**Anterior Ischemic Optic Neuropathy**

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Anterior Ischemic Optic Neuropathy (AION) is a very important topic for us as optometrists because there are a lot of clinically relevant implications for the patient's ocular health as well as their systemic health. Often times, I feel that optometrists are scared of this, or concerned that they are missing the diagnosis or not handling it properly. So after this next hour, I'm hoping you will feel much more comfortable and confident in diagnosing and managing Ischemic Optic Neuropathy.

I'm specifically breaking this down into AION because Posterior Ischemic Optic Neuropathy can happen, though it is very uncommon and you are unlikely to see much of that in your practice. So let's start with a case:

60 YO White Male who has sudden vision loss, and upon examination, unilateral optic nerve edema. This is a case that would be fairly common in most practices that see a good portion of elderly patients.

So, what do we do now? There are 20+ things that can cause optic nerve edema. This lecture is going to help you become more comfortable with the two most common reasons for optic disc edema. What I'm not going to do in the next hour is talk about bilateral optic nerve swelling – that has a whole new differential and a whole new diagnostic course you are going to go down. This just covers unilateral vision loss, unilateral nerve swelling, which is probably much more common than the bilateral nerve swelling.

There are four main causes of insult to the optic nerve that can cause unilateral optic nerve edema: vascular, ophthalmic, inflammatory and compressive. With compressive, we are thinking more along the lines of thyroid- or orbitopathy. We are thinking along the lines of a tumor, like glioma or hemangioma. Inflammatory could be optic neuritis or other infectious agents such as syphilis. Ophthalmic could be Central Retinal Vein Occlusion (CRVO), drusen, and other things of this nature could cause the nerve to swell. What I want to focus on today is the vascular causes. Again the two main causes for this are Arteritic Ischemic Optic Neuropathy (AION) and Non-Arteritic Ischemic Optic Neuropathy (NAION).

**Arteritic Ischemic Optic Neuropathy**

So let's start with AION. This is caused by Giant Cell Arteritis (GCA). What we know about GCA is that it's an immune-mediated vasculitis which affects medium and large arteries. The way it affects the eye is by affecting the posterior ciliary artery (most common), the central retinal artery, and the ophthalmic artery (least common). The posterior ciliary artery is the most common, and this is considered a medium-sized artery, which is why GCA will target it. It can lead to anterior nerve ischemia, which leads to the edema.

Oftentimes there is confusion about GCA when we call it Temporal Arteritis and the confusion is how does the temporal artery affect the optic nerve? There is no blood flow to the optic nerve from the

temporal artery, so what's the connection? The connection is that GCA affects medium and large arteries, and the temporal artery is very commonly affected, just as the posterior ciliary artery is commonly affected. Again, this ischemia will lead to the nerve swelling.

These patients will have a sudden, painless vision loss. Sometimes they will also have amaurosis fugax. The statistic on this says that 31% of patients will report amaurosis fugax symptoms before they get the Ischemic Optic Neuropathy. Now let's take a moment to clarify something here. I'm not saying that 31% of patients with amaurosis have GCA. What I'm saying is that of the patients who get AION that is from an arteritic cause, then 31% of them had preceding amaurosis fugax. It's not like your patient with amaurosis will come in and you should do lab workups on every one of them looking for GCA. When you question the patients with swollen nerves, you'll find about 1/3 of them will have preceding symptoms. GCA occurs when the patient is 50 years and older and has a strong predilection for patients who are 75 and older. So, while it can occur in patients 50 and 60 years in age, as we get older, it increasingly gets more common. Of the patients 50 years & older, who have unilateral nerve edema, about 1 in 10 of those will be from Anterior Arteritic Ischemic Optic Neuropathy (AAION).

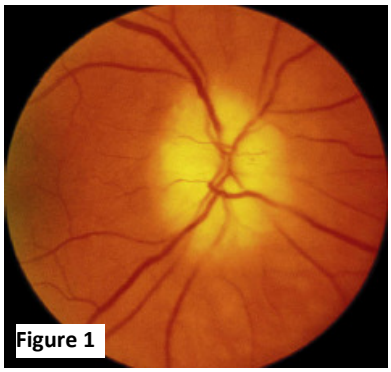


**Figure 1**

What we see in Figure 1 is a picture of optic nerve edema. I apologize because it's difficult to see this without stereopsis, and it's difficult to appreciate the swelling that's there, but there are some clues that there is swelling: the vessels around the nerve are obscured, there are blurred disc margins, and it looks generally like it may be coming towards us, and may be a little bit out of focus. What a lot of experts will say about AAION is that the optic nerve disc has this chalky white pallor, whereas NAION or other swollen nerves will have a more hyperemic or fully-colored optic disc that is swollen. I have to say that in my experience, I haven't been able to use this as a clear differentiator between AAION and NAION, but I believe that someone who sees quite a lot of this, like a neurophthalmologist, would have an easier time differentiating based simply upon whether there is pallor present or not.

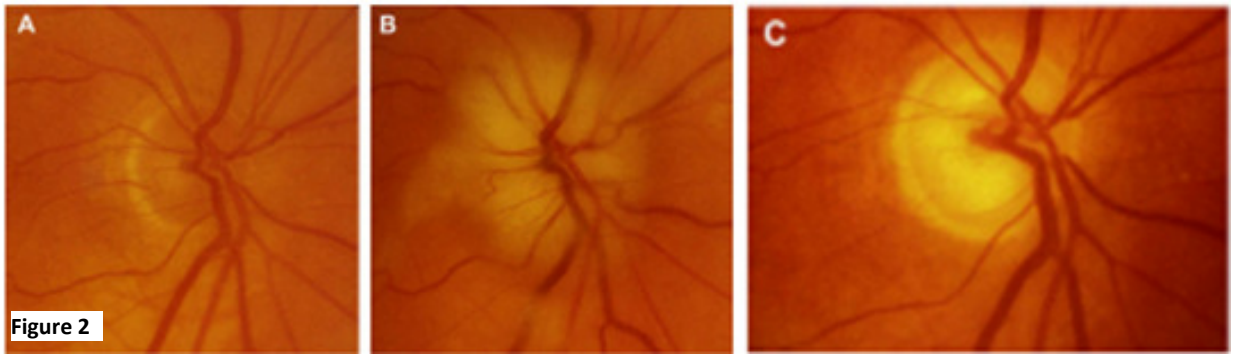



**Figure 2**

Figure 2 goes through the abnormal progression of an eye that goes through AAION. Picture A will see a normal looking nerve, healthy, everything looks fine. Picture B shows that chalky, white edema. In picture C we see some atrophy. Especially when you compare picture A to picture C, it is easy to see the atrophy of the optic nerve. This is not common with other swollen optic neuropathies, to see atrophy after the swelling goes away – it is much more common with AAION. NAION does not get this. We

cannot look at the patient in picture C and say, “Oh, he must have had AAION.” It will not help us differentiate at the time of diagnosis. It is just important to note in clinical care in the future as the patient is monitored, especially as we keep track of the other eye to try to keep it healthy. We may be confused into thinking this is a glaucomatous optic neuropathy when it’s simply excavated nerve because of the AAION.

Why is it so important to take the swollen optic nerve and differentiate it between AAION and NAION? There are a couple main reasons, the first being that there is such a profound vision loss with AAION that patients will typically be around 20/200 or worse, which is much more profound than other causes of a swollen optic nerve. The most pressing and scariest idea is that it can become bilateral in about 2 weeks in 1/3 of patients who are left untreated. The other reason is that there are systemic complications, systemic disease, that can lead to death. Myocardial infarction and cerebrovascular accident are two that come to mind as big complications with medium and large-sized arteries becoming inflamed. The most important thing to keep in mind is that this is all treatable – we can prevent a lot of this. We cannot bring back the profound vision loss, but we can prevent the other eye from being affected. We can curb some of the systemic complications, as well.

How do we diagnose AAION? There are four basic things. Age, typically 50 years and older, though much more common in those age 75 and older. We could use the fundus appearance, as we talked about, the chalky white pallid nerve edema. I don’t know if that’s something that I personally would rely on specifically, but it could give us clues. Systemic systems, which we will discuss later, will guide us, as will special testing.

With systemic systems, we are taught that there are many symptoms a patient with GCA could have. But what Dr. Hayrah, (Hayrah SS, et al. Giant Cell Arteritis: Validity and Reliability of Various Diagnostic Criteria. Am J Ophthalmol 1997; 123:285-96) an ophthalmologist at the University of Iowa, found is that there are some symptoms that are more likely to be present in patients with GCA than in others. The way he went about this was that he took patients with unilateral swollen nerves and 50 years old or older, and basically tried to differentiate between AAION and NAION. What he did was a temporal artery biopsy on all of them, and treated that as the gold standard for finding GCA. Then he asked the patients questions, examined the eyes, and did a lot of special testing. He tried to find characteristics of the eyes that had AAION that were different from the eyes that did not have AAION.

Some of the pertinent findings he had regarding systemic symptoms are as follows: He found that jaw claudication – patients who had this were 9 times as likely to have GCA than those that did not have that symptom. Neck pain patients were about 3 times more likely and anorexia patients were about 2 times more likely to have AAION as opposed to patients who did not present with these symptoms. Less predictable but still important were headache, fever, scalp tenderness and malaise.

Now, you are probably finding this a little surprising, as I did, that headache is on this list. We are taught is very important and very predictive of GCA and thus we should pay attention to it. What Hayrah found was that the NAION and the AAION patients were equally likely to have headache symptoms. (AAION: 46%, NAION: 54%) This could be very misleading. For example, AAION accounts for 1 of every 10

unilateral swollen nerves in patients 50 years of age and older. But NAION accounts for 9 out of every 10. Thus, if half of patients had a headache, you're 9 times more likely to find it in an NAION patient than an AAION patient. So, if you rely solely on headache, you will be wrong 9 out of 10 times. But headache can play an important part because Hayrah found that the average number of symptoms in a patient with GCA was three. This is very important because it means GCA patients typically manifest multiple symptoms. This can aid us in our diagnosis. It will most importantly affect how we interpret our lab work. For instance, if we have a patient with headache and anorexia, we may be less inclined to interpret some equivocal lab results favorably than if the patient had jaw claudication, neck pain and a headache. So three symptoms, some that are very likely to be associated with AAION may push us over the edge in lab results that are borderline.

**Table 1** **Objective tests to differentiate AAION from NAION**

| | | |
|---|---|---|
| Most reliable | Labs | ESR, CRP, CBC |
| | Fluorescein Angiography | Slow choroidal filling |
| Limited benefit | Imaging | Ultrasound, PET, MRI |
| Gold standard | Surgery | Temporal Artery Biopsy |

However, it isn't like we are going to treat based on symptoms alone – we have other diagnostic cues we can use. There are many ways to test for GCA, and some are more reliable than others, as listed in Table 1. The most reliable are the lab tests because they are cheap, quick, and have very good sensitivity and specificity.

Fluorescein Angiography is something that is not used very often to differentiate AAION from NAION. Some experts will say there is a classic delayed choroidal filling due to the posterior ciliary artery inflammation. Again, this is something that in my hands I don't think would be very useful. You, however, may have more experience with this or the person you refer to may have more experience with this, and they will be able to use this with more accuracy than I personally would be able to.

Ultrasound, PET and MRI all have limited benefit in differentiating patients who have GCA.

The temporal artery biopsy, as I talked about earlier, is still considered the gold standard. It is the go-to if we are not 100% certain or things are equivocal. We will talk about when this is warranted shortly.

You notice when we talked about labs I mentioned Erythrocyte Sedimentation Rate (ESR), C-Reactive Protein (CRP), and Complete Blood Count with differential (CBC). So CBC is a very important piece of lab work because it can affect lab values. For example, one of the main ways it can is in anemia, which can falsely elevate ESR. If we are looking at the CBC and we see the RBC count is low, we may interpret the sedimentation rate to be falsely high, and the patient may not have GCA. Other things that can falsely elevate the ESR, as well as the CRP, are inflammation and infection. We need to have this vital piece of information, the CBC, so we know we are not getting a false reading based on other things that are going on in the body, such as other infections or blood dyscrasias.

Let's talk about ESR. ESR stands for Erythrocyte Sedimentation Rate. What Hayrah found was that when his patients had 33 mm/hour or greater of sedimentation, they were much more likely to have GCA than if they had lower values. We know that the normal values for men over 50 are 20 mm/hour and for women over 50 are 30 mm/hour. (Fig 3)

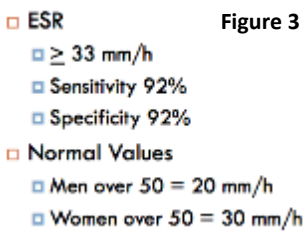



**Figure 3**

The way they take ESR is the lab takes the blood in a vial, and let it settle for an hour. They then measure how much of those RBC's settle in the bottom of the test tube. Based on how much sedimentation, we can extrapolate that if there is more sedimentation, there is more inflammation. If there is less sedimentation, there is less inflammation. Hayrah found was that the sensitivity and specificity were both 92%.

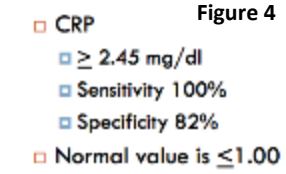
Let's take a brief moment to back up and let's define sensitivity. Sensitivity is the ability of a test to correctly identify those who do have the disease. So in this case, ESR has a 92% capability to find those who do have GCA. Specificity is the ability of the test to correctly identify those who do not have the disease. In this case, who does not have GCA. If we have a low specificity, that will increase our false positives. If we have a low sensitivity, that will increase our false negatives. Ideally, we like to have both of these readings as close to 100% as possible, especially in GCA – you really do not want to miss or over-diagnose this.

Why is that? If you have a test with low sensitivity, and you are under diagnosing GCA, you have the potential that your patient has a bilateral blinding disease. If your specificity is low and you over-diagnose GCA, giving you lots of false positives, you run the risk of over-treating a patient. As we talked about earlier, 9/10 patients with a swollen nerve over the age of 50 have NAION. As we will talk about later on, most of these patients also have diabetes, hypertension, and other vasculopathies. So, when we start introducing high-dose steroids, which is the treatment for GCA, we can really throw off those values and can really mess up the patient's quality of life. We really want to be accurate and get this right.

The way Hayrah arrived at these numbers is, again, he took all of his patients, did a temporal artery biopsy, collected all of the labs, and used the temporal artery biopsy as a gold standard to say 'Yes, the patient has GCA' or 'No, the patient does not.'

Dr. Hayrah also used CRP, or C-Reactive Protein. What he discovered was that if there was 2.45 mg/deciliter or greater, he found that those patients were more likely to have GCA. Normal value in the population, which we don't have for ophthalmic reasons, but we have for cardiac reasons, is often noted in literature as less than or equal to 1.00 mg/dl. (Fig 4) This is a pretty elevated level that Dr. Hayrah found. He also found a 100% sensitivity, which is very good. The trade-off, however, is a very poor specificity. Thus, if we lose CRP alone, we would have a very high false positive rate for GCA, which is just not good enough.

**Figure 4**




What Dr. Hayrah did was decided to combine the ESR and CRP results, and he found some dramatically different numbers. Sensitivity went up to 99% and specificity up to 97%. This changed everything – what a huge change in medicine based on this study alone. What he found was that we can use these labs and not have to do temporal artery biopsy on everybody. Before this study, anyone suspected of having GCA was sent in for temporal artery biopsy. Now, while temporal artery biopsy is not a difficult procedure for a patient to go through, it is not benign; the procedure includes risks of infection,

bleeding, necrosis, and cost to the patient in time and money. We should be sensitive to these issues and realize that it's not for everybody.

There is still an indication for temporal artery biopsy. If there is a clinical suspicion based on the age, the nerve and the patient's symptoms, we can use the labs. If things are still a little bit shaky, then we can rely on the temporal artery biopsy. So again, it is a case-by-case decision in patients where things just aren't adding up but we suspect GCA. If everything is stacking up and looking like GCA, I don't feel that it's necessary when labs, symptoms and presentation alone can guide me to my diagnosis.

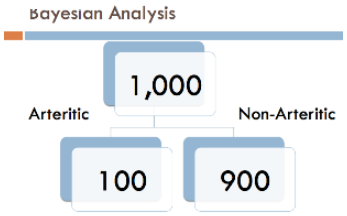
We have to consider the unaffected eye for two big reasons. Number one is that it gives us clues for the diagnosis. I'm going to introduce to you a new way to think about examining the patient that adds even more confidence to our diagnosis of GCA. The other thing is that we need to make sure the other eye stays healthy, because often times it's the one good eye that we will need to keep healthy for the duration of the patient's life.

Bear with me while I teach you a novel way to look at the optic nerve in ION to guide you through an exam and to give you more confidence in diagnosing GCA. What we know about the cup-to-disc (C/D) ratio in the average population is that the C/D ratio is about 0.4. That is the mean. We don't have data on the median, but based on my clinical experience I think we can all come to the conclusion that the median is also very close to 0.4. What we also know is that the contralateral C/D ratio in patients with NAION is about a 0.3 or less in 75% of patients. It's important to look at the other eye because in NAION it's not like you can look at the swollen nerve and with confidence say 'This used to be a 0.3 or a 0.2 or a 0.1' – we have to look at the other eye. We also know that C/D ratios within the normal population are quite symmetric. It's reasonable to assume that the 0.3 in the NAION eye is the same size as the 0.3 in the non-NAION eye, or at least it was prior to the swelling of the optic nerve. In NAION, we know that patients often have small optic nerves and oftentimes this is called a 'disc at risk.' We will get back to 'disc at risk' later, it overstates a lot.

- Average C/D in Population = 0.4
- Contralateral C/D in NA-AION
  - 75% are ≤ 0.3
  - 33% are ≤ 0.15

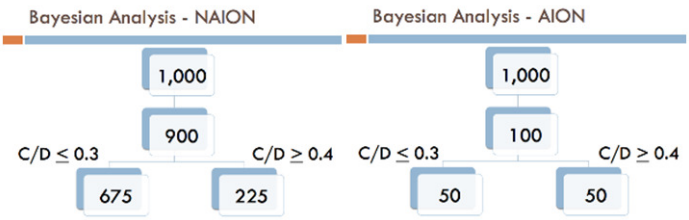
**Figure 5**

**Figure 7**




Bear with me – there's a lot of numbers coming along. Figure 6 is what we call a Bayesian Analysis; it's taking a fake population that we've made up. Let's say we have 1000 patients that walk in to your clinic over a given amount of time. Based on the statistics we talked about earlier, we know that 1/10$^{th}$ of those over the age of 50 have AAION, and 9/10$^{th}$ have NAION. If we had 1000 patients, 100 would have AAION and 900 would have NAION.

**Figure 6**




Of those 900 patients with NAION, 75% of them in the contralateral eye would have a C/D ratio of 0.3 or smaller, so 25%, or 225

patients, will have a C/D ratio that is 0.4 or greater. (Fig 7)

Now, with AION, there is not a predilection for a certain C/D size. AION will affect patients both above and below the average CD, so we can assume that of those patients with a cup size of 0.4 and greater, compared with those with a cup size of 0.3 or less, there is a 50-50 split.

Here's where it gets a little confusing. Figure 8 shows on the left hand side the 100 AION patients out of our original 1000. Half of them have a C/D ratio of 0.3 or less, and the other half have a ratio of 0.4 or greater. Of the 900 patients with NAION, 75% of them will have a 0.3 C/D or less, and 25% of them will have a ratio of 0.4 or greater. We can combine these numbers, and arrive at a meaningful conclusion.

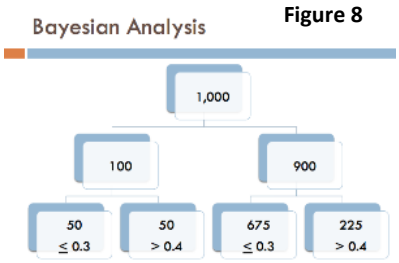


**Figure 8**

If we have a patient with a swollen nerve who is 50 years old or older, and the other eye is a 0.4 or larger, 1/5 will be AAION. If the nerve is 0.3 or smaller, 1/15 will be AAION. We cannot make the diagnosis simply based on looking at the contralateral eye alone, but we can add this information to our other information, such as age, symptoms and the labs, and be much more confident in our diagnosis. This is something that optometrists can and should diagnose. AAION is within our ability to diagnose and we should be able to be confident. Thus, instead of the earlier 1 out of 10 patients with a swollen optic nerve having AAION, if the C/D ratio on the contralateral eye is 0.4 or greater, we are looking now at 1 out of 5 patients. This can boost our confidence.

Let's take a patient example. We have a patient with a swollen optic nerve. They are over 50 years old, their labs add up, their systemic symptoms add up, and their contralateral C/D ratio is 0.4 or greater. This is a home run – this patient has GCA. We should start treatment and referral.

However, if the patient has borderline values, let's say their labs are borderline, they have only a symptom or two, and the contralateral optic nerve is 0.3 or smaller, it is not very likely that they have AAION. This may be someone who would benefit from a temporal artery biopsy.

Now, let's say their labs are normal, their systemic symptoms are nonexistent, and their C/D ratio is small. I think we can look at this patient and say with confidence that they do not have GCA and send them on their way. Just like we would look at a glaucoma patient who has normal pressures, normal nerves and a normal visual field, or maybe a larger cup than normal but still the normal pressures and normal visual field, we would send them home, and possibly monitor them. We could confidently make the diagnosis of glaucoma based on our exam findings. It is the same with GCA – we <u>can</u> make this diagnosis.

Now, I keep talking about lab values. I order labs every single time. Part of this is because I'm at the VA. The other part of this is that I don't want to miss this. This is very serious, and as we've talked about before, can have very serious repercussions for the patient. Thus, I am checking for this every time. I would get to know your local lab, whether it is at the hospital you're at, if you have hospital privileges at the closest hospital, or if you are at a teaching facility you may have a lab close by. Definitely get to

know them and be in close contact with them, because we can get these results within an hour. The sooner we get the patient into the arms of someone who can treat them, the better off the patient will be.

A common question at this point is why not just refer the patient? There are several reasons. The first one is that, as optometrists, we should be diagnosing this. GCA is within our capabilities and we can do this. The other reason is that the closest MD may not be close enough. You may be in a rural area that doesn't have ready access to an ophthalmologist or rheumatologist. It's also possible that even if you contact an ophthalmologist and they can get them in, they may not be able to get the patient in soon enough. Ophthalmology and optometry tend to take GCA very seriously, while rheumatology and primary care do not view it quite the same way we do, so they may not get the patient in as soon or get the patient treated as soon. Thus, if you are referring to someone else, you may not get the patient in soon enough. The tools that I am giving you today will help you gain confidence so you can make this diagnosis and get the patient into the right hands as soon as possible.

Now, speaking of cup to disc (C/D) ratio, there is some evidence that says that instead of 75% of NAION patients are less than or equal to 0.3, in truth 90% are. (Doro S, Lassall S. Ischemic Optic Neuropathy Arch Ophthalmol 1985; 103:1143-1144) This skews our numbers even more. According to this, 1 in 17 would have AION if they had a swollen nerve and the contralateral nerve cup was 0.3 or less. But, if it was 0.4 or greater, then it would be 1 in 3. Again, sorry for all of the confusing numbers. You don't need to memorize the 1 out of 3, 1 out of 17. The main picture I'm trying to get across is that we can use the contralateral eye to aid our diagnosis and to be more comfortable.

We talked briefly about Rheumatology. The American College of Rheumatology has a list of criteria (Fig 9) where a patient has to meet 3 of the 5 criteria to meet the diagnosis of GCA: Age over 40, new onset of headache, scalp tenderness, ESR over 50 mm/hour and a positive temporal artery biopsy.

**Figure 9**

Need 3 of the following 5

1. Over 50 years of age
2. New onset of Headache
3. Scalp tenderness
4. ESR > 50 mm/h
5. (+) Temporal Artery Biopsy

Now as I alluded to just a moment ago, Rheumatology views GCA much differently than ophthalmology and optometry do. The way they view it is that it's a condition of inflammation, mostly affecting the joints, giving aches and pains to the elderly. They don't view it as a potentially life-changing, vision-altering condition. That's why they don't have as strict of criteria as we do. The other thing is that they aren't seeing patients with swollen optic nerves. We are, which guides us down the path of looking for GCA, whereas they see a patient with achy joints. They may not see the potential for blindness. I don't think we need to follow these criteria but be aware that it's out there. The biggest reason we should use it is that it's just not good enough. These guidelines come with 94% sensitivity and 91% specificity, which is just not good enough.

So let's return to our case. As we talked about earlier, we have a 62 YOM with sudden vision loss and unilateral optic nerve edema. What do we do now? I think we have some tools and an idea of what we should do for this patient. The first thing we should do is look at the other eye, ask how the C/D ratio looks. We should ask about systemic symptoms: jaw claudication, neck pain, anorexia being top on our

list, but we should also ask about fever, malaise and headache. Then we should order labs. Based on that clinical picture, we will decide whether we need to treat the patient or not.

**Table 2: Case Study AAION Summary**

| | |
|---|---|
| Patient entrance info: | 62 Year Old Male<br>Sudden Vision Loss |
| Exam findings: | Unilateral Optic Nerve Edema<br>Contralateral C/D ratio: 0.5 |
| Systemic Symptoms: | Headache<br>Neck pain |
| Labs: | ESR = 70 mm/h<br>CRP = 3.2 mg/dl |

The details on this patient are that the other eye has a C/D ratio of 0.5. He has symptoms of headache and neck pain. His labs are elevated much beyond Hayrah's criteria of 33 mm/h of sedimentation rate, and 2.45 mg/dl of CRP. (Table 2) This patient has GCA, and we should refer for treatment.

The way it works at the VA I am at is that the patient sees ophthalmology the same day, and ophthalmology starts the steroids. Usually it is 1mg per kg per day, which typically is 80-100 mg per day. So, we start the patient on a very high dosage and we do a very, very long taper. Often times I'll see patients 6 months to 1 year after the initial diagnosis and they are still tapering steroids. They get nitpicky at the end, possibly down to 7.5mg of steroids. This is not a benign treatment, which is again why we should be careful with this diagnosis. It's much more common to have NAION, which have diabetes and hypertension as risk factors. We need to be cautious.

There is no evidence that IV steroids are better than oral steroids so the mainstay is still oral steroids. There is no evidence at this point that tumor necrosis factors (TNFs) blockers or methotrexate or other immune modulating medicines will help any more than oral steroids. This is a bummer for our patients – there are so many side effects of these oral steroids over the years; anything from worsening diabetes to psychotic episodes. You will see these patients come back and they've gained weight and you can just tell from the moment they come in that they have been on high dose steroids for awhile.

**Figure 10**

Unilateral Optic Disc Edema
Systemic Symptoms
Labs
Other Eye
Temporal Artery Biopsy

Figure 10 gives us a clinical picture of a patient with AAION. They have unilateral optic disc edema with painless, sudden vision loss. Their systemic symptoms are most predictably neck pain, jaw claudication and anorexia. The labs we should do are ESR, CRP, and CBC with differential. Looking at the other eye will help give us more clues and confidence in our diagnosis. We can use temporal artery biopsy. Again, if things are not adding up, the patient is the right age, the nerve is swollen, the labs are borderline, their symptoms are borderline, I would be ordering a temporal artery biopsy. But if everything stacks up pointing to GCA or not GCA, I don't think we need to order a biopsy. I think we can make that diagnosis in the exam chair with a little bit of help from labs.

## Non-Arteritic Ischemic Optic Neuropathy

We are now going to move on to Non-arteritic Anterior Ischemic Optic Neuropathy (NA-AION). What we find with NA-AION is that there is also a sudden, painless vision loss. In fact, 3 of 4 patients will wake up with the vision loss. It occurs in patients 50 years of age or older. Of those patients 50 years of age and older, 9 of 10 will be from NAION.

There are some systemic risk factors associated with NAION. The two most common are hypertension and diabetes. One that doesn't get talked about too much is nocturnal hypotension, but that can be a

very important one. Hyperlipidemia and atherosclerosis have been indicated, as well. This all makes sense when we think of an ischemic eye.

As we talked about earlier, NAION is more common in small C/D ratios. 75% of these patients have a C/D ratio that is 0.3 or smaller. 33% will have a C/D ratio of 0.15 or less. It's important to realize that a small C/D ratio is not the primary factor in why these patients get a swollen nerve, though it doesn't help anything. The proposed hypothesis is that the patients get nocturnal hypotension so the perfusion through the posterior ciliary artery to the anterior part of the nerve gets reduced. This leads to ischemia, which leads to swelling. Because of the small nerve, the swelling will congest the nerve, leading to further ischemia and edema. This is a vicious downward spiral where the eye gets worse and worse.

(41:42) Often we hear a term 'disc at risk' and it's catchy, but way overrated. The highest incidence of disc at risk in patients with NA-AION I could find was 10 per 100,000 patients. What is more common: a C/D ratio that's 0.3 or less, and never having NAION or having NAION in any size C/D? It's much more common for us to have a normal optic nerve that doesn't get NAION than for us to get NAION. The reason I bring this up is that I've heard patients be educated about their disc at risk and they are much more likely to have a normal, healthy eye for the rest of their life and not have NAION.

We know in NAION the visual acuity is much different than that in AAION. It is much more likely to have a good resolution. In fact, 33% of our patients end up with 20/20 acuity. Half of our patients end up with about reading acuity of 20/50 or better. Only about 1/5$^{th}$ of patients will get to 20/200 or worse. Contrast that to AAION where the vast majority of patients suffer profound vision loss of 20/200 or worse.

NAION can affect the other eye. In AAION, the other eye is affected within 14 days in about a third of patients. In NAION, about 17% of patients will have the other eye affected within 5 years. A common question I get in my clinic is 'What's the likelihood that it's going to affect the other eye?' I'm quite optimistic that it's not going to affect the other eye, and I tell them they have about a 1 in 6 chance, and most patients are pretty happy with that because it means 5 of 6 do not.

Often times we will hear about this 'classic visual field loss' in ischemic optic neuropathy, and you're probably thinking 'it's altitudinal' in your head right now. That's actually not correct. There is no classic visual field loss in ischemic optic neuropathy. Sometimes the loss is arcuate, sometimes it's central, sometimes it's ceco-central, and other times it's altitudinal. It really depends on what part of the nerve is affected. The reason I bring this up is because we can't really rely on the visual field to say 'Aha! This is NAION!' We have to rely on our clinical intuition and what the other eye looks like, systemic systems and things like this.

Let's go back to our original patient: the 62 year old male with sudden vision loss and unilateral optic nerve edema. What do we do now? Just like when the patient had AAION, we are going to go through the gambit. First we are going to look at the nerve and we are probably going to expect to see a swollen nerve that is a little bit more hyperemic as opposed to the chalky white. We are going to look at the other eye – it's cheap, it's easy, and all we need is the condensing lens and to think about it. Granted,

the patient has to have a normal other eye without optic neuropathy, etc. We look at the other eye, ask about systemic symptoms, and run labs. Then we will get a better clinical picture.

**Table 3 – Case Study NAION Summary**

| | |
|---|---|
| Patient entrance info: | 62 Year Old Male<br>Sudden Vision Loss |
| Exam findings: | Unilateral Optic Nerve Edema<br>Contralateral C/D ratio: 0.2 |
| Systemic Symptoms: | None |
| Labs: | ESR = normal<br>CRP = normal |

Let's say this patient had a C/D ratio of 0.2 in the other eye, and absolutely no systemic symptoms, and their labs were normal. (Table 3) Again, we can make this diagnosis. It's scary because what if we miss GCA and our patient goes blind? If you are thinking of the right things at the right time, asking the correct questions, and looking in the correct way, you will not miss these. It is 9 times as likely that your patient will have NAION, especially if they have hypertension, diabetes, or other systemic vasculopathies.

What if the patient was 50 years old and they had the same setup but no diabetes or hypertension? Well, I would be looking for other uncommon optic neuropathies rather than ischemic optic neuropathies. Especially in those 50-60 year olds, I would be much more suspicious of another cause, such as a tumor or other inflammatory condition.

As of now there is no proven treatment for NAION, and we should keep in mind that 40% of these spontaneously resolve. As I mentioned earlier, a third of these will actually resolve with 20/20 vision. What Hayrah found was what he called Insipient NAION. Patients come in with 20/20 vision, and they have a swollen optic nerve. In the past, we would call this Diabetic Papillopathy in all of our diabetic patients, but what will happen in these patients is that it will resolve. Sometimes it will get worse, but more often than not, it will resolve. The question in the past has been should we do anything with oral steroids, and the answer to that is no. We should not do anything with oral steroids. Hayrah found that of his very small clinical trial, some patients benefitted from using oral steroids, but he was criticized for having a small sample size, and a selection bias, and this study has not been repeated.

So what about optic nerve decompression? We have done a trial on this and what we found was that 24% of patients progressed when they had the decompression, compared with the 12% that progressed when left alone. Thus, it actually made the patient worse. It was a widely used treatment for many years, but now we know that it leaves the patient worse off.

**Figure 11**

- Unilateral Optic Nerve Edema
- Age 50+
- No Systemic Symptoms
- Systemic Disease
- Contralateral ONH $\leq$ 0.3

So what does the clinical picture look like in our NAION patient? Again, we have unilateral optic nerve edema. NAION is found in patients 50-65, but consider it in any patient 50 years old or older. The patient should not have any systemic symptoms, though Hayrah found half of the patients did have headache. These patients do have systemic disease, such as diabetes, hypertension, atherosclerosis, or hyperlipidemia. In the contralateral optic nerve, it is much more common to be a 0.3 or smaller C/D ratio. If all of these add up, we can call it NAION. If the data is equivocal, we should be considering a temporal artery biopsy to rule out AAION.

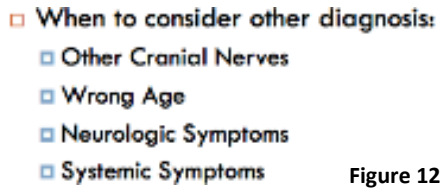



**Figure 12**

Again, just like glaucoma or optic neuritis, we can make this diagnosis in our exam chair. However, I think we should be cautious and consider sending a patient to neurology, neurophthalmology or general ophthalmology, if you're comfortable with your general ophthalmologist as a referral, if one of these following four criteria are present. (Fig 12) If there are other cranial nerves involved, any diplopia from a 3rd, 4th or 6th nerve palsy, any facial nerve problems with dropping or eyelid droop, if there is any sensation issues, or anything else that could be involved with other cranial nerves, we should be sending that off. If the patient is the wrong age – again, in patients 50-60 years old it's uncommon but it can happen. NAION is much more common in age 60 and above. Thus, if the patient is the wrong age and things are just not adding up, then we should refer. If there are neurological symptoms, such as slurring of speech, tingling, weakness, numbness, then these patients should be sent on. If there are any other systemic symptoms that worry you, we should be sending them on, especially if we are seeing a patient who doesn't have diabetes or hypertension, then we should definitely be passing them along. It may also be worth checking their blood pressure and checking labs for diabetes.

I hope in this last hour that I was able to give you some more confidence in your diagnosis and more confidence in your management of these patients. And I hope you learned a lot. You can do this – you can diagnose this and you can take great care of your patients.

Thank you for using Pacific University's online education program.

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