

A Non-Aerosol Caries Treatment Option: Silver Diamine Fluoride (SDF)

Video Transcript

Speaker - Jeanette:

Let me turn on my webcam so you can see me. Hey, good morning. Hi everybody. Thanks so much for tuning in. Thanks so much to Crest + Oral-B for sponsoring this talk this morning. It's very timely talk, so much to cover. So we're going to go ahead and get started. And just as a disclosure, I don't have any financial interest in any of the products that will be featured today. I have received speaking honoraria in the past from various companies like Elevate Oral Care, Oral Science, GC America, DMG America, NuSmile, DryShield, Procter & Gamble, et cetera.

However, they have no input on the content of my presentation. This is just the things that I actually use clinically in my private practice and what I recommend. I'm a big supporter of organized dentistry, shout out to ADA and ADHA AAPD and all the things that they're doing to help advocate for us in these challenging times. I think it's really important to support organized dentistry and either with your membership or if you can get involved on their committees, this is perhaps no better time than the present to do that. And of course, big supporter of humanitarian efforts to donate our time and talents to those individuals who may not otherwise receive care. So needless to say, here we are in the era of the Covid-19 pandemic. This is my office after we closed. I believe this was actually taken on St. Patrick's Day. I'm so very sad to see this empty... The stop sign on our door. So there's a lot of uncertainty. There's a lot of fear, anxiety.

So I just want you to know that I'm going through this with all of you and certainly empathize

with what we're all experiencing right now. But just know that we can lean on each other and support one another and we're going to get through this. We don't know exactly what things are going to look like six months, 12 months, 18 months from now, but we're going to figure it out and we're going to get it right. And we're going to keep our patients and their families healthy. Our staff, our team members are healthy and do the best that we can. And I miss my work family so much. We're not back yet. We're going to have our first on-boarding as they call it, just to get everything all up to snuff starting next week. And of course I miss my patients. I miss them so much. But we'll get back.

And of course, I've become known as an advocate for Minimally Invasive Dentistry, which is the topic for today, Silver Diamine Fluoride. And just as a disclaimer, I am a clinician. Like I said, I've been in private practice for 17 years now. 15 years at the same practice, private practice. So I do consider myself a forever student. And of course science is ever evolving. Isn't that like, you've heard that 500 times in the past month. "This situation is ever evolving, stay tuned." So we need to keep reading. Things are constantly changing now more than ever before. And people often wonder like, "How did you even get involved in advocating for Minimally Invasive Dentistry?" So I just like to share very briefly if you haven't been on one of my talks before. There's some key life events that changed the way I practice, of course becoming a mom. Happy mother's day to all the moms.

But to be more specific, my daughter had surgery under general anesthesia as an infant,

and that dramatically impacted the way that I empathize with parents and guardians when recommending sedation for their children. And, essentially just taking more time and care and consideration in the informed consent discussion and making sure that we truly review the risks, benefits, and alternatives to care. I also experienced a medical emergency with a young boy with autism that was undergoing IV sedation in my practice. He recovered and he's fine. But at that moment, it really was a wake up call to make me see, "What am I doing?" And just in general, I noticed that what I had been taught in residency, which I now like to refer to as the medicaid mentality, where it's just overly aggressive, one size fits all treatment planning.

I realized that didn't necessarily equate to better health. So it made me just look at things and question what I could do differently and what I could do better for my patients and for their families. Globally, care is a huge problem and the cost of care is very expensive. And, Oh my goodness, if you're like me and you've had to order PPE, if you can even find it lately, the cost is exorbitant. Like one disposable gown, \$10 times two. It's really concerning. It was concerning before this crisis. But especially now, because I see people talking about, they're going to be operating in the red. How can we continue, especially for kids on Medicaid, we were already operating essentially at a loss. But our PPO patients help float the Medicaid. So that's really scary now, when you see people saying, "I'm going to have to drop Medicaid." Because who's going to take care of these kids, these are the kids who really need us the most. But it's been a frequent headline.

And then this is an article that I was quoted in, in 2017 in the New York times just discussing the need for sedation. There's always going to be a need for sedation, but in many we can treat these kids if we get to them early enough and in noninvasive ways where we can either delay or avoid sedation altogether. And just examining the treatments that we are doing, we've had this Primarily Surgical Approach to clinical care for the past three decades. And this is a paper from the APD journal where

they found that there's lack of substantial evidence to suggest that restorative treatment leads to acceptable long term clinical outcomes. And there's certainly a need to go beyond drill and fill dentistry and integrate other concepts of disease management to ensure long-term success. And the simple fact is, we're never going to drill our way out of this behavior driven biofilm disease. It's a multifactorial disease.

So while fillings and crowns are important, they're beneficial. We're always going to need to do them. They don't actually cure the disease. They're just treating the symptoms of the disease. And when it comes to training children in particular, it's concerning when you consider, if you do gold standard pediatric dentistry in the operating room, you still see these relapses six months later, 12 months later, and they have new lesions. So again, unless we really look at the disease process itself, if we don't address the underlying problem, what are the behaviors? What are the habits contributing to this imbalance in their biofilm? It's like replacing the windows on a burning building. Shout out to Dr. Nicola Innes from Scotland for that analogy, I thought that was brilliant.

So my point here is as clinicians, we want to be a firefighter first. So caries is an imbalance in the biofilm where net demineralization is exceeding net remineralization. So we've got to get things back in balance. So be a firefighter first, control the biofilm. And the topic today, Silver Diamine Fluoride is something that allows us to do that. Let's say you see a patient, they've got four quadrants of treatment needs. You can't always fix all of that in one appointment. Now let's say, it's a child. Here we are going on month, two, three of being closed. And we have this backlog of patients. If you already were facing months of waiting time for the operating room, imagine what that wait time is going to look like now, it's scary.

Do we want to just let things get worse? No, let's put out the fire, control the biofilm, we can arrest and remineralize lesions with minimally invasive treatments like Silver Diamine Fluoride. And then we can be a carpenter second, so we can restore teeth as time, money and behavior allow. Shout out to my friend, Dr. Frachella

for that great analogy. This is a typical raging biofilm fire that I see it in Pito. Delicious, look at that lovely photo. So here's a kid, "Oh yeah, mom, I brush totally." It looks like he brushes below the brackets. That's nice. Drinking soda every day, eating all the chips and junk. And it's just so sad. But seriously, sure you can go in and pulp cord and put beautiful, perfect little resin composites in there. But if he doesn't change the behaviors in the first place, how long do you think that's going to last? Probably not very long. It's like taking a squirt gun to a forest fire. So we've got to get back to the disease.

I love this from APD, "It is now known that Surgical Intervention of dental caries alone doesn't stop the disease process. Additionally, many lesions do not progress. And tooth restorations have a finite longevity, therefore modern management of dental caries should be more conservative." And here it is in a nutshell, I wish this was required reading for all dental professionals. I'm sure if you've ever seen one of my lectures before I mentioned it, but this is open source, now online, you could find it, read it. But just looking at the oral microbiome and the dysbiosis, and really understanding the etiology of caries, as opposed to just focusing on procedures that we're doing to people. But rather how are we getting them healthy and what is the disease process?

And again, especially with children there's always going to be a need for sedation and general anesthesia in my profession. Just because unfortunately, a lot of these kids get to us when it's simply too late. But it's not without risk. So this could be the end of the road or the last resort where they absolutely have to have it, fine. But in many cases, if they get to us earlier enough or where we are not to a point of abscesses and irreversible pulpitis, let's utilize some of our minimally invasive treatments like SDF, Glass Ionomer, Hall Technique.

And conveniently, these are things that can be done without generating aerosol. This is a little boy that passed after complications from an in-office anesthesia. This is just tragic, period. There's always inherent risk in anesthesia, but what was really frustrating is the time this hit the media and it hit national news. But

especially all over the media here, was also when there was this announcement from the US Department of Justice that they had a \$24 million settlement with the Kool Smiles Clinics for Medicaid fraudulent billing and overbilling and et cetera. And that is just a bad PR period for our profession. It's just frustrating.

Because I know the majority of us are trying to do right by our patients to the best of our ability. But the reaction to this from parents is like, "I'm just not going to take my kid to the dentist." And that doesn't help anybody. I've actually had families drive up from Yuma to see me as a result of this. So we need to find a way to win back our patients and their trust and the true factors for at least the time being we're going to be looking like we're astronauts coming back to work. So that's scary too. Especially as pediatric dentists. But now we have this new concern with practice when we're dealing with Covid-19 and there's still that uncertainty, is it transmitted through droplet only? Or is it in fact airborne and we have to take airborne precautions and as it stands today, CDC and OSHA are both saying yes, take airborne precautions.

So when we use a hand-piece, when we use even the air water syringe or Cavitron, and even Coronal Polish, those do generate aerosol. So we need to wear the appropriate PPE, which is airborne precaution. And again, just think of all the costs associated with all the extra things. So if we can avoid having to wear all the extra things, it's going to be beneficial in many ways. So again, looking at what we've been doing and what it's actually been accomplishing over the past few decades we really haven't impacted oral health things are basically unchanged. And there's more disparity in the minority groups or in rural areas, underserved areas. However, our spending has increased from \$1 billion to \$7 billion. And then spending is expected to reach 15 billion by 2020. This is all going to get screwed up, because of Covid-19 because we're closed.

But the big point or big picture here is, oral health is not improving in concert spending and that's the problem. We can't just keep spending more money if what we're doing is not getting

people healthier. So learning and innovation go hand in hand, the arrogance of success is to think that what you did yesterday will be sufficient for tomorrow. So I hope that we take this time, I don't know how many of you are already back in practice, maybe at a reduced capacity. I don't know how many of you are not able to get back to practice just yet. So you're still in that preparation phase. But I hope to use this time constructively, productively and use it to reflect and introspect on what we could all do differently and better for our patients and for their families. So much like when I started my journey to Silver Diamine Fluoride, I kept hearing about it. I'm sure you've heard about it, maybe you're already using it.

But I just wasn't aware that this was an old treatment and just because it wasn't taught to me in dental school. So the point is, your education doesn't end when dental school ends or hygiene school or assisting school ends or dental therapy school ends, it's ongoing. So in 2014, the FDA cleared Silver Diamine Fluoride for the treatment of dental hypersensitivity. So technically, it's an off label used for caries. But that's the same clearance as Fluoride Varnish. I'm sure everyone here uses Fluoride Varnish, but exactly the same clearance. And then in the US, the first commercially available SDF product came out in 2015 which is Advantage Arrest from Elevate Oral Care. And they sell it directly.

And then in 2016, the FDA granted Advantage Arrest, the prestigious breakthrough therapy designation for Carie's Arrest which has led to the funding of NIH studies of US-based clinical trials. But there's plenty of non US-based clinical trials, which I'll show you. But the point here is, this is the only oral medicine to ever receive this special recognition. So new opinions are always suspected and usually opposed without any other reason, but because they are not already common. But is this really new? No, it's not. Silver nitrate is actually quite old. You can look back to the mid 1800s and see reports of silver nitrate used in dentistry. But to be more specific, in 1908 GV Black described using silver nitrate to treat caries in children calling it a first measure against the disease.

I think that's brilliant. Because it really can be a first measure. They think like a firefighter controlling the biofilm. The precursor to Silver Diamine Fluoride is that it lacks the fluoride component. So it couldn't remineralize the teeth. Now in 1909 GV Black discovered fluoride when studying the mysterious Colorado Brown Stain. So it was widely used in the early 1900s as well. In the US it became so popular that a former ADA president, Percy Howe... They started calling it the Howe solution. And it's really interesting, you can look back at these old JADAs from the 20s and see ads for silver nitrate. That blew my mind. This was like, "What are you talking about? I'd never heard of this before." But I'll meet friends who, let's say their dad was a dentist and they'll, "Yeah. My dad had silver nitrate. I know about silver nitrate."

And here's some kids lined up at the Forsyth Institute in Boston getting silver nitrate treatment. But in the mid of that century, and when we started fluoridating the water, we had better anesthesia, fluoride in toothpaste. I think we thought, "Fluoride is going to save the day." How's that turned out? Has it eradicated tooth decay? Heck no. Because now we have Gatorade and Sour Patch Kids, "Caries lives." It's funny how we shifted focus on fluoride. So that's where you see the decline in popularity of silver nitrate. But meanwhile in Japan, professor Emeritus Mizuho Nishino, she developed Silver Diamine Fluoride. So instead of saying, "Goodbye, silver nitrate. Hello fluoride."

She's like, "How about we use them in combination? Because the synergy of the two is even better." So shout out to women, we are ultimate multitaskers. We can't just do one thing at a time. We've got to do it all. All at the same time. She developed Saforide, which is the first Silver Diamine Fluoride product in Japan. It was approved in 1970. So it's been used for decades. So this is not new by any means and around the world it's used in many countries and what you can buy varies on where you're located. So of course in the US, the first one we were able to get our hands on was the Advantage Arrest product. This one you get direct from Elevate Oral Care. The second product, I think this either launched 2017 or 2018, I forget now, but this one was the second one. This was available

previously in Australia though. This was like the original. So Dr. Graham Craig, Dr. Jeff Knight, this is their idea and they own the original patent.

So that became available second in the US. But it's available, for example, in Europe, this is what you can get, let's see, FAgamin. I believe that one's Argentina, Cariestop is in Brazil. There's this e-SDF, I know a lot of colleagues in India use this particular one. There is CSDS which is also Graham Craig. So this is actually the ammonia free silver fluoride. The key is you want to make sure you're using 30 to 38%. So these have 38%, this is a 30, so you have to be careful. For example, there's a Cariestop that's like only 12%. And you have to be careful with the quality, because sometimes like in the US the FDA will do surprise tests of these products and make sure that they're meeting the claims that they're making. So, like, for example, they would make sure that it's the correct potency.

I'm familiar with a paper where they were using a Silver Diamine Fluoride product, and it was not the potency that was claimed. So surprise, surprise. The results were not the same. So you've got to be careful in that respect. Now, let's say you can't get your hands on this. Let's say, you're somewhere where they don't have this, or you just want to do DIY you could use silver nitrate which you can purchase through dental distributors. It has to be at least at 25%, but you could do DIY. But be aware of misleading marketing or online brands that are not subject to strict regulations on purity and concentration. Big picture here, use any brand that you like. I could care less. It doesn't matter to me. I'll tell you what I personally use, but use whatever you want. The point is, I just want you to give patients noninvasive options when clinically appropriate.

So let's look at Silver Diamine Fluoride, it's 25% silver. This is the 38% Advantage Arrest, which is the product I use. 25% silver, which has antimicrobial. 8% ammonia, which is the solvent that keeps it in solution, and 5% fluoride which of course is for remineralization. And it's the synergy of silver and fluoride that are better in combination than individually. And their main actions are to arrest, prevent caries and

of course, decrease hypersensitivity. The main mechanism of action is that it occludes dentinal tubules and it produces the more favorable fluorohydroxyapatite, which of course is more acid resistant and also increases the mineral density.

And this is what's unique, is the antimicrobial component and it actually helps inhibit biofilm adhesion on the surface of the lesion. And it does penetrate deep into tooth structures. So this is a great image from my friend, Dr. Jeremy Horst, formerly of UCF, where he showed the red lines are actually silver down in the two bills of the tooth. And then of course you have the distribution layer on the surface of the lesion, which helps to prevent further mineral loss or destruction of the tooth. And there is an abundance of evidence for SDF. I'm not even going to spend my time on these papers, but this is a highlight reel of some of the better review articles. Let's stop and just briefly look at this one. This is a systematic review and meta analysis, 89% more effective than other treatments or placebo, and here's that 30-38% amount.

So the deal is we now have evidence based guidelines, not only from the American Academy of Pediatric Dentistry, here's theirs, where they support the use of SDF and they support the off label use. This is perfectly acceptable and clinically appropriate. And I should point out this point is moot in Canada, where health Canada from the get go from day one, approved it as a caries treatment. Yay! Canada. I think that was 2018, the cover of the ADA journal. I was so excited when I saw this because think back to 2015, when I really was out there telling people, "SDF." And people were thinking like, "You're weird. Is this like hippie stuff?" So for me, it just helped normalize this as an evidence-based treatment option, but here they showed how yearly 38% SDF applications to expose root surfaces of older adults are a simple, inexpensive and effective way of preventing caries initiation and progression.

And just look at how happy they are. They're just loving life out there in sun city or wherever. And if you look really closely, I think

on the crown margin of 14, you can see her SDF. So ADA also came out with it's first ever evidence-based clinical practice guideline. The lead author on this was Dr. Rebecca Slayton, shout out to her. This is a fantastic thing. So this is an evidence based treatment. So I do hear from colleagues from time to time where they're frustrated, because let's say they're in a group practice, or perhaps they're in a public health clinic, and they're getting pushed back from the old guard, so to speak. So I'm sorry, but in 2020 with ADA and APD evidence-based clinical practice guidelines, if your head is still in the sand and you think this isn't legit, I don't even know what to tell you.

So this is also from ADA. They have a chairside guide, and were happy to contribute some clinical images to that. Here, let me look at time. I'm going to skip this. But they're going to come out with a series of evidence based clinical practice guidelines. They started with SDF because there was so much buzz around the topic. So they got the Disneyland FastPass. Key points of the literature: it's safe and effective, it's more effective than Fluoride Varnish. In fact, one SDF treatment is twice as effective as applying Fluoride Varnish every three months, i.e four times in a year. So that's amazing. It's more effective than Interim Therapeutic Restorations alone. It's most effective applied twice a year or biannual. If you lump all the studies together, because mind you, some of the clinical trials did once, and that was it. Or some did it every six months. The studies that had it biannually had the highest rates of arrest.

But if you lump them together, it's about 80% of lesions, not 100%, 80%. So it's not a cure all. And in the big picture, to me it satisfies the concept of the triple aim of care whereby it increases access to care because it is simple and low tech to do, and it improves health. It has this high efficacy and it reduces costs. Because it is simple to do. And when you do it in the non aerosolizing way, you don't need the full hazmat suit, the beekeeper suit. Because you can use droplet precautions instead of airborne precautions, because you're not going to create aerosol. Other things to consider, improving provider experience. Reducing stress

for the provider was important too. And now our new thing that we need to be aware of is, it reduces aerosol. Because you can do it in a non aerosolizing way.

So this idea is evolving and now they call it Quadruple Aim of Care where the missing link was Care Team Well-being. That's important. Especially right now, there is so much stress on providers. We need to give more time and attention to this critical element and our well-being, our safety, our health, our mental health. I do love that minimally invasive procedures take some stress off of me because they're quick, they're simple, they're painless and they're effective, the patients have a positive experience. So, it's great. And as a pediatric dentist and this really relates to anyone, any patient. They're going online to get information, which is good and bad. It's annoying when you have to deal with the Google MD where they're questioning everything. But, at the same time in this day and age, we can't just give one size fits all treatment plans because people can find out that there are other ways to do it. The example I like to give is I had a patient where both parents were physicians and another office in town said, "You have to do IV sedation, you have to do it right away."

I'll show you that patient's clinical case later. But the parents, they actually are MDs. So they did their own lit review and found Silver Diamine Fluoride, found me and came to me as a second opinion. So just remember that sometimes the Google MDs actually know quality evidence versus garbage from like some blogger. And there is increasing awareness of Silver Diamine Fluoride. The New York Times was a big one. PBS did a segment, I saw another spike of interest there. But my personal stance is this. It's not like I'm saying this is the end all be all. It certainly isn't, but it's one more thing that we can add to the toolbox, so to speak. But I still do everything and we're still going to need to do a little bit of everything. But it has dramatically reduced the amount of sedation that we need to do.

So that's huge because it will increase access to care and reduce costs and reduce risks.

And then of course I mentioned reducing aerosol. So we could still see a higher volume of patients when we eliminate all the extras. And the adoption has been pretty amazing, of Silver Diamine Fluoride. It's been faster than use of the high-speed hand-piece. So that's incredible. Alright, so let's get into it. How do you do it? So case selection of course is very important. It's not going to be for every patient, it's not going to be for every tooth. So use careful case selection and there's indications and contraindications, and those can be on the tooth level and on the person level. So I'll direct you to this article that I was really excited to have been asked to participate in. This is from the British dental journal, just a couple months ago. But I really liked the table here where the tooth itself just either could be asymptomatic.

Let's say it's a non cleansable lesion, or let's say there's a lot of lesions that you can't treat in one visit, this scenario of multiple quadrants. The example in adults, especially with our aging population, root surface caries can be very difficult to manage. So that's a great option. Molar incisor hypomineralisation or MIH, that's another great one. I'm going to show you that. And then on the personal level, perhaps it's a pre-cooperative child, let's say they're high caries risk, maybe they're phobic. And then as far as contra-indications, the only main contra-indication is irreversible pulpitis. If it's abscessed, SDF is not going to resurrect a tooth from the dead. I'm sorry, you're too late. So clinically radiographically, if there's pulpal involvement, it's not indicated. And now on a personal level, I thought that this was a nice way to point it out. If they're not willing to do their part, it's not going to be very successful. Because you have to do repeated application and maintenance, it's not one and done.

Now, depth of lesion, this tends to be a point of confusion. Because there seems to be this misconception out there that you can't use it in deep lesions. That's not true. I use it in deep lesions. It just can't have irreversible pulpitis. And part of that misconception is people thought, "Maybe it's the components of SDF that are problematic. Or maybe it's the pH that might irritate the pulp." But if you actually look at the literature, there's a histologic study

that looked and they found silver in the pulp. Like it gets in there, it wasn't necessarily a bad thing. And then as far as the pH, I've used the Advantage Arrest product, the pH of that is about 10. And if you think about things we actually use for direct pulp capping, this is not to be used for direct pulp treatment. No, you can use it indirectly. But for example, calcium hydroxide, it's the same pH. It's a pH of 10. Let's look at MTA. MTA, right when you mix it, the pH is 10.2 and then after it sets, which takes about three hours, the pH increases to 12.5. So this really is a misconception.

So for example, here's a kid I treated at 20 months of age. These teeth are asymptomatic, but radiographically people would look at this and think like, "Oh no, it's too late. It's too deep." But this child was asymptomatic. I did zero caries removal, did one treatment of SDF when they were just 20 months old and they didn't blow up. Like, I'll hear that, someone's like, "If you do that, it's going to blow up." It didn't blow up. And then 10 months later, I was able to do pretty conservative restoration. So we were able to avoid the general anesthetic, about by almost a year and the parents were so happy for this option because their other child had to have D, E, F and G extracted under GA. So I go into that in more detail. I just realized now I forgot to put the references. But the dimensions of dental hygiene is actually a two CE credit article that you can find online, practical guide to Silver Diamine Fluoride. And I talk about that in more detail about depth. So of course you need to obtain a form of consent, review the risks, benefits, and alternative to treatment. This is my consent form. You can download it off of kidsteethandembraces.com. UCSF has a great form with actual adult teeth like root surfaces. Dr. Horst has made that available online. I like to go a step further and give them a copy. Like, let's say they've never heard of it before, will give them a copy of the New York times article. And I find that it increases case acceptance, because they're like, "This is so cool." And also it helps with internal referrals or internal marketing because parents talk to other parents. You can download this for free off of our website. There's a SDF tab. And then further with informed consent. It's really

important to show before and after images of SDF treated teeth, because of course, SDF elephant in the room, it will stain active caries. It won't stain healthy enamel, but any active caries, it will permanently stain black until you either cover it or restore it.

So I like to show before and after SDF treated teeth, review the pros and cons. This is what we call our chairside guide. You can also download this off of our website kidsteethandbraces.com and use this for patient education. We have the proximal application and notice pros, cons. And then disclaimer, proper diet and oral hygiene, including daily flossing are critical for long term success. So we really need to make sure we're effectively communicating this with patients. We may have to make sure we as clinicians understand that don't think that, "This is like pixie dust and it's one and done and you just do it and walk away." Patients need to take ownership of their disease and do their part of it too. They're really the only ones that can truly control the disease process. I also have before and after SMART. Like let's say they're a little reluctant to do it because of the discoloration and I show them, once they actually cooperate. Because again, I'm mostly seeing kids, but once they're able to cooperate, I can always put an aesthetic restoration.

And acceptance is really high. I think that the mentality of people not wanting this is really coming from the dentist. We assume, because we like to make teeth look pretty. We think everyone's going to say no, but it's not the case. And especially when you look at parents, if the alternative is sedation or general anesthesia, there's even higher acceptance. Even if it means the anterior teeth. And Frosty is all about it. He's got his home teeth blackening kit. He loves him some black teeth. And then this is the quote from the New York times article where I said, people assume parents will reject it because of poor aesthetics.

But if it means preventing a child from having to be sedated or having their tooth drilled and filled, there are many parents who choose SDF. And I like to point out my patient Knox, who was four at the time, his mother is an MD

anesthesiologists, and they're from Scottsdale. If you're not familiar with Scottsdale's, theory, they'll say, lots of wealthy people. This was my subliminal message because one of my pet peeves is people will say that somehow this is third world care. Which that alone is offensive to say, "How about developing countries?" Or they think that this is for the Medicaid population or it's lesser care. No.

Clearly this mother has the money and the brain power to choose what she feels is best for her child. And this is what she chose. So the point is, present options that are clinically appropriate and empower the parent or the patient to choose what's right for them. And you will absolutely have patients and parents who are like, "I want sedation and cosmetic dentistry." "No problem. I got that." You will have some that are like, "I want to do just the minimum. I don't really care about aesthetics. This, that, and the other thing are going on. I'd rather do the SDF." et cetera. "Awesome. I have that too."

So think of it as having more items on your menu, more tricks in your toolkit and that way you can better serve your patient population and that will increase retention of patients. Because let me tell you, I do a lot of second opinions and people are not getting more than one option even when it is clinically appropriate. Oh, weird. I don't know why that looks a little blurry. This is a TeamSmile event. And I thought this was just interesting because they sent out consent in advance with before and after images of SDF treated teeth and 86% of the parents consented to using SDF more than any other treatment that we offered. And these are sisters that I did some SDF and smart on, this is after their treatment. And it was really interesting, because I started to get a line at the end of my chair.

Because parents, they watch and they're like, "Oh, they're not screaming and crying. I want what she's got." So here's your basic setup or what we call a kit. We assemble it like in a little plastic tub so everything's there, ready to go. And depending on how many chairs you have, maybe you need one of these for each chair, we have nine chairs. But these

are the basics. So at a minimum you want your SDF, of course armaments, and some of your cotton disposables. Now there's optional items as well, and you can just decide what's appropriate for you. But again, we're trying to do more with less. So it's not like you have to have everything. And then when it comes to the stability of the product itself, this is a great article from last year from Dr. Yasmeen Crystal, who is actually my co-lecturer for the APD. That's coming up on May 23rd, where we're going to talk about this as well as Interim Therapeutic Restoration Art and Hall Technique.

But she looked at stability over time. The takeaway from this, because I realize there's a lot of text on there, the takeaway is if you're using SDF frequently like I do, get the bottle, it's economically more logical because it's going to be less expensive. Now let's say you use it less frequently. Then I would go unit dose, but just to understand that unit dose will have a slightly higher cost obviously but at least the stability will be better. I've had people who are concerned with cross-contamination and I am sure people are more aware of that now than ever or concerned with that more now. So that's understandable. Certainly like in a dental school setting clinically, it's more logical to have the Unit dose vials. But for me, private practice where I do this or did this daily the bottle is the way to go because it's less than a dollar a drop.

So here's the basic protocol: protect your clinic and the patient. Eye wear, cover the surfaces. I like to put Vaseline on their lips and face. The tooth itself just needs to be clean. You don't need to do any caries removal. In fact, I recommend don't remove the caries period. Just get the plaque off. Now in our Covid world, non aerosol white way, you could use a micro brush to clean the tooth versus this rotary slow speed prophylaxis brush. Also recommend that the parent brushes the child's teeth before they come in, if it's an adult recommend that they brush and floss really well before coming in, if you're trying to eliminate aerosol. You want to isolate it really well with dry-aides and cotton rolls, and then you want to get the tooth nice and dry. So here I was treating the buccal of the lower left, first permanent molar or number 19 in the States.

Now that non aerosol version of this, or let's say someone has hypersensitivity, do you want to blast compressed air on their tooth? No. They won't be very happy with you. So the alternative to this would be to simply dry the surface with gauze or a cotton roll. Okay. You don't have to use the compressed air and you don't want to use the compressed air if you're trying to eliminate aerosol or reduce aerosol. So now you're going to apply the SDF to the tooth, using a micro brush for at least a minute up to three minutes. Use a plastic dappen dish, that's important because you don't want the SDF to react with the glass of those reusable dappen dishes. Use caution to only get it on the desired tooth and teeth. This is not Varnish. You're not getting cray, cray and swabbing it everywhere. It's site specific. And just saturate the lesion and then allow it to absorb by capillary action. I just make sure it's saturated and then I let it soak in. I do have colleagues that like to scrub it. Has it ever been studied one way or the other? No.

And now this is optional. We know we don't need this for efficacy. Oops, my bad. I do like to cover the SDF treated site with varnish at the end. So it's not necessary for the proven efficacy of SDF alone, meaning the clinical trials didn't add SDF at the end. It would be cool to have a clinical trial to compare one to the other. Because, I've been doing this for five years and I can definitely say it's not a bad thing. I would argue, it's a good thing. But I have no evidence, so it's anecdotal then. But anyway, why do some practitioners like to use it? For me it masks the poor taste and it improves the patient experience. I give this example, I literally can think of this cute little patient that I did full mouth, minimal interventions. Where she came to me just like, "I don't want the spicy medicine that the other dentist used."

She had a bad experience because somehow she tasted it or it got on her. And her knee jerk reaction was to freak out. We basically had to lie to her and be like, "Oh, I'm just looking." So she had no idea that we did the SDF. But yeah, it improves the patient experience. This is key too, it keeps it where you placed it. I don't see unwanted stains in areas that I didn't anticipate or want it, so that's important. Because you

don't want to do a molar and then accidentally end up with stain on, let's say a white spot lesion in the front. Another way to prevent that is apply varnish to those areas that you don't want affected first, don't contaminate your varnish brush on the SDF tooth and then drag it elsewhere. That would be a no-no. And there are some places where, in the interest of time, but anyhow, this is where you see it. In some other studies it's mentioned, Oh, this is critical though.

If you are DIY doing silver nitrate, you have to add the varnish to have similar efficacy. Don't rinse it. Don't blow compressed air while it's absorbing, don't light cure it. I know that was a pervasive, anecdotal thing out there. Don't like, cure it. Just allow it to absorb by capillary action. Ideally for at least a minute up to three minutes. Me personally, I do a minute and then I cover with varnish. Let's say there's a pooling excess of it. You could blot up excess liquid after it's absorbed for at least one to three minutes and then you take the cotton out and you're done. And just to show you, they had to update the package inside because there was some confusion. The rinsing confusion STEM from the UCF paper, the compressed air stemmed from the APD guidelines.

So just allow it to air dry, do not rinse. And notice, it does not say to light cure it. Light curing it will precipitate the silverodo solution and then immediately will turn any and everything, even the healthy tooth structure that it touched dark. Granted that it will all brush away, it would only permanently stain active caries, but it's a great way to freak out your patient. And of course if you're doing a same day smart, which I don't personally do, but it would immediately stay in the restoration as well. So I do have this basic application tutorial on YouTube. The YouTube channel is Affiliated Children's Dental specialist, or you can link to it from Kidsteethandbraces.com. Subscribe to my channel.

I know last night I uploaded the first non aerosol tutorial with SDF, which we're going to watch now. But I have already recorded non aerosol glass ionomers sealant, non aerosol glass ionomer filling. And then this afternoon,

I'm going to do non aerosol Hall technique. (music). Hi, Dr. MacLean here. I'm going to show you how to apply Silver Diamine Fluoride or SDF without the need of any compressed air or water syringe. So we're going to be able to do this without creating any aerosol. And our patient today is actually a repeat patient. It's my daughter Sabrina. She had Silver Diamine Fluoride applied before. Alright, you ready to start?

Speaker - Sabrina:
Mm-hmm (affirmative).

Speaker - Jeanette MacLean:
Okay. So first thing I like to put some Vaseline on their lips and face just so I don't get the SDF on them. Because it can leave a little temporary tattoo, like a henna tattoo that will disappear within a couple of days all on its own. Just depending how quickly their cells turnover, the skin cells. You can also get it off with hydrogen peroxide. Now we're going to isolate the tooth. Can you open a bit? I like to use dry-aides and cotton holes and you can see, open really big. See that little spot on the accusal, lift your chin up. On the accusal of her primary second molar. You can see that little groove, where she's had SDF treatment a number of times.

Speaker - Jeanette MacLean:
Okay. So we're going to now dry it off. We're not using compressed air. So you can use cotton to dry it, cotton roll, you could use gauze. Keep your little, silly tongue out of the way. So you want it nice and dry. Alright. Open really big. Okay. So nice and dry. And now we're going to apply it with a micro brush for one minute. Try not to allow it to get on their tongue. The flavor is rather unpleasant. And now we're going to allow it to absorb for one minute. Just a few more seconds left. So there's nothing else you need to do. If there is some excess pooling on the top, you can blot the excess with some cotton. Can you open really big so I can get the extra off. Thank you. So you can just blot excess and that's all you have to do.

Now, this is optional. It's not necessary for efficacy, it's just my personal preference. I do like to cover with a varnish. So this is FluoriMax

mint. We like to call it candy cane. So now you're going to carefully remove your dry-aide. And then this is a little trick I like to do, is I like to put the cotton roll over the tooth and then have them bite down on it. Cheese. Because that also helps them not have a strong reaction to flavor. Was that easy?

Speaker - Sabrina:
Mm-hmm (affirmative).

Speaker - Jeanette MacLean:
Yay. High five. All done. And I should just say, as a disclaimer to the PPE police, that's my daughter and there were no aerosols. So dropped the precautions. Really the only thing I upgraded there was just the fact that I was wearing a face shield. But let's say like if someone were to cough or sneeze, your face is covered. So be careful, some products have a higher pH. So you just want to use caution, like for example, you could get some soft tissue burn. So use caution with that. Just read the package insert. They'll tell you they need a gingival barrier or rubber dam. So like this is one product that suggests to use the gingival barrier or rubber dam. And this really goes along with the addition of a Potassium iodide because, there's claims that it can minimize or mitigate stains. But if you look at the literature, results are not long-term.

But I just wanted you to show, to point out, go to the website and look at what's on the actual package insert, and you'll see where it says, "Do not use on teeth with carious lesions." Because it's supposed to be a desensitizer due to potential stain, recommending don't use anterior unless diagnosing for caries, warn patients with... So just be aware. I don't care what you use, but understand what you're using. So I don't bother with the Potassium Iodide, because I always knew you could have it. Even before that product became available in the US I knew you could use it. You could add it, but I never did. Because I knew it decreased the efficacy of SDF alone. Like this zone of inhibition sample from my friend, Dr. Duffin, where you can see it shrunk the zone of inhibition and these are independent studies. The first author doesn't have financial interest in the product, but just showing it was not as effective as SDF alone. And then there were

still some perceptible stains. And then here's another one with root surfaces.

It was effective, but blackening of arrested caries is not reduced by immediate application of KI. So again, use what you want, just know what you're doing. I don't want people to be surprised, like "Why did it turn dark?" "Why, five months later, is my restoration a little dark." So just, just understand that. And of course caution, this can stain, not just teeth, but it can stain you. If it gets on your lips and face, it can cause stain, your clinic surfaces. So you want to handle it carefully, make sure you're always wearing gloves, and protect the clinic surfaces. Could get on your clothes, so protect that. If you have a raincoat on, people keep saying, "I'm going to wear a raincoat." Then I guess it wouldn't be as big of a problem. So let's say it happens. There are ways to get it off. You can get it out of fabric.

Dr. Graham Craig recommended the Napisan, nappy as in cloth diapers. Surfaces, various cleaners will get it off. It's easier to get a fresh stain off. And skin Hydrogen Peroxide or salt slurry will basically wipe it right off. It's harder, like it came right off the face with just the Hydrogen Peroxide. But in thicker layers of skin or dryer skin, it's going to be a little harder, so you can use a slurry of salt and water. So basically it looks like a sugar scrub and you can try to get rid of it that way so it'll lighten it up. But let's say it's in your palms or it's on a lip, it might take a little longer just depending how the skin cells turn over, but it'll go away. See how it's gone off the lip, very easily. Proximal application.

We went into detail, if you watched my last zoom webinars for Crest. We went into this in detail, but just going to briefly review. You can get it to proximal surfaces that you can't reach with your micro brush by using a puffy floss. And I have a couple of YouTube tutorials on this. But basically, dry and isolate and then put the floss into the contact and then apply the SDF to the puffy floss. Let it sit for at least a minute and then remove it grabbing both ends.

Blot it, so it doesn't splash if you see pooling excess. Don't slide it out, because then you might give them kitty whiskers, like my face

shield. So this is one of the videos and that particular patient, was the second opinion where they were recommending sedation to treat her... Oh, shoot. I guess I don't have her x-rays in here. Darn. Okay. But, I know that there's an archive on dentalcare.com of the proximal lectures. So I won't go into it in too much detail, but I will show you the rack of lamb. You can do several areas at once. And just to show, let's say these teenagers that are going to Dutch Brothers or Starbucks every day, or they play sports so they need to hydrate with Gatorade. Drink some water. But compliance isn't always great. So this tends to resonate with those parents that have had a bunch of MODs that are now falling apart and they need root canals and crowns and whatnot. So they want to be more proactive.

And when we see incipient lesions, I will recommend improving diet and hygiene. Will recommend Prescription Strength Fluoride Toothpaste, but that doesn't mean they're going to use it. So often that's the scenario where they'll want it and you can see how you can barely see it. So this is someone who's been treated multiple times with it. And this is not a new concept, this is an old paper. Actually the first I ever read about proximal was GV Black, who you silk floss to apply Silver Nitrate to proximal caries. This is a Japanese study. And then I think it's back here. But we did get our retrospective study of my patients published this year. Just showing it arrested about 84%. So it's just another option. And as teeth exfoliate, you can see if you're dealing with kids, you'll see but that'll get covered as the other teeth erupt. And it does penetrate nicely.

Here's one I followed for two and a half years and those are some good size cavitated lesions that were fine. But it doesn't always work. This was four quads of casing lesions. One quad got bigger. So I restored it. The kid was older and more cooperative. So it's still a good outcome. Tips to avoid stain. I think we have less than 20 minutes now. So I'm going to try to speed up here, but like for example, this kid has had SDF before, see how there's white spot on the facial of the primary canine. If that's an arrested white spot, it's not going to stain any way, but can you tell? No. It's hard to tell that's one of the hardest

things to know whether a lesion is active or arrested.

So when in doubt you could cover that area with varnish. So to keep the SDF off of it, so you can see how I'm doing that there. So you don't even see it from the front. Another tip, if you're doing a full mouth varnish, varnish the other teeth while the SDF is absorbing and cover the SDF treated site last. So you're not contaminating your varnish brush and then dragging it and staining other areas inadvertently. But again, arrested lesions aren't going to stain only the active caries. And you can see this over time, it's got a cool radiographically. Especially in the enamel, you can see some remineralization. It almost looks like little fillings in there. It's interesting. It's awesome for hypersensitivity. So you'll see how it stains the varnish, but once that's brushed off it doesn't stain healthy enamel.

And that's my own tooth. I had horrible hot, cold sensitivity. I still have a baby tooth. That's having this funky calcific metamorphosis, whatever, but just was having horrible, lingering, cold, hot sensitivity. And when I took the extra, I'm like, "Okay. Well, it doesn't look too bad. It's not implant time yet. What the heck? Let's try SDF." And I'm talking about night and day improvement. And this was over two years ago. One time. If it's hypersensitivity, you don't have to do it biannually. Just apply as needed, if it's just for hypersensitivity.

So just anecdotally for me, this was like one time over two years ago. I've had patients where we did hypersensitivity, let's say for MIH and I had to do it again in a year. Caries are different. You want minimum biannual. But it can vary depending on risk. And I applied it to myself that's why I don't have gloves on, to the PPE police. So this is an article. If you're interested in an SDF for using MIH, I want to direct you to this open article that you can read in November, is this 2018?

If you just put in MacLean MIH it'll come up. But decisions in dentistry and it walks you step by step and how to use it for this scenario, where we see these folks that have just horrible, hot, cold sensitivity, because they

have either mild or moderate or severe MIH. And this is a great noninvasive option to get these folks comfortable until they decide what the next step is going to look like.

Whether it's full coverage or extraction, and second molar replacement. In the US the code is 1354, Interim Caries Arresting Medicament Application and it is per tooth. It's not full mouth. It should be per tooth and surface. So like that example on the application, it was the buccal of 19. So we have Dentrax, so it says 19 buccal, 1354. So that way you can track it. And just remember, this is especially important to the payers.

It doesn't restore a form or function. So holes in the teeth, cavitations, especially in the posterior where it's not easy to clean them, they do benefit from a restoration. Otherwise, they're just going to continue to trap food and the lesion can become active again in time, or is more difficult to arrest. So we have to understand that and also look at how your plans are written. Because in some cases now, if you apply it, then they will deduct it from a restoration. Let's say, you're trying to do SMART, and they want to deduct it from your restoration, that's a whole other story for a whole other day. Because I feel like it's penalizing me for trying to give people a noninvasive option. Like, would you rather pay me more to sedate someone? Okay.

Toxicity is a very important topic. One drop can treat as many as five or six teeth, especially if they're small lesions, but big lesions. You might need a drop just for the one tooth. I regularly will use more than one drop. That's not the limit. But you figure one drop per Telic 10 kilogram of body weight. So that'd be like the average one-year-old, that's considered a safe dose. And I do apply it the same day as varnish. So if you look at the fluoride content you hear 38%, you think, "Oh my goodness, that's a lot of fluoride." Well, it really isn't. The amount of fluoride in a drop of 38% SDF is only 2.24 milligram of fluoride.

Compare that to conventional 5% varnish that has 11.3 milligrams of fluoride. But even so if you take the possible toxic dose, which is five

milligram per kilogram, you have a one-year-old 10 kilogram child. They'd have to ingest 50 milligrams of fluoride to maybe have an upset stomach and vomit. So let's say we do a drop and let's say we use the whole varnish, like who actually uses the whole thing? I worry sometimes. So anyone ever get worried like what's happening at the pediatrician? How are they applying varnish? But that's only 13 and a half milligrams of fluoride. So you're not even close to one year old to 50 milligrams. I switched to FluoriMax, which is 2.5%.

So it's even less. So you're looking at just under six milligrams of fluoride. I liked that this was more cost effective, because you could put a drop alongside your drop of the SDF. And think of an enamel like a sponge. It can only absorb so much fluoride and you can reach that maximum concentration at 2.5%. So why essentially double dose these kids and they don't need it. I want to be conscientious of how much fluoride I'm giving them. More on toxicity. Specific to the silver component.

This study looked at short term serum pharmacokinetics, it found that fluoride exposure was below US EPA or reference dose. I already showed you that now the silver does exceed EPA's oral reference dose for cumulative daily exposure over a lifetime. But for occasional use, we're typically only putting it maybe biannually. It's well below concentrations associated with toxicity. So I promise you you're not going to turn anyone into the Smurf man. He was actually drinking colloidal silver every day for years. I think it's either this paper or that paper, I have people ask about the ammonia, there's no free ammonia. So it's not a concern. I pointed out the CSDS product, Hey, if you're in Australia, you could use that. But it's not a concern. And then here's another one. This is from ADA.

It's a safe and effective treatment. It's well tolerated, no adverse events related to the SDF were reported. Now, as far as what will and won't be arrested, it really depends on how open the lesion is to flow of saliva and natural remineralization and cleanse ability of the lesion, if they're actually cleaning it. So obviously anterior teeth are going to be

more likely to arrest posterior teeth, especially proximal contacts are going to be less likely to arrest. However, if they're keeping it clean, they can still arrest, but you have to understand why some areas work better than others. And this is coming from Graham Craig. This is his handbook, which is outstanding. I highly recommend it. You can order at dentaloutlook.com.au. Frequency, I mentioned the biannual that is the most likely to arrest an un-restored cavitated carriers lesion. You want to reassess and reapply, it just depends on the risk level. Let's say you have someone who's in a nursing home and they have no saliva and they're like extreme risk. Maybe you're putting it every three months, just case by case.

But this is important to understand. Once a restoration is placed, a sealed restoration, you don't have to go back and remove it. You don't have to reapply it. It's done. And now let's say you have an easy to clean area. I'll show you some incisors, they're shiny and hard, it's arrested. You don't have to indefinitely apply it. And just make sure you communicate this as a treatment, not a cure. So anything we do, if the patient needs to be on board with their hygiene and diet to prevent recurrence of disease when you assess it, it should have a matte block appearance. It should feel firm to a perio probe or dycal instrument. In some cases it will feel hard, but if you pierce it with enamel, if there's let's say necrotic dentin, like real soft mushy caries, that's necrotic tissue. It's never going to remineralize. It doesn't matter how much SDF. So let's say you're putting restoration, as long as you're not exposing the pulp it's beneficial to spoon and excavate that. But don't think like, "It didn't work." No, it can't remineralize.

Radiographically it's radiolucent, so you want to watch for stability of the lesion size, secondary dentin formation. Now granted, if it's like a proximal lesion and it's confined to an animal, you might actually see it get more radiopaque, but not so much in the dentin. And then of course how's the patient doing? Are they asymptomatic? Do they have less sensitivity? So it works really great in the anterior, so these are shiny hard. Unless aesthetically this is problematic, this might be all the treatment that a child needs. And it could even be bad

lesions. This was the child of the two physicians that found SDF, because they were real Google MDs. These are pretty extensive, but this is shiny and hard. I only applied at those four times and they stayed shiny and hard, he comes every six months. So that was the end of it. You don't have to indefinitely do it.

Now if you're talking, molars posterior tooth, you bet, until you can seal it, you've got to restore it. You've got to keep a closer leash, tighter leash. Because it's been three years and he's fine. Did you notice the date? It was March of 2017. I didn't get my three year picture. How about a four year picture then? So this is Autumn, I did a variety of stuff. SDF in the front, some SMART and Hall Crowns in the back and it's really cute because she's had such a positive opinion about this and now her little brother has come, her cousin came with her and she just hopped in the chair and was like, "They're going to put medicine on your teeth." So this is a happy kid. People are very negative sometimes about SDF and they say the color is ugly, but obviously this is a beautiful, happy, healthy child. So there's beauty in the simplicity of this treatment, but it is not a cure all.

So you have to realize that it does need followup, it needs reapplication, restorations should be placed on lesions that can't be cleansed. So here's an example of a tooth that got SDF only for two years. I don't want people having this mentality that like, "I'm just going to save the world. I'm going to run around and put SDF on everyone and heal." Wouldn't that be nice? That's not reality. So there's various considerations when you want to restore it. And like I said, if it's a child it depends on their age, calendar age. If the tooth is about to exfoliate how cleansable is the lesion, associated risk factors, if it might end up fracturing? How's their behavior and then what's the preference for the parent? Dr. Horst has a nice decision tree on that too. On whether or not, let's say it's not cavitated. You could just do SDF, if it is cavitated, if it's cleansable you could just do SDF. Like those anteriors. If it's not cleansable think about doing art or Hall Technique.

So obviously we don't even have remotely enough time to do SMART. That was not the goal of today, but I do have lectures you can

watch online on SMART, to restore cavitated lesions. I have lectures online about Hall Technique, like in cases where you actually need a crown because there's considerable destruction of the tooth. And these are all other options that you can do, no aerosol. So we do need to get the incentive right. Unfortunately the more invasive procedures tend to be reimbursed the highest. And a lot of the stuff that would matter the most, like the motivational interviewing, the diet and the hygiene education often are not reimbursed at all. It's problematic. I know we're running out of time. But just real quickly, this is a kid that the mom flew him to see me five times from Oklahoma because no one in her state would offer anything other than general anesthetic.

So I did quadrant dentistry using some SDF and some traditional restoration, so we could avoid the general anesthetic and he could have had everything for free with IHS. But she spent more money and more time to come see me for the minimally invasive option. So again, just present options. In this population in particular are severely affected by severe early childhood caries. They're also severely affected by Covid-19. If you guys have been watching what's happening in Navajo nation, it's heartbreaking. We need new things in our toolkit to manage disease in this population. I point you to Dr. Frank Mendoza's great work in Warm Springs in Oregon where these kids were having more than 90% historically hard decay.

And he was just frustrated because decades of their caries interventions and prevention programs had no discernible improvement.

So in 2013 he implemented Dr. Devlin's protocol, the DIY SDF, because we didn't have Advantage Arrest yet, but Silver Nitrate followed by Fluoride varnish and the results were incredible. 85% arrested of lesions, more than 50% reduction in GA cases. He's retired now, but he said, "After 32 years, I believe I finally have something that works." Oops, that's my timer. I think I only have a couple of slides, so we're finishing up here and then we'll do questions. But I said, this is great word of mouth. He came back and brought cousins.

Everybody got SDF and his name in Chickasaw, means scream. Tasahli is his name. His mother's actions are a scream for change in the way we deliver care to children. So remember to be a firefighter first, control the biofilm arrest and remineralize lesions. Be a carpenter second, restore teeth as time, money and behavior allow. For future study, I highly recommend these textbooks if you have your iPhone out, click a picture of these. Articles, a lot of this, you can just find on my website and go to the blog and it'll link you to these articles and thank you so much. And here's other places you can take a picture of this too and subscribe or follow me on social media, YouTube and Instagram. And thank you so much. We did it.