Introduction to Brain Imaging

Hello and welcome to the Alzheimer's Summit 2.0. I'm here with James Hamet. He is an innovator in the brain health space. We're going to be talking about his invention that is going to transform the way in which we can view the recovery of our brains.

It's going to be an incredible session. This is true innovation in medicine. And, James, such a pleasure to have you here on the summit. Thank you James.

Well, let's jump into it straight away. I guess the first thing that I'd love to, to understand for our audience who are watching at home, many of which are working with family members who may be experiencing cognitive decline, experiencing themselves, maybe there's, practitioners and clinicians who are working on reversing cognitive decline.

I'd just like to start by you giving us a little bit of a landscape for the world of brain imaging, because ultimately, you know, there's different ways in which we can understand whether the brain is healing.

Right? There's all kinds of biomarkers that we could look at to understand the sort of drivers of cognitive decline. There's new biomarkers that are actually showing whether or not the process that ends up with Alzheimer's is happening way before.

So there's a lot of really interesting biomarker work, but you're specifically interested in visualizing the brain. And I would say that most people who have got into this topic would probably understand that there are different ways to create images of the brain.

And so I'd love for you to start like, what are the ways in which we understand the health of the brain through visual medium today? And, and what are your thoughts on them?

Yeah, of course. So probably the way of visualizing the brain that's the most common place would be the MRI. It's a it's a giant machine with spinning magnets.

And one of the ways that it works, of course, is by making your body, not just your brain, visible on the magnetic spectrum. It looks a lot like an X-ray.

One of the cool things about it is that it doesn't just show you your bones, it shows you, the cellular structures. It shows you the neurons. It's a very powerful tool.

And it's a tool that, frankly, I think everybody, if they experience any type of brain disease that they've had before, it's very standard, very routine.

Besides that, there are sometimes CT images, but you also have something called a pet scan. A lot of people know about the Pet scan, but they might not know is that the question is actually relatively rare, in the world, and also even in the US and the world, there's not even one Pet scan for every country.

A lot of countries, they have to send their, their, their patients out to get the Pet scan. And in the US, even though we have a couple hundred machines, that's still not enough to deal with all of the patients who need brain imaging.

The most common use of the Pet scan is actually for cancer. But that might be a little surprising, but it's because cancer cases are also very frequent.

And then for Alzheimer's, I find that it's a very valuable test. And that's because the Pet scan is not just giving you a

structural image of the brain, it's doing something special.

It's using a radioactive tracer that you drink, that you inject. And what that tracer does is it binds to certain proteins, the proteins that you want to be measuring.

And so for that reason, there's lots of different types of Pet scans you can get. It's not the same as an MRI where every MRI is basically the same. But Pet scan depends on its tracers.

But what that does is it gives you an extra dimension. Now you you have an image that's colorful. It's not just showing you the structure, it's also showing you the concentration of certain proteins.

And so those are the main visualization techniques that exist today.

MRI, PET, and SPECT Compared

When you're looking with MRI, what someone's typically looking for is a stroke. Always important to rule out a stroke. You may if you're dealing with an Alzheimer's case.

But in the in the case of Alzheimer's, you might use an MRI to see if the volume of the brain is changing. You know, is the person's brain shrinking? Obviously, if it's getting larger, that that that could be concerning.

Could be a sign of inflammation, but typically it'll be shrinking with with a neurodegenerative disease. But it shrinks very, very slowly. So for that reason the MRI is typically done at the very beginning to rule out other potential causes of symptomatic behavior of the patient.

And then also maybe very, very late, if you wanted to see, you know, how you've changed over the past couple of years, the test that I think is really the best to see changes over time would be the Pet scan, if it were possible to do that more than once a year.

Yeah, yeah. Well, just give us the lay of the land on the Pet scan. So if someone is lucky enough to get one in America, they can't get it very often.

Is that because of a health risk or is that just availability of the machines? Yeah. So Pet scan is unavailable for routine use for a variety of reasons.

One of them is, as you called out, it's the safety risk. I already mentioned the radioactive tracer that gets used to measure the proteins. Right? That's a fundamental, important part of the Pet scan and how it works and the value that it provides.

But it also introduces risk if you have too much of that tracer, if you have too many of these tests, you can unfortunately cause, a cancerous event for the patient as well.

So the safety guidelines for Pet scans are only doing one per year, once every 12 months. Those guidelines are sometimes, unfortunately, ignored. There is a case where they're ignored for for a particular reason.

And that case is actually brain cancer, because we know the value of the Pet scan, and we know the value of doing this repeatedly to see how the brain is changing.

It's been accepted in the field of neuro oncology to do Pet scans within three months of each other, and so that's accepting the risk that it may exacerbate the cancer.

But the value of being able to do the imaging is so important. But it's worth it. The guidelines have not been adjusted for other conditions. Alzheimer's, for example, you wouldn't necessarily want the person to now also have cancer.

So for that reason, those guidelines are still there for 12 months. Interesting. All right. And then just briefly before we come onto like some of that, like I know in our space.

Well, you know, there's, there's someone who's quite well known as Daniel Ayman. And visualization of the brain is a part of his, you know, methodology.

What are your thoughts on on that and how does that fit into the picture? Yeah. So that's a technology called Spect scan. I mean, honestly, there are a lot of of these other types of scans.

There's something called a Dat scan which is for measuring dopamine. What it comes down to is what what resolution are you looking for? And are you interested in measuring certain proteins.

The spec is going to look a bit like a lower resolution MRI. It might be able to show you I'm not as familiar with the Spect scan, but it might be able to show you some things that other other tests can't.

But my understanding of it is that it's a pretty low resolution. And it's mostly looking at structure. So you might need, you might be able to use it at the beginning for ruling out things.

You might be able to use it at the end to confirm that the person's very late stage. The middle point, I think is, is where the value might still be competing with the Pet scan, which has higher resolution and the proteins involved.

Yeah. My my understanding is that it's sort of just like a sort of a broad baseline for all the things that you've done to yourself your whole life shrinking the brain, you know, is the volume going down or otherwise.

But yeah, it's, it's interesting. So look, let's get on to, you know, let's, let's, let's do visuals for people. Yeah. Because I think, I think a picture tells a thousand words.

Let's contextualize these things. So this is, this is what a Spect scan looks like. And it's looking at blood flow, which you know often is associated with structure.

So that's one of the strong parts about the Spect scan. But as I pointed out previously you have some information about the structure. But this is this is very low resolution right.

Yeah. I see that you might have like a heatmap type of a visual, versus so here's an MRI of the brain. Right. I mean, this is hyper, precision on resolution.

Right. You can see all the ventricles. You can see all the little, pathways that the brain is making. You can see that the volume is changing. I don't know if you can necessarily trust the volume of, of a Spect scan.

Yeah. The last thing I want to show is what a Pet scan looks like. Let's make it Alzheimer specific to. So this is very similar, right. To an MRI. The difference is that you have these colors.

And those colors are so helpful, which is one of the reasons the Pet scan is today the gold standard. Not only do you have some, you have a little bit of loss of resolution sometimes, like in this one.

Not only do you have that structure that's preserved, right, you can clearly see this is the amygdala, but you also have these colors and those colors are so key.

The colors are showing you amyloid protein. So here these red clumps are accumulations of amyloid. And we can see here that it's mostly in the front of the person's brain.

It looks like it might be more on one side versus the other. This is the type of information that that you want to have. Right. Because then you can see what's going on.

And if you give someone a therapy, especially a therapy that's, you know, reducing trauma on their brain, reducing

inflammation, whether it's anti amyloid or whether you're treating the underlying causes of the amyloid, which again go back to stress of the brain, then you have a reduction of the amyloid.

Introducing Sarah Graham

And hopefully, you know in the case of successful therapy you gradually see these images move towards the negative here. This is what a healthy person's brain should look like.

Here's your of amyloid. I just want put a little asterisks to say that amyloid is present in most people's brains. This is this is a golden example of somebody without amyloid.

But even people who are asymptomatic, usually their brains look somewhere in between. Yeah, thanks for sharing. That is actually very helpful. And I'm really glad you shared that.

Well, look, I don't want to keep everyone in suspense any longer, you know? Yes, you are to some degree a commentator on the history of the way that, brains have been visualized.

But you're actually an inventor who has invented a new way to visualize the brain. So, you know, share with us a little bit about, you know, your invention, where it came from, and ultimately, like, why you think it's particularly relevant to this conversation, which is the reversal of Alzheimer's, which has never really been appropriate before.

Ultimately, recently we had the first preprint to show that, you know, that that precision medicine approach can improve people's brain health, can, in some cases, reverse Alzheimer's.

And so I'd love to love to just to you up to share like how you got here and where are you and why you're interested in this field. Yeah. Of course what I, you know, I guess drumroll.

What I've invented is a new way to visualize the brain. And the exciting thing about it is it it doesn't require a new level of education, you know, it doesn't give you information that that you might not be accustomed to.

It actually solves the problem of the Pet scan. And that problem, again is the use of the radioactive tracers. It makes the test really expensive. It makes the test unsafe for repeated use.

And then, you know, besides that, the Pet scan is also impractical to have at a clinic. So, you know, if I if I'm if I'm a physician treating Alzheimer's, then the challenge that I have is what to do with my patient.

The patient comes in, I give them a treatment. Right. That part's easy. A person probably has come in with a diagnosis in many cases, or at least a suspected diagnosis.

What happens when that patient comes back a month later and says, hey, I don't know if I want to keep doing this treatment. I don't know if it's working.

You know, there might be side effects, it might be difficult, you know, if it's dietary, exercise, sleep, you know, there's some behavioral challenges.

The person might be ready to throw in the towel. What can you do for that person? You can send them away to get a Pet scan to another facility that they might not come back from.

You can, you know, try to just ask them to have faith. And of course, if they've already had a Pet scan, then then you know, the first options on the table.

Well, so what I, what I'm doing here is called, evoked potential tomography. The technology is called Sarah Graham. And it allows you to know what a Pet scan might look like for your patient if they were to get one today, but they can do it in office without the tracers.

And it's really inexpensive available equipment so we can ship it to you. It's called Sarah Graham. You can do it in a, you know, in a closet. I mean, it's really small. It's a suitcase.

And inside you have some hardware, you have a laptop, you know, software. And what that test will do is it will look at the structural integrity of the neurons in your brain and how they wire together, and it'll give you images that are very accurate estimates of what the Pet scan would give you today.

Beautiful. I know, there's one in Doctor Burke's office who's the co-host here of this, of this summit. I know you've got a few and some leading Alzheimer's reversal clinics around the country.

Why is it particularly interested to interesting to doctors and practitioners that are in this emerging field of, let's call it reversing cognitive decline?

Yeah. So it's a fairly powerful technology in that it gives you many different endpoints with the same test. It can tell you what type of symptoms the person might be experiencing.

It can of course give you those image estimates that are very valuable. I mean, the biomarkers that we have under the hood are the measurement of the integrity of the network.

So we are directly measuring how the neurons are wired. And when you have a neuro traumatic event, whether that's a concussion or whether that's a gradual onset of disease like Alzheimer's, we are measuring it at the fundamental level, right.

Because if you're measuring how the neurons are connected, you do know the downstream symptoms of the disease. You do know how the disease is progressing.

And then when you are administering a therapy right at your office, you now have a way of seeing that therapy work in real time. So you can do this test this month, next month, a month after that, you can share the results of the patients, and they can see the picture and they understand.

They see that it's their brain. They know that red means bad, and they see that the clumps of red are shrinking and getting smaller. Over time, they see themselves returned to health.

And what's been most exciting for me is over the past couple of months, I, you know, the people using the technology have of course, been communicating with me and sharing how the technology is in fact showing improvement for almost all of their patients.

Of course, there are sometimes cases where the treatment was not the right treatment for the patient. And so in those cases, you know, the patient might appear to stagnate.

But that is the purpose of the technology is to answer the question of is therapy working? And if it's not to help the doctor strengthen that trust that they have from the patient and come up with new strategies to treat them, because every patient is different.

Individualization of therapy is how we will have the best outcomes, and the best doctors know that it's worth trying a few things before you know you find the one that works.

And so our technology is about shortening that timeline, making it possible to answer that question within a month instead of a year. And just have that question be answered.

I mean, I had grandparents who unfortunately passed a Parkinson's and Alzheimer's, and it's it's very painful to receive a therapy for over a year and have no answers as to whether or not is the right therapy.

Clinical Use and Monitoring

I mean, there are so many therapies out there, and there's also so many types of neuro disease. A lot of them look similar. Parkinson's looks like Alzheimer's sometimes.

Very often. By the way, answering this question early, creating that feedback loop, I think it's going to drive us to a cure. But now now I'm going into the aspirational, yeah, yeah.

No, it was just good for us today is it helps you build trust with your patients and show them that the therapy is working, or if it's not, you know, try something else.

Yeah, absolutely. Well, I just give a shout out if you're if you're a practitioner, listen to this. Definitely. Get in touch with James and and check out the site and to, you know, test the technology because it's going to take clinicians, you know, bringing into their practice for this to scale.

If you're a patient or a potential patient and ask your doctor if Sarah Graham might be right for you to get them involved there so that they can see that my understanding is that this is actually already payable by insurance. Is that right?

Yeah, that's a really good question. So the hardware that we're using is actually EEG. A lot of people don't see EEG as an imaging tool. And and frankly that that's that's been correct.

EEG has not been capable of imaging for a very long time since it was invented. But yeah, we've come up with a very special technique, and it goes beyond the use of AI and algorithms and that type of stuff.

It's a procedural invention. So it changes the way EEG actually works on a fundamental level. But the EEG component, the hardware use is reimbursed. So for that reason you can go to your doctor.

You can do this test. The doctor can be reimbursed for the procedure. But it's I just want to be clear. That's not our component that's reimbursed. It's the fact that it's the hardware that you're using.

That's the one that gets reimbursed. Yeah, I love that. Well, yeah, let's get let's get so the details on do you want to do you want to I'd love to actually if you have, some visuals, maybe we could see, like, what it looks like and how it compares to Pet scan.

Yeah, I absolutely would. I want to point out just so from a regulatory perspective that this is a monitoring technology. So if you're planning to use it for a diagnosis it is not a diagnosis technology.

So again monitoring so we're we're we're going to a bunch of conferences this year, other conferences that we've been to many times before. This is a poster for the, Alzheimer's and Parkinson's Disease conference, EPD.

It's next month. And what you can see here is you can see on the top row, you see Pet scan images. And these are for three different patients. And on the bottom row you see the output of of the Sarah test.

We are, you know going after diagnosis as a strategy. It's not it's not approved yet. So again it's not for diagnosis. But you can see from these results that our claims for diagnosis are already actually quite strong.

And so we have some work to do with the FDA before those claims are in the product. But you can see of just how close this technology matches from a structural imaging perspective with PAP.

And again, this is a EEG. These are not you don't just get one slice, you actually get all the slices in the brain, just like a normal Pet scan. And it's, here we have a metric for evaluating it.

This is the structural image similarity index. And here we put a little C here because it's combined looking at the intensity of the of the amyloid proteins and also looking at the gradient.

So sort of where they're distributed in the brain. And we have a similarity score of 0.75 which is incredibly high. I

mean again you can you can see this for yourself.

Look at the top image on the bottom image and you can see how closely that they match. So let me just about this is really cool and I thank you for sharing it.

I guess what I'm trying to imagine is like a new standard of care for cognitive decline and this standard of care, my judgment is the type of medicine that's being delivered by Doctor Burke and Doctor Sanderson and Doctor Bredesen, you know, is the standard of care because it's able to identify what's driving the pathology and it's able to catch it early to bring us back to, you know, health before we get so far down that we have Alzheimer's as the network sort of, brought back to health, it seems as though in that if that were to become the standard of care, having some monitoring technology that could be deployed, you know, every month through the journey back from mild cognitive impairment, major cognitive impairment and Alzheimer's, back to health, you know, would be helpful for keeping the patient engaged, keeping them participatory, and also like tracking the progress back.

Does that resonate with you? Yeah, absolutely. My background is in electrical engineering. And before this I co-founded a company called durable, which is a brain computer interface company.

One of the things that I've learned, and all of my education, is that you need a feedback loop. You need a way to measure success. The business owners know this.

You need your your key performance indicators, your metrics. If you're not measuring the output of your input, then you're working blind. And so I think that that's one of the reasons we have such amazing physicians like Doctor Berg and Dale Bredesen and, you know, several others, but that those physicians are few in number.

It's because they basically have to be magicians in order to apply their techniques. They need all of that knowledge that they have that other doctors lack.

All of that experience, that practical experience with patients that other doctors lack. It's not scalable, right. So if we want to see more physicians finding the same levels of success as Doctor Burke had with a recent preprint showing reversal of Alzheimer's, right?

I mean, it's huge. It's happening. It's here. Reversal of Alzheimer's. If we want more physicians to be able to do that, a tool like this is going to simplify the task quite a bit, because finally, you can give a treatment and you can see if it's working and without that you need your intuition to be very, very, very, very strong on pattern recognition and history of learning, functional medicine and experience of reversing other chronic illnesses that don't have as much, you know, unique physiology or as many potential calls.

The fact is, each each one of the physicians out there in the world right now, clinicians that is has reversed the case of Alzheimer's, is doing incredible work and has an incredible ability to be able to do pattern recognition across such a wide variety of biomarker.

Future Vision for Personalized Care

You know, ultimately, our vision through this summit is to introduce those practitioners to true neuro, which is the software that we've developed to make it easier for practitioners to synthesize that level of data and therefore for it to become the standard of care.

And that's why I'm really excited about, you know, meeting you and connecting with you, because I think that we're on the shared mission towards this, that together.

What do you think? That's why we're we're ideal partners. And I'm glad that you called out just how impressive these physicians are, because it's true.

I mean, some of them, you know, they're credentials in several fields of medicine. That background in the functional medicine, that background in other areas.

It's such a difference for sure. Well, look, let's get aspirational for a moment. You know, what are your what are your hopes with the technology. And what do you feel is, is the vision that you have for for how this technology will affect care?

Good question. Thank you. Thank you. My vision is for this technology to start downstream, start post screening, post diagnosis. You know, I frankly, I don't want to compete with the blood test either, because they're doing a ton of marketing, a huge amount of money for that thing.

So I want to start really downstream. And I want to answer the question no one's answering is therapy working for this patient? So I want to start there.

But then I do want to move upstream. And my vision is that this technology in the future, what it will do is it'll match new patients who get their serum for the very first time.

It'll match that patient with the closest patient in our database. And look at which treatments those that patient had and which treatments were the most successful, and immediately suggest treatment options for this patient and even predict what the outcome that is expected.

So if I'm going to use a serum every month, here are three different treatments that that have been matched with me through the database. And here are three different brain images that I should expect to have in a month.

And so then a month later, I can do a confirmation, make sure that the therapy I got was the right one, but also make sure that the physician is always, always, always in the driver's seat.

You know, this is this is not going to be a system, a technology that always tells you the right therapy to take the right therapy is for the doctor to decide.

But it all it'll give you some options and it'll model out what those options will look like so that the doctor who knows their patient can make those decisions based on other therapies they're taking based on allergic reactions they might have.

Right, based on all of the things that are that are for prescribing treatment. And so my vision is that this type of technology will become a forcing function for the cure.

It will accelerate, certainly the time to successful treatment and treatment response. But what I'm really hoping for is that somebody who is pre-symptomatic and use this technology to get a treatment that will prevent them from having ever adopting those symptoms.

I mentioned earlier I was working in BCI. I was working in telekinetic wheelchairs. That was my my previous vision. Everyone can can control wheelchairs with their mind.

What if nobody needed wheelchairs? What if this type of technology could be used to prevent neurodegeneration from ever reaching that point? And so that's my new vision.

Thank you for asking. Yeah, I love that. Well, look, we're here to support that vision. And, really excited to feature you here on this reversing Alzheimer's Summit.

I think you've got so much to add for, you know, for this conversation. And I'm excited to see, you know, more opportunities for us to, you know, partner here in the future as you continue to refine the technology and have more patients go through it.

And so, yeah, if you're watching this again, if you are, practitioner, check out Sarah Graham, you know, and to be able to have something in your office that is, already reimbursable if you're doing insurance or can help guide the pro if you're delivering brain health programs can help showcase the success of those programs and make it easier for patients to see if they're on the journey.

And then, for patients, you know, ask your doctor if Sarah Graham might be right for them. Thanks so much for being part of this summit. And, we look forward to checking back in with you in the future to see how things are going and, seeing how we can be of, most value to each other and look forward to other events coming up this year.

So my name is James Maskell. I'm one of the hosts of the Reversing Alzheimer 2.0 summit. I been with James Hammett. I'll visit him labs and we'll have all the details on how you can get in on the on the details below.

Enjoy the rest of the summit. Tune in to something else. Awesome today and thanks so much for tuning in. Goodbye.