normal. Hemoglobin is normal. Hematocrit is normal. We want to look at the ferritin to see what's going on here but we want to find out why is this … What's going on here? What's going on here? This is not real clear cut. It's not as real clear cut as the other one. I would want to look at the ferritin because it's not real clear what's going on here.

Iron's super good, MCV is super good but the RDW is slightly high, slightly high so not a terrible situation but in this situation, they probably look at the whole picture and then just keep monitoring it. Because iron's good, all the numbers are good except RDW is a little bit high, MCHC is a little bit high. This is a kind of check and see, probably nothing really serious going on but it's a check and see and just watch the pattern. We look at our RDW, it's 13.2. It's just like the last one so it's slightly high so we know there is some anemia going on.

Ooh, what's happening with iron? It's 169, it's pretty darn high. What's happening with her red blood cells? Normal. Hemoglobin, normal. Hematocrit, normal. Look at her MCV, 93 so iron is high, MCV is high, MCH is high, RDW is slightly high. This could be a B12 deficiency and it could be iron excess. If we look at the iron at 169 and we look at hemoglobin at 14.3, the hemoglobin's at the high-level so I'm not even suspecting like oh it's a B6 problem, the conversion. I'm thinking, what's going on? I want to look at her ferritin to see what her ferritin is.

Ferritin is not often done, it's a really important one when you're thinking and suspicious of anemia. In this particular case, I would have them, I would look at the ferritin and I would start to look at supplementing with the Vitamin B12. I'd look for other signs of B12 that would support that. I might want to do an MMA, methylmalonic acid. When you're suspicious of B12 or folate deficiency from an MCV and you wanted to see how can I confirm that, you could do a serum B12 or a serum folic acid or folate but those aren't necessarily accurate because it doesn't reflect the tissue stores.

What we want to do is functionally see if we have enough of the B12. There's two tests, one is homocysteine and homocysteine is indirect, it could be a folate deficiency, it could be a B12 deficiency, it could be a B6 deficiency. It could be an MTHFR genetic problem, it could be a CBS genetic problem and we'll look at that when we do genes. It could be genetic things in the pathways, in the methylation pathways or it could be any of those three nutrients. We don't know for sure.

The MMA test, methylmalonic acid is very specific to B12. In fact, it's considered the gold standard of checking for B12 and B12 deficiency anemia. You can do that in serum or you can do it in urine. I usually do it in urine, so you run the urine, they look for the methylmalonic acid and if it's high, then you know that there's some sort of B12 impairment because it means that that pathway is blocked at that point, you can't take it past that point because you don't have enough B12 so it's a very good indicator.

That's how I would do it and how I would confirm in cases where I'm suspicious. A lot of times, we don't run a lot of extra test because people don't want to spend the extra money. Usually we run those test when they don't respond as you think they should. You look at this, you add the B12, you add some folate, add some B6 and you see what happens. If that iron stays high and the ferritin is high then I'm looking at the tendency towards hemochromatosis that's creeping up in that direction. That's the end of our anemia presentation and we're going to move on and look at other things that you get in the CBC when you look at infectious disease.