SUPERIOR COURT OF NEW JERSEY
LAW DIVISION, CRIMINAL PART
MIDDLESEX COUNTY
INDICTMENT NO. 17-06-01785
APP. DIV. NO. _____

STATE OF NEW JERSEY,	:	
	:	TRANSCRIPT
vs.	:	
	:	OF
DARRYL NIEVES,	:	
	:	FRYE HEARING
Defendant.	:	

Place: Middlesex County Courthouse
56 Paterson Street
New Brunswick, NJ 08903

Date: September 30, 2020

BEFORE:

HONORABLE PEDRO J. JIMENEZ, JR., J.S.C.

TRANSCRIPT ORDERED BY:

CAROLINE V. BIELAK, ESQUIRE, A.D.P.D. (Office of the Public Defender, Middlesex Region)

APPEARANCES:

VANESSA I. CRAVEIRO, ESQUIRE, A.P. (Monmouth County Prosecutor's Office)
Attorney for the State of New Jersey

CAROLINE V. BIELAK, ESQUIRE, A.D.P.D.
DANICA L. RUE, ESQUIRE, A.D.P.D. (Office of the Public Defender, Middlesex Region)
Attorneys for the Defendant

Transcriber: Tammy DeRisi, AD/T 518

Agency: KLJ Transcription Service, LLC
P.O. Box 8627
Saddle Brook, NJ 07663
(201) 703-1670
www.kljtranscription.com
info@kljtranscription.com

Digitally Recorded
Operator - Noemi Ramsammy

I N D E X

(Hearing commenced at 10:45 a.m.)
THE COURT: All right. Let me know when we're ready to continue with this witness.
MS. RUE: Begin with Dr. Mack, Judge?
THE COURT: Yes.
MS. RUE: Okay.
THE COURT: And Dr. Scheller is coming back on the 15th, right?
MS. RUE: Yes. And we -- I guess we'll wait for Ms. Craveiro to come in. I'm just wondering if we should -- because the next witness was supposed to be October 13th. He is also available the week after, so I don't know if the Court wants --
THE COURT: Wait. You have three doctors?
MS. RUE: Three doctors.
MS. BIELAK: Yes.
THE COURT: Well, we're going to have to keep rolling it.
MS. RUE: Okay. So we can finish Dr. Scheller on the 15th, and do Van Ee on the 15th, just for continuity, so to not have it broken up too much. Or we could --
UNIDENTIFIED SPEAKER: Do you want me to get her?
MS. BIELAK: Yes.

MS. RUE: Yes. Thanks. I'm letting our witness know to join that waiting room.
THE COURT: Well, Dr. -- all right.
MS. BIELAK: This is what we were thinking, Judge. We were talking about it last night.
THE COURT: Mack. Dr. Julie Mack?
MS. RUE: Dr. Julie Mack. Yes. And then, Judge, she -- I sent to -- she sent a PowerPoint this morning, just demonstrative images, mostly that are in her report. I don't believe the State has an objection. She can address it, but we don't even have to enter it into evidence. It's more so for understanding of anatomy and things.
THE COURT: All right.
MS. RUE: But I have a color copy of her report for the Court, just to help --
THE COURT: Okay.
MS. RUE: -- see the images a little better than --
THE COURT: We're going to straight until one o'clock today. All right?
MS. RUE: Okay. Thank you.
(Pause)
THE COURT: This is the exhibit that you're going to use?

MS. RUE: This is her report, Judge. I just was --
THE COURT: Oh. All right.
MS. RUE: -- e-mailed this morning the PowerPoint that she sent this morning for demonstrative purposes of the anatomy. It's -- almost every image is in that report.
THE COURT: So this was --
MS. RUE: This would just be on a PowerPoint, so this is just for the Court's reference.
THE COURT: Okay.
MS. RUE: The only thing I believe she added were a couple of different things that are words on this -- to explain anatomy. She says she doesn't have to go into them. If there is any objection. But also there's an added image of what the tearing of a bridging vein looks like in the PowerPoint, just for --
THE COURT: Okay.
MS. RUE: -- demonstrative purposes when she testifies to that. In terms of scheduling I don't know what the Court's preference or the State's preference is. Obviously we aren't continuing this morning with Dr. Scheller because of his scheduling conflicts.
THE COURT: Right.
MS. RUE: The next time available for him to

appear in person was at nine o'clock on October 15th.
THE COURT: Yup.
MS. RUE: We had scheduled Dr. Van Ee for the 13th, obviously anticipating we would have concluded those other testimonies prior to that.
We confirmed with Dr. Van Ee this morning that he is available the week of the 19th if -- if we wanted, for continuity's sake, to finish Dr. Scheller before we began with Van Ee, or we can do Dr. Van Ee on the 13th. It was really whatever was --
THE COURT: Dr. Scheller can't come before the 15th?
MS. RUE: Correct. So we could -- what we were saying is we can conclude with Dr. Van Ee in its entirety versus having it broken up even further than it already is.
THE COURT: Right. Dr. Van Ee starts on the 13th.
MS. RUE: Okay.
THE COURT: Roll until either the end of the day or you're done with her, whichever comes first.
MS. RUE: Right.
THE COURT: And then the 15th we'll finish Dr. Scheller. If you want Dr. Van Ee to make herself available for the 15th so we can roll into her after

Dr. Scheller, that's up to you.
MS. RUE: Okay. So --
THE COURT: So -- but then there was another date scheduled after the 15th?
MS. RUE: There is not.
MS. BIELAK: No.
THE COURT: Okay.
MS. RUE: The 13th was intended to be the end, it was just more so --
THE COURT: Not a problem with that.
MS. RUE: -- the issue was breaking it up more. I was just --
THE COURT: Yes. Yes.
MS. RUE: -- proposing that as an option, Judge.
COURT CLERK: Judge, Dr. Mack is in the waiting room, so whenever you're ready I can bring her in.
THE COURT: All right. Let's do it, then.
(Pause)
COURT CLERK: Can you hear us, Dr. Mack?
DR. MACK: I certainly can. Can you hear me?
COURT CLERK: Yes, we can. Thank you.
THE COURT: All right. Dr. Mack, good morning. Thank you for being with us. Doctor, I'm

going to swear you in in a second, and then we're going to proceed with the attorneys' examination of you. Okay?
DR. MACK: Sounds great. Thank you.
THE COURT: All right. The first thing I need to do is identify that this is the continuation of a 104 hearing that we started on the 25th, I believe. I'll double check that. I'm making sure with the clerk.
MS. RUE: The 24th.
THE COURT: 9/24. September 24th. The matter of State v. Darryl Nieves. The Indictment is 17-06-785 on File 17-837. Let me just have everyone put their appearances on the record.
MS. CRAVEIRO: Good morning. Vanessa Craveiro for the State.
MS. RUE: Good morning, Your Honor. Danica Rue and Caroline Bielak on behalf of Darryl Nieves, who is in the hallway. I believe your officer is going to grab him now.
THE COURT: All right. Ms. Bielak, are you putting your appearance on the record?
MS. BIELAK: Ms. Rue did, but Caroline Bielak on behalf of Darryl Nieves.
THE COURT: Okay. So, the record should

reflect Mr. Nieves is here. All right. Who is conducting the direct?

MS. RUE: I am, Your Honor.

THE COURT: All right. Thank you.

MS. RUE: Thank you.

DIRECT EXAMINATION BY MS. RUE:

Q Good morning, Dr. Mack.

A Good morning.

Q Can you hear me okay?

A I can.

Q Okay. Great.

A If you hold that tone of voice, I can. Otherwise it's a little muffled.

THE COURT: Okay.

Q Okay.

THE COURT: Ms. Rue, probably so that you can take advantage of a microphone, you'll probably even be able to move over here, closer to that one, or hold that one up --

MS. RUE: Okay.

THE COURT: -- to amplify your voice.

MS. RUE: Or -- I can --

THE COURT: Whatever you prefer.

MS. RUE: I hate to stay seated. I guess -- I guess for now --

THE COURT: No, you don't have to -- you can stand right over there, but use that microphone.

MS. RUE: Yeah.

THE COURT: Turn it around.

MS. RUE: I'll stay seated for now, Judge, and --

THE COURT: Are you sure?

MS. RUE: -- we'll see how that goes. Thank you.

THE COURT: Okay.

BY MS. RUE:

Q Good morning, Dr. Mack. Where did you go to school?

A Can I ask a question? Was I supposed to be sworn in?

THE COURT: Oh, yes. I didn't do that? Yes. I said I was going to do that, too. All right.

J U L I E M A C K, M.D., DEFENSE WITNESS, SWORN/AFFIRMED.

THE COURT: Okay.

MS. RUE: Thank you.

BY MS. RUE:

Q Dr. Mack, where did you attend medical school?

A I attended medical school at Harvard Medical

School in Boston.
Q And when did you complete schooling there?
A I graduated 1990 is when I got my M.D. degree from there.
Q And are you licensed to practice medicine currently?
A Yes, I am.
Q Where did you do your residency?
A I was at Baylor University Hospital in Dallas, Texas.
Q And what does a residency entail?
A So, a residency is training in a particular part of medicine. So my training was in radiology, which is the interpretation of images in the context of patient care.
Q And when you say images, what are you referring to?
A Any medical imaging, so chest x-rays, abdominal x-rays, CT scans, MRIs, ultrasounds.
Q And are you -- I'm sorry. Where are you licensed to practice medicine?
A Pennsylvania now.
Q And are you board certified?
A Yes, I am.
Q What board certifications do you hold?

A I hold a board certification by the American Board of Radiology, which is the general certification for radiologists. And then I have an additional certification called a Certificate of Added Qualifications in pediatric radiology.
Q And can you explain a little further what that means, that added certification?
A So, a board certification, general board certification is required most places just to practice in the field of radiology. The additional certification is not required, but is undertaken for those physicians who may have a particular interest or a desire to practice in a particular area. It's just an additional step also given by the board, but that particular certification requires recertification, so I -- I participate in recertification under something called a maintenance certification, which is not a board -- there are actually weekly questions they send me.
Q It's weekly questions? And those are sent from whom?
A The Board of Radiology.
Q The --
A I don't have to answer them every week. I just have to answer so many a year.

Q Okay.
A Sorry. I usually let them pile up and then answer a number at a time.
Q So it's an annual amount of questions that you have to answer to remain that certification?
A That's right.
Q And you've done that?
A I -- yeah. I'm maintaining that certification. And you can find that on line by searching my name under the American Board of Radiology (indiscernible). It will give you that information.
Q And do you practice in pediatrics?
A Radiology. I practice in pediatric radiology, not pediatrics.
Q Where do you work now?
A Penn State Hershey Medical Center.
Q And what are your job responsibilities there?
A I work part-time. I'm currently the Division Director of Breast Imaging, and then (indiscernible) the Breast Center, which is joint (indiscernible) breast imaging and breast surgery.
Q And how long have you been in that position?
A As Director, Division Chief, since late 2018, I believe.
Q And what did you do prior to that job

responsibility? What was your title at that point?
A Well, I was in the Breast Imaging Division. So I came to Hershey about -- I think it was 2006, late 2006, September, October, and then in that role when I first got there I rotated through two divisions. I rotated in -- through the E.R. and something called Abdominal Imaging and Breast Imaging. But about five years after I got to Hershey I moved only to Breast. They needed me in Breast to cover the service, so for about ten years I've been just doing breast imaging there. Breast imaging and intervention. We do biopsies, too.
Q Okay. So if your responsibilities, your day-to-day -- pardon me. I should say what are your day-to-day responsibilities?
A So, I interpret imaging studies is what radiologists do. In the context of breast imaging it's discussing those results with the patients, recommending additional testing, performing some of the additional testing (indiscernible), biopsies where findings may require biopsy -- quarterly has biopsies with Pathology. That's a huge part of our job, to make sure they match, that we've explained why the imaging looks the way it does. And then because it's a teaching institution I teach both medical students and

residents.
Q And how long have you been a teacher of that?
A Since coming to Hershey.
Q And that was in 2006?
A '06. Yeah.
Q Okay. And so if your day-to-day responsibilities don't entail pediatric radiology, why do you maintain that added certification, and why do you keep up with that?
A So, I still have an interest in pediatric radiology. I still -- I've published in pediatric radiology. That's actually most of the publications that I think are particularly meaningful in that field. And I still consult in pediatric cases using the knowledge of anatomy that I've gained both in training and in research, to help whomever is asking understand more about what imaging can and cannot do, what underlies -- what's the matter that underlies the imaging (indiscernible). And that I do to this day. And that maintenance -- I would say first it actually requires me to maintain or participate in what's called maintenance of certification. Mine is in peds, so -- I'm also doing what the consortium requires me to. That's part of my requirements. Yes.
Q Okay. Great. And I believe you said this,

but do you participate in research?
A Yes. In both breast imaging, and then the anatomic research is -- it has -- so a lot of the research from the papers that I've written are actually delving back into the literature that already exists, really looking at things in parts so I can better understand, or people will understand why I was seeing the things that I was seeing that weren't well explained.
Q And so in that research does that entail research into the pediatric radiology that you've discussed?
A Well, the research which I've published and given lectures in has to do with the anatomy, so that -- of the meninges or the covering surrounding brain, the things that drain the brain, so yes, that -- that intersects with pediatric radiology. It's only a small part of it, but that's -- that's in pediatric patients. The same anatomy exists in adults. It's not like it's limited to pediatrics, but the anatomy is what sparked my interest.
Q And you said you've been published before, correct?
A Yes.
Q What -- can you list some of your

publications that would be of relevance to this hearing?
A Well, starting with a publication in 2009, that was just an ad hoc review of what is known and not known about the anatomy and physiology of human injuries of coverings that surround the brain. A couple more papers specific to dural anatomy, which is one part of the meninges. And what lives there, what we can -- what we -- what could have -- what that anatomy could mean in terms of physiology. (Indiscernible) onset, were there vessels that were there, what are the things that could be related to the lymphatic system? So those are the kinds of things that -- that usually apply when I'm asked to discuss anatomy relevant to dural collections, as in this case.
Q And what has your research into subdural hemorrhages shown you?
A So, I think the biggest thing it's shown is that what I was taught, which was subdural hemorrhages are caused only by bridging vein rupture, that's incorrect, that there are other structures, anatomic structures, that can give rise to subdural fluid collections other than bridging veins. It's not that bridging veins can't cause subdurals, they can. But what you can't do, so that the outcome of that research is you can't

look at a subdural and presume bridging vein rupture. That's the big thing. Because I was taught that that's what you could do, because that's the only thing that could cause them, so then that's what you knew had happened is that bridging vein had ruptured. That's incorrect. The anatomy shows that that's incorrect. Well, pathology does, too.
Q And to be clear, when you say that's what you were taught, are you referring to medical school?
A Well, medical school and in my fellowship in pediatric radiology. That's -- that was predominant. I think it's often relied on even today, even though the anatomy is more complex than that.
Q And what specific research has shown you that bridging vein ruptures are not to be presumed when there's subdural hemorrhages?
A That there's another source within the dura proper, so the dura is the membrane closest to the skull, and I was taught, and many still are taught that that's just this kind of benign, fibrous membrane, dura mater actually just means tough matter. That's what we're taught. That's where I got the name. But that's not what the dura is. The dura is full of little vessels, much more in a baby, or an infant, or a young child, compared to an adult's, full of nerves, capable

of producing fluid on its own. We call them subdural effusions.

So, the bridging vein goes across that membrane. It goes across the dura on its way towards the dural sinus, which is a big vein (indiscernible) big veins that carry blood back to the heart. So we never want to forget the bridging veins. They exist, and we know that. But we also don't want to ignore this very complex anatomic -- these structures within the dura that can give rise to some of the things we're seeing on imaging.

Q Have you spoken at conferences before?

A Yes.

Q Can you list any of them that would be relevant for this hearing?

A So, they're in my C.V., but it's been in the U.S. and overseas. So, Sweden was, I think, the most recent one I was overseas. I think Illinois was the most recent one in the U.S.

Q And what were the topics that you were asked to speak about?

A I was -- we were talking about the anatomy and physiology of the dura and membrane surrounding the brain, that (indiscernible) in fact, what we're seeing on review.

Q Was it related --

A And how that should (indiscernible). Go ahead.

Q I apologize, Dr. Mack. Continue.

A So, the conference I spoke at in Sweden was a pathology conference, because of course radiology is just having a shadow of what you would see as a pathologist. It's -- it's an image of the person who is still living, obviously, but that conference, radiology and pathology are so tied together, that that conference was actually to a group of pathologists who were at a pathology meeting, so --

Q And was that related to pediatrics or just pathology in general?

A I beg your pardon?

Q Was the conference that you spoke to -- spoke at in Sweden, was that pathology generally or pediatrics specifically?

A So, actually I don't think I named the conference, but I'd have to look at my C.V.

Q Okay. That's -- that's --

A I can look that up.

Q That's fine. And --

A I was specifically asked to speak about this topic because it -- it was important for the things they were discussing at -- I think it's their yearly pathology

meeting.
Q And when you say this topic, what are you referring to, Dr. Mack?
A The topic of anatomy, so dural collections, veins that traverse the dura. So the -- this was the annual meeting of the Swedish National Board of Forensic Medicine. And the title of my talk was SBS/AHT, or abusive head trauma from a radiologic perspective.
Q So you have lectured and written about AHT, abusive head trauma, and shaken baby syndrome before, correct?
A About the radiologic findings that gave rise -- that can be present in patients who either have been identified as abuse victims, or those that are alleged to have been abused.
Q And are you a member of any professional societies?
A Yes. Several. Also on my C.V. Standard radiologic organizations.
Q Are any of them pediatric radiology organizations?
A Yes. I still maintain my membership on the Society of Pediatric Radiology.
Q Have you testified as an expert before?
A Yes, I have.

Q Do you know approximately how many times?
A I know how many -- about how many times I've testified in criminal court. I don't keep track of the amount of times, but it's about 32 to 35 times in criminal courts.
Q Do you know what states you've testified in? I mean, if you have an idea?
A I have -- so -- well, multiple. Florida, Illinois, Pennsylvania, New Jersey, New York. I'd have to go back -- I keep having a running list. It's not fully accurate, but multiple states, and overseas.
Q And when you've testified that's been as an expert, correct?
A Expert.
Q In what field?
A Radiology and pediatric radiology.
Q And have you testified solely for defense counsel?
A (Indiscernible) more recently that's all. You know, those are the only parties who reach out to me. So in Lancaster I was pediatric radiologist on staff so Children and Youth could reach out to me with questions, investigators would reach out to me with questions there, and I from time to time testified in Family Court on behalf of the Children and Youth in

Lancaster.
Q And, I'm sorry, I believe the State --
MS. CRAVEIRO: Just the beginning portion of your answer?
Q I believe you said in your career you have not just testified for defense counsel?
A Oh, yes. So, the beginning portion I said since 2009, about the time that I published that paper on the anatomy, I have been contacted by defendant (indiscernible) almost exclusively. An investigator contacted me not too long ago (indiscernible). I did testify from time to time on behalf of Civil Courts in Lancaster. Children and Youth would be the entity that called on me for testimony.
Q And in your understanding is that an organization similar to what's formerly known as DYFS in New Jersey, or what's currently known as DCP&P?
A Yes.
Q Okay.
A That's correct.
MS. RUE: At this time I would like to offer Dr. Mack as an expert in the field of radiology and pediatric radiology.
MS. CRAVEIRO: No objection.
THE COURT: Objection?

MS. CRAVEIRO: No.
THE COURT: All right. Give me one second. Julie -- is it D? Julie A. Mack. Julie A. Mack.
MS. RUE: And Judge, I have Dr. Mack's C.V. that she referenced marked as Defense Exhibit 8.
MS. CRAVEIRO: I assume you're putting it in evidence? Or no?
MS. RUE: If the Court wants that in evidence --
THE COURT: We might as well.
MS. RUE: Okay.
THE COURT: You said field of radiology, right?
MS. RUE: In the field -- and pediatric radiology.
THE COURT: And pediatric radiology. All right. I'm going to accept the proffer. The State is not objecting. And Dr. Mack, I'll allow you to testify as an expert in the field of radiology and pediatric radiology. And, Ms. Rue, her C.V. is coming in as -- correct?
MS. RUE: D-8.
THE COURT: D-8. Have you got stickers?
MS. RUE: We do, Judge.
(D-8 admitted into evidence)

THE COURT: All right. Use those stickers, and --
MS. RUE: Great.
THE COURT: Ms. Craveiro, what are you using? Are you using the pink -- who is using the pink stickers?
MS. CRAVEIRO: I have pink and red. I may have used both.
THE COURT: All right. Well, anything non-blue.
MS. RUE: No blue.
THE COURT: You guys use the blue.
MS. BIELAK: We're blue.
MS. RUE: Yes.
THE COURT: Oh. And put it on the back, the last page.
MS. RUE: Okay.
THE COURT: Or actually, put it on the -- you can leave it there. That's fine. No problem. Yeah. Put it on the front, please. All right. Your witness, Ms. Rue.
MS. RUE: Thank you, Your Honor.
BY MS. RUE:
Q Dr. Mack, you've prepared a PowerPoint presentation for today? Is that right?

A I have images specific to Darryl's imaging. That is a PowerPoint specific to anatomy. So I have those.
Q Great. I want to start with the anatomy of the brain. I don't know if now would be a good time to access that. If you could share your screen? Or if you would prefer to just testify to it first? Whatever your preference is.
A I can -- I think I can share the screen with (indiscernible). I don't know if you can see it there.
THE COURT: Yes, we can.
THE WITNESS: Okay. Now I'm going to press my slide show, and then see if that -- can you still see my screen?
MS. RUE: Okay. It looks like it's receiving the content. There's a bit of a lag.
THE COURT: Yes.
MS. CRAVEIRO: Yeah. That's what it did to me. It -- it doesn't actually show the screen. Oh. There it goes.
MS. RUE: We see that, Dr. Mack.
THE COURT: Okay.
MS. RUE: It says dural anatomy.
THE WITNESS: Yes. So that's just the title of it. We can jump directly to the imaging files. I do have some Word slides in here because this is part

of some of the talks that I give, and -- you know, I'll explain why, but this is -- this -- the reason why I go over this in talks and the reason I -- that sometimes it's relevant for the Court is we're talking about a collection that occurs between the dura and the arachnoid. They call it subdural (indiscernible). And --

THE COURT: Doctor? Can -- Doctor, can you hold on for a second? If you would do me a favor, because on our end we can see your slide, but we have no idea if it's Slide Number 1, 2, 3 or 4 of your presentation. I'm assuming that --

THE WITNESS: Okay.

THE COURT: -- all of your slides are coming from the same PowerPoint program that you're presenting. You have a copy of it, Ms. Rue?

MS. RUE: Judge, I believe the one that I have that I provided to the State was related specifically to Darryl's anatomy.

THE COURT: Okay.

MS. RUE: This -- this has the images from her report, along with the Word -- so the State has the images from the report. The only thing that's missing from Dr. Mack's report that's on the PowerPoint are these --

THE COURT: Okay.

MS. RUE: -- the PowerPoint with words.

THE COURT: Okay. My point is this. Doctor, if you wouldn't mind just identifying for us when you are referencing a slide or when you're showing us a slide, what slide number that is, so that way we can keep track of it.

THE WITNESS: (Indiscernible).

THE COURT: So right now you have Slide Number 2. We can see that it's Slide Number 2. Okay?

THE WITNESS: So what -- I'll just keep it in this mode. I won't do it in presentation mode. I'll just keep it in this mode so that you can see the slides that I'm showing.

THE COURT: Okay. Whatever you prefer, Doctor. But counselor, your responsibility, both your responsibilities will be keep the slide number because somebody has got to document it for -- for appellate purposes.

MS. RUE: Absolutely, Judge.

THE COURT: Okay?

MS. RUE: So --

THE COURT: Because at some point also you're going to have to retrieve copies of these and make this part of whatever record you want to establish.

MS. RUE: Right. Understood, Judge.
THE COURT: Thank you, Doctor. I appreciate it.
MS. RUE: Thank you, Dr. Mack.
BY MS. RUE:
Q So, it looks like on this PowerPoint, this is related to a general anatomy of the brain. Is that correct?
A Of the meninges, the things that slid around the brain and structures that pass through them.
Q Okay. And so I just meant that these aren't specific to this case?
A Not -- they don't have any specific images of Darryl. That's correct.
Q Okay. We'll get to those. Thank you, Doctor. So, what is the dural anatomy?
A The dural anatomy is just a description of a structure that lives next to the skull, around the brain. And one of these I understand was discussed already. This is one that was in my report. It comes out of the paper that I wrote. I'll take you through it. This is of course --
Q Yes. Can you just give me one moment, Dr. Mack?
A -- (indiscernible).

Q Sorry. There's a bit of a lag here. So, we're on Image -- or Slide 3 of the PowerPoint, and this was also, I believe, referenced by Dr. Medina just in discussing the general anatomy of the meninges. So this was already seen by the Court. It's in Dr. Mack's report. I apologize. Go on, Dr. Mack.
A All right. So, again, it's pictorial drawing of the anatomy. The brain is the beige stuff down here. The bridging vein, all that means is there's a vein that travels from the surface of the brain up through the subarachnoid space, which is this green trabeculae, and into this dural sinus, which is the big triangle. And eventually that dural sinus gives the blood back to the heart. So the significance of the dural sinuses is -- is and the bridging veins is those are the -- kind of the last portion of blood that enters the skull. That's their exit zone. So they exit, all exit through the dura. So the dura is not just a fibrous membrane, it's actually the primary conduit of all the blood that's leaving the brain to get it back to the heart. So, it's important, number one.
Next to the dura is the arachnoid barrier membrane, which is yellow here. And the dura and arachnoid are adhered to one another. They're actually cell to cell interfaces. There's no space there, not

until one is created by the collection.

And the subarachnoid space is noted in green, and that's filled with cerebral spinal fluid. So we'll see that in the dura. The pia is just the membrane closest to the brain.

So this is a pictorial drawing. This is Slide 4. It is not Darryl. It is just to show that the bridging veins are large. So this is a cadaver. The bridging veins have been injected with blue latex.

And when you look at imaging, and when you look obviously at autopsy, these are visible. So when I say the things are large, I mean they're visible and you can measure them, so they're not microscopic. The amount of blood they carry, again, all of the blood exits the brain through these -- through the pleura, a lot of it through these bridging veins up at the top, so they are -- they're large. You can see them. They carry a lot of blood. They average about six to 12 per side when we're talking about the top of the brain. And we know they're strong. They can be tested. This is actually an infant, not Darryl. This is Slide 5.

And you can see that the bridging veins can be stretched at autopsy if you're careful and identify them. And they don't break easily. So normal bridging veins are strong. And good thing, since they're

carrying so much blood, and are responsible for keeping that blood outside the brain.

So this is Slide 6. These are (indiscernible). They're large caliber. The blood flow through them has been measured. If you're talking about trauma and you have normal veins, then a rupture, a true rupture where the vein is, you know, broken into two pieces, that requires force. And then (indiscernible) the ones that I've showed, those are responsible for draining a large amount of blood from the cortex to the brain.

So this is -- this is why -- on Slide 6, this is why I was taught, what we know all these things, and we look at a subdural hemorrhage, then we can reasonably say if bridging veins are the only origin, then that took force. So that's where we get into the assumption that a (indiscernible) subdural force must have taken place.

And in fact you can get bridging vein rupture. This is an example. This is not Darryl. It's Slide 7. This was a bridging vein rupture confirmed at surgery. So, acute bridging vein rupture is a surgical emergency. There's a lot of blood flowing through that, and they often, you know, shift the brain over to the side. So bridging vein rupture

is true, you know, breaks in the vein, are a surgical emergency.

Q And what would cause --

A So --

Q I'm sorry, Dr. Mack.

A Go ahead.

Q If I may for a moment? What would cause a bridging vein rupture? I believe you just testified that force would?

A Right. So if you accept all those anatomic facts, if the patient is normal, you know, quote, unquote, normal, they don't have a collagen disease, they don't have a known disorder that would cause them to hemorrhage from a vein without trauma, like a significant bleeding disorder, hemophilia or something, so if all those things are absent, then if you truly have bridging vein rupture then you can say, well, that took trauma. You can't say how much trauma, because it can be different depending on how old they are, and how -- you know, how -- you can't make any -- without being where we can ask a biomechanical engineer to model what forces might, that you can't say I know how much trauma occurred, all you can say is, well, this bridging vein rupture would require trauma.

So, the next kind of anatomic fact

(indiscernible), that's -- they're not theoretical, they're -- here's the problem, and this is where I first got interested in it, is -- so we can accept all those things. The problem is you see subdural collections without trauma and without predisposing conditions like collagen diseases, or severe bleeding disorders.

So I know -- this is the second number in Slide 8, is BESS, or BEHS, that's been described as an anatomic variation. You see subdural collections in this. This is just a list of some of the things that we can see subdural collections in that don't require trauma. And this is how I got interested in the anatomy because I worked with a group of patients in Lancaster, with a clinic and saw patients that got subdurals without trauma. So that's my -- I kind of backed into this abusive head trauma controversy because I was interested in this non-traumatic collection.

Q So I want to interrupt you really quickly, Dr. Mack. So, I'm sorry, which slide is this, just to --

THE COURT: Eight.

Q Slide eight, correct?

THE COURT: Yes.

A Slide eight.
Q So, when you describe subdurals you're referring to subdural hemorrhages?
A Anything that occurs that -- that disrupts the connection between the arachnoid and dura. So it can be fluid. It can be old blood. It can be new blood. Or it can be a combination of blood plus fluid.
Q Blood plus fluid. And --
A Yes.
Q -- what is a subdural hemorrhage?
A So -- yes. So that term is used any time there's a collection because -- because oftentimes when you see a subdural, you know, if you're a radiologist sitting in a chair and you've got the thing coming in, you think, oh, subdural hemorrhage (indiscernible) there's trauma, hemorrhage.
Q I'm sorry. Can you repeat that just a little bit slower?
A So, hemorrhage is sometimes used as a catch all. But you have to go back and look at the data and say, okay, how much of this is hemorrhage, how much of it is fluid, and can you tell the difference, you know, using the imaging modality that you've chosen? You can. You can tell the difference between hemorrhaging and fluid usually. The problem becomes when it's only hemorrhage

it can look like fluid, like old, months old, not like a couple of days old, but months old. That's called a chronic subdural, and that used to have blood in it, that used to have blood cells in it, but those blood cells have broken down and the body is starting to remove them so that it's now a fluid collection.
Q Okay. And, Dr. Mack, if you don't mind, if you could just slow down a little bit, so -- just so we can follow all of the terminology, which is, as lawyers, a little bit confusing, I think, sometimes. So if you don't mind just slowing down a little bit so we can understand.
A Sure.
Q I want to ask you, you just -- you said you became interested in this in your study of a population regarding these subdural collections. Can you explain what you were referring to?
A Yes. I think it's one of the first presentations in my C.V. There's a clinic in Lancaster called the Clinic for Special Children. Lancaster has a high -- has a big population of Amish and Mennonite families, so there's a particular condition that occurs in the Amish called glutaric aciduria. It occurs in more patients than just the Amish. It just happens to occur more commonly --

Q What is it called again?
A -- that (indiscernible).
Q I'm sorry. What was it called again?
A Glutaric aciduria -- GA-1.
Q Okay.
A Capital G, capital A, and then one. Glutaric aciduria. So, Darryl doesn't have that. That's -- so it's not really relevant. It's relevant to the idea that you have subdurals without trauma, because those children, the children with GA-1, do not have an underlying collagen abnormality, and do not have an underlying bleeding disorder. So they have a metabolic condition that predisposes them to hemorrhages without trauma, or collections without trauma, some of which are hemorrhagic.
Q And so when you learned that, when you determined that, can you just explain how that, for lack of a better way to put it, sparked an interest in subdural collections without trauma?
A Yes. So it was interesting you asked that, because I was taught that in, you know, residency, and fellowship, yeah, you know, subdurals equal trauma, except in these very rare conditions. And I said, okay, that's fine. And I really didn't think about how that was not congruent (indiscernible). I just said,

okay, that's a fact. I'll take that and put it in my brain. But when I started working with this population, the director of the clinic said, so, why? And I went, what do you mean, why? And he says, why? Why (indiscernible)? You know, I need you to tell me why, because that's my reason for being here is why do they have the things that they have? And I said, oh, I don't know why. Let me think about that. Let me start looking.

And I started, so, kind of embarrassingly, I hadn't -- it hadn't really occurred to me that there was a problem, that we can't invoke rigid vein rupture when it's non-traumatic. So that's why I went looking. That's what sparked my interest. I'm like, oh, good question. So I spent six months looking into (indiscernible) and what lives there, what else could be bleeding, what do we know about this, what's in the literature? And then I happened to coincidently run into some pathologists who were also studying the dura in infants and newborns. So it kind of came together, those two fields intersected. And the paper was written by me and two pathologists.
Q So have you since learned that obviously the special population had a specific condition that sounds pretty specific to them, you've learned that -- is it

fair to say that you've learned that other non-traumatic events can cause subdural collections?
A Well, again, I had always known this in the back of my mind because, you know, it was taught, but, you know, the occasional kids with meningitis had subdural collections, and I was taught that. This whole concept of benign external hydrocephalus, I was taught that, and that was part of my training. I just never -- I just never asked why. I knew that in BEH or BESS the theory is that, oh, it's -- you know, these veins are stretched across this space, and therefore they're at greater risk for trauma. I don't think it's that simple. (Indiscernible) predispose. But I don't think the anatomy suggests that -- the anatomy demands that we be more careful about saying that we know the cause. We know that they occur together. And we know that they are non-traumatic. But we have to be careful about saying I know what happened to give the subdural collection. I can tell you the physiology that could participate in that. And I don't think that the stretching is not related. It may well be. But it's not the only possibility whereby you can get subdural collections.
Q What --
A Because you can see (indiscernible) there is no

stretching.
Q What would bridging vein rupture look like in an infant's brain, or a baby's brain?
A So -- yes. So I'm on Slide 7. This is documented bridging vein rupture, not hypothesized. Documented. This baby came in, went into surgery, single frontal bridging vein is ruptured. And that clot was evacuated the vein coagulated, or, you know, the bleeding stopped during surgery. So that's a -- this is just data. It was a single bridging vein rupture. When you look at how much blood is carried through a single vein this makes sense. This is what it should look like. And there are -- actually I have given a lecture about -- quoting some of the literature that showed what you expect in volumes in bridging vein ruptures. Acute hemorrhage. So this is a CT scan with acute hemorrhage. Not fluid, but blood. All of this white stuff is blood. That's what is definitive about this -- about CT, but also in this case because he went to surgery. So blood comes out of the veins, and when it's acute it looks like on this study. If it were fluid, it would look like this, this black color. So that's what bridging vein rupture looks like. And it's not a hypothesis, but actually a documented bridging vein rupture.

Q What would -- strike that. What is BESS?
A What?
Q What is BESS? I believe you just testified that that was another alternative explanation of why there would be a subdural collection.
A Yes. So it is an anatomic variation that's poorly understood. The initials, BESS, stand for benign enlargement of the subarachnoid space. But it has many different names. That's just one of them.
Q And when you --
A It's a very (indiscernible) anatomy. It's more fluid than you usually see around the brain. Sometimes in the subarachnoid space, but sometimes in the subdural space.
Q And when you say it's poorly understood, what do you mean by that?
A We don't understand why some kid get it and others don't, why it tends to be limited, like only occur in infants, and usually resolves by a year or so of age. We know that it's more common in certain subgroups of infants, males. For some reason it's more common in males. Nobody can tell us why that is, but it is more common in males. Sometimes but not always is associated with a big head. It is more common in premature infants. And there's some -- you know,

there's been some hypotheses about why that may be so. So we don't know all the time why it occurs and why it goes away. Sometimes we have to treat it. Some of these kids present with findings that require treatment, in other words, a shunt or two to drain the fluid, but not all of them do. Some present with seizures. So that's what I mean by poorly understood. It's a spectrum of presentations. And of course we don't even know how many patients out there that don't develop symptoms since it resolves on its own, and we don't image anybody except those who come in with symptoms. But we're only seeing potentially the tip of the iceberg on that one.
Q And other than seizures are there other symptoms that a baby with that anatomic variation of benign enlargement of the subarachnoid space, are there other symptoms that a baby may show other than seizures?
A There's a whole spectrum of things. Any symptoms related to increased pressure. Many of these kids actually present with changes in the eyes, lethargy. Any time you have an imbalance in the micro environment around the brain you can get symptoms related to the brain. The brain requires a very stable environment. It is -- it's actually an electrical organ. It's

passing electrical signals back and forth between neurons and glia. So any time you alter that micro environment you can present with findings that suggest there's something going on. And that's why they get imaged. Otherwise we don't pluck kids off the street without symptoms. We image because they have symptoms.

Q You said -- you reference that there might be symptoms in the eyes. Why would that be?

A If there's increased (indiscernible). So I'm not talking about retinal hemorrhages. That's something that we look into (indiscernible) the kid presents with downward gaze. That's when -- that's an exhibited sign of increased (indiscernible) pressure, and then they get imaged, and we find a variation of this anatomy.

Q Doctor, as an expert in this field if you were to hear that -- what do you think of the premise that a child that presents with BESS would have a rupture in the bridging vein with very little trauma?

A So, I would agree -- sorry -- I would agree that you can get subdural collections in the ESS with very little trauma. When, again, we talk about ruptured veins it's a large vessel. It's carrying a large volume of blood. So I would not agree with the word rupture. I think you could argue that the stretching could produce some leakage, maybe. But not rupture.

Rupture is -- you saw the slide where the scar was being stretched away. Those veins don't rupture, truly break, without trauma. But the stretch can, you know, cause other things to happen, including leaking, a clot forming in the vein because the stretch could produce changes in the lining of the vein. We call that the endothelium. And those can lead to subsequent events, including seizures. So there are things that can affect the bridging veins directly because they're non-stretch, but I think rupture would be the wrong word to use.

Q Is there anything about the infant brain specifically that make them more vulnerable to bleeding?

A To bleeding in the brain or around the brain?

Q I'm sorry. I didn't catch that.

MS. BIELAK: Bleeding in or around the brain.

A So I think the question was is there more -- something about the infant brain that makes them more susceptible to bleeding? Is that your question?

Q Yes. In or around the brain.

A Well, the -- so infants have a particular anatomy in the dura that make them more susceptible to dural bleeding as non-infants. They have more vessels in the dura than an adult. I don't know that I could say

overall that infants compared to adults are more likely to bleed. That is a general statement.

Q Right. I --

A The dura are more likely to bleed than adults because there's more vessels. So blood comes from vessels, they've got more of them. And the vessels I'm talking about in the dura are not something you would pick up the dura and could easily see. These are microscopic vessels. These are little capillaries. Capillaries are the tiny little end vessels that can leak with heart trauma, et. al.

Q Dr. Mack, can I ask you to go back to that -- I believe it's Slide 2, which is in your report, the anatomy of the brain, the meninges. I'm sorry. That's Slide 3. Pardon me. Can you explain your answer about the vascularized infant brain, just referencing Slide 3, where that would be?

A Well, it's -- actually I have a better slide of it, but it's in the dura. I don't have the vessels in there because this was just meant to show what (indiscernible) dura looks like by this gray thing. So it's actually later on. I think it's actually the next couple of slides --

Q Do you want to show us that?

A -- where I show the -- this is Slide 11. It's the

same as Slide 2, but it shows the vessels and the dura. So the dural plexus is what I'm referring to.

Q Okay. And what is the dural -- pardon me. What are dural plexus?

A Well, the plexus is not a name I gave this. This is a name that the anatomists who first described it gave. It gets this -- plexus of small vessels, capillaries that invest the dura, and one of the things that everybody was asking by the time that these were first discovered and still ask to this day is why are they there? Because the dura itself is a fibrous organ. It's not like the heart, or the brain, that requires a lot of vessels just to survive. So these aren't vessels that are there just to support the metabolic needs of the dura. But nevertheless they live there. So that's one really interesting question is why? What are they doing there? So -- but the fact is they live there. And they are much more diverse in babies than they are in adults. They live within the dura proper. And when they bleed you -- the end result of that bleeding if the volume of blood is great enough can be subdural bleeding, subdural hemorrhage.

So this is Slide 12. And I believe this is also in my report. Both Slide 11 and 12 are in my report. If the dural plexus bleeds with enough volume

you will see subdural hemorrhage. So unrelated to (indiscernible) things. And this bleeding can occur without trauma. So when we have these conditions where bleeding can occur without trauma, if this vessel is normal we can't (indiscernible) there because that vessel has to be strong. We really won't survive (indiscernible) if we didn't have strong bridging veins. Those are really -- those are important vessels that take all the blood and bring it back to the heart.

Q And by that I --

A Those other ones --

Q Just to interrupt --

A Sorry.

Q -- quickly, because you're pointing with the arrow to the B.V., the bridging vein, when you're saying that vessel you're referring to the bridging vein?

A Yes. Yes. And the bridging vein is the strong one. The plexus can bleed without trauma. Certainly trauma can cause bleeding. And in anything if you have an impact to the head and that's enough to disrupt this vascular plexus, there will be bleeding. It's just like any capillary. If there's impact it will bleed. But it can bleed without trauma, whereas the bridging vein, if the bridging vein is normal, normal thickness,

normal wall thickness, it shouldn't rupture without trauma. That doesn't make any sense. But these can bleed without trauma.

Q And if you can just elaborate for the Court, what are some of those reasons that a dural plexus could bleed without trauma?

A Yes. That's the -- that's --

Q The slide you showed before.

A Yeah. No.

Q Okay.

A We know the associations, and I can go into, you know, the (indiscernible) of why this is there just based on how the brain grows and how the dura accommodates that growth. But the bottom line is we don't know for certain why kids get benign external hydrocephalus, or (indiscernible), BESS, or, you know, whatever name you want to give it. We don't really understand why they accumulate fluid and meningitis. We don't understand why they get fluid and blood and metabolic diseases, but they do. Autoimmune diseases, there are a couple of autoimmune disease that (indiscernible). So we don't understand that. And I can go through the anatomic structures that live there that could be contributing, but we don't -- we can't possibly determine cause, like A causes B from a

physiologic standpoint when we don't even understand why those vessels are there, where they don't need to be there to split the membrane, but they are clearly there for a reason, or we would have lost them in the course of evolution. So they clearly are performing a function.

And I understand some of those functions, but, you know, that's probably more than we want to get into, the physiology of how the cerebral spinal fluid gets absorbed in all of that, or they participate in that.

Q Okay.

A So I think relevant to ask about why, you know, you can get fluid or bleeding without trauma, you really do have to think about fluid, because that -- because (indiscernible) fluid in a subdural compartment, it's only that tinged, so not nearly bleeding as we think those capillaries are rupturing. You just get fluid. And that we call a hygroma. But that's definitely what's happening with meningitis. That's fluid coming from the dura in the presence of meningitis. So meningitis affects the pia and the arachnoid, and (indiscernible), that's how meningitis (indiscernible) that space.

Q And the pia is --

A The response of the dura is in some cases to produce fluid.

Q Okay. And the pia on that diagram is the dark green?

A The dark green.

Q Okay. Dr. Mack --

A So --

Q Go ahead.

A Go ahead.

Q No, no. Continue.

A So, yeah, so the dura is -- belongs -- I should have said this in the beginning, this arachnoid and pia and the brain, that actually belongs to a very protected space called the -- it's behind the blood/brain barrier, and I call it the protective brain space. That space has to maintain a very unique equilibrium for the brain to function well. A little bit of blood in this space and we could run into trouble, we can start seeing some. Whereas the dura can bleed and you don't have any symptoms at all. Most newborns who have subdural bleeding don't have symptoms.

The same with fluid. You could have fluid in that space and you wouldn't know it. You know, until you develop symptoms we don't image you. So -- but

that's different than the brain space. This actually has cells -- act more like cells in the spaces outside the brain, so more like spaces in the cells around me rather than the kind of -- the way fluid acts in the brain. The bottom line is these vessels are leaking by themselves, just like vessels -- you know, just like your finger can swell through minor trauma, or just because you know, you're sitting on an airplane they can swell. So the dura can (indiscernible) with trauma, too, because the vessels are like the vessels in the rest of the body.

Q And again, that's in the dural space?

A The dural space, which is -- the dural space is systemic. It's not brain space. It's actually part of the systemic circulation, which is (indiscernible) the rest of the body. So the vessels participate -- the vessels in the dura are separate from all the vessels that invest the brain.

Q So if a patient exhibited subdural hemorrhages why would it be important to look for the presence of fluid in the subdural compartment?

A For two reasons. You don't want to inadvertently call subdural fluid hemorrhage, because it's not. And second of all, when you do have hemorrhage, remote hemorrhage in the brain, sorry, in the dura, over the

long term, meaning weeks to months, you can actually develop fluid as part of a chronic process that occurs after leaving the dura. So a chronic subdural hemorrhage, all of the fluid that you see in those is not from that episode of bleeding, it's from a combination of the initial blood and then the body trying to heal that -- that disruption of the two compartments. So when you disrupt the dura and arachnoid and you put blood there the response of the body, the systemic circulation is to go in and say, okay, this is a problem, let's try to heal it.

Well, in some patients (indiscernible) of fluid and re-bleeding becomes part of it. So you can get this progressive increase in the size of the subdural fluid compartment because (indiscernible) bled a little bit months ago. Again, not all patients get that, but some patients do.

Q What are re-bleeds?

A So, re-bleeds are -- I think I have to -- I don't think I have it in the slide part, but I have it in the report. Let me see if I -- I have to pull up my -- my report. I can share that, I think, with you.

MS. BIELAK: I don't know if we mentioned, you're on Slide 13.

MS. RUE: I think she said it. I think she

was putting them on the record each time.
THE COURT: No. She --
THE WITNESS: I can actually point you to Court (indiscernible). If you go to -- I'm slow here. If you go to Page 5 of the report, this is just a published image. I talked about the small vessels that invest the dura normally. They live there normally.
When you have previous bleeding part of the repair response of the dura is to produce something called neomembrane. So neo, just new, membrane. So in addition to the dura there's this additional thing there, neomembrane. Within that neomembrane by design are increased vessels, because the vessels are part of the repair process. So those tiny vessels, just like vessels in the dura can bleed. And that's where we can get, you know, this production of a chronic membrane. Not everybody who has a dural bleed gets chronic collections, but all form a membrane before they heal. The neomembrane is part of the pathologic human process.
BY MS. RUE:
Q Dr. Mack, what is macrocephaly?
A Large head. Macro is just large.
Q Okay. And how does that relate to what you have been testifying about this morning?

A Because some patients who have a large head, this is just, you know, infants with large heads, a subset of those have this condition called BESS, particularly males with large heads. A large head doesn't mean you have it, but it's one of the things associated with it. However, you can have -- particularly in the premature population, you can have expanded spaces, fluid spaces around the brain if you have a large head. And part of the reason for that may be that the premature brain has some atrophy associated with it just from the insult of being born early. If you have atrophy, so lack of appropriate growth, you still have a discordant size of the brain versus size of the skull when you have this enlarged space that makes up the difference.
So macrocephaly can be associated with BESS, but it's not a requirement for the diagnosis of BESS.
Q In your practice -- can you describe what the scientific method is, Dr. Mack, as a scientist? What is the scientific method?
A So, in general the scientific method is how you observe. So we're saying it's observation, investigation, and then drawing from that a hypothesis, and then testing that hypothesis using experiments. And then if the hypothesis fails to confirm, or the testing fails to confirm your hypothesis, then you

modify your hypothesis and you try again. It's the classic scientific method.

Q Do you utilize that in your practice?

A Yes. Well, medicine and science are related, but they're -- because obviously you can't perform experiments. We do make observations, obviously. That's part of our job is we make an observation. We make -- so our differential diagnosis could be a hypothesis. This finding, A, could be caused by, you know, B, C, D and E, and I favor C based on this data. So that would be a hypothesis (indiscernible), and then we would do testing. So, actually let me make this (indiscernible), because this is (indiscernible). I see a mammogram. There's something (indiscernible) doesn't belong. I say, ah, that's abnormal. I need more investigation. I'll get an ultrasound. The ultrasound shows a mass, something that doesn't belong. And I'll say, ah, that could be A, B or C, so, benign, malignant or infection. So let's do a biopsy. That would be the test to confirm whether -- if I thought it was benign, not cancer, I would do a biopsy to confirm my hypothesis that it was benign. If I thought it was cancer I would do a biopsy to confirm that. So the confirmation process, the testing, when you have that confirmatory test, that's obviously critically

important. You wouldn't treat for breast cancer unless we had that confirmation test, that positive pathology.

Q Is there a confirmatory test that you know of for abusive head trauma, or shaken baby syndrome?

A No. The confirmatory test I think would have to be courts, since abuse is a crime. So -- but there's not like a test you can order and say this -- you can't order a test and say I know intent. And, you know, a test to say it was a crime --

Q So, can you --

A -- (indiscernible) medicine.

Q Can you explain what you mean by that?

A (Indiscernible) you know, we can code it as abuse, but that's not the gold standard. Just because we code it as an abusive head trauma case, that's not the gold standard of how you determine whether or not a crime was committed.

Q So, can you elaborate on what you mean by that in terms of we code it as something? You mean a medical code?

A Yeah. It's a billing code. (Indiscernible) saying is there a medical diagnosis. Yeah. There's a medical diagnostic code for abusive head trauma. But that's -- if that were the final outcome then we wouldn't need the courts. Obviously it's not. It's

the way you code it. It does unfortunately affect the literature because if I'm a medical doctor or I am a child abuse pediatrician, if I want to do a retrospective review of how many abusive head trauma cases came through the hospital with retinal hemorrhages, the only data I have access to is through the children that I have labeled abusive head trauma. And I can look into those. But I can't go back on that data set and say to the courts and say which one did the court actually say was abuse, which one of the parents, which ones were -- did the court say it was -- met the legal threshold or the standard, whether a Family Court or Civil Court. That (indiscernible). So really the literature, when you're talking about the medical literature, it's got a built in confirmatory bias. You know, if you're going to search for the things you already coded for, but not for the -- not for the gold standard, which is the legal outcome.

Q And so if you were to hear that there's a 96 percent accuracy rate of retinal hemorrhages in diagnosed abusive head trauma, what are your thoughts on that?

A So I think the -- it's usually called specificity, which is how specific it is. Although more commonly positive predictive value, if you -- because -- because

no one imaging (indiscernible) can be specific for intent. No, it can't do that, but positive predictive value. So, positive predictive value is the true positives over the true positives plus the false positives. And therein lies the problem. Positive predictive value for a test should really never be above 50 percent, or you're missing the false positives. (Indiscernible) missing the false positives. And that's what we just talked about. If the false positives are only discovered in the courtroom, because that's the kind of test, then all of those are absent from the kind of research that gives those that level of positive predictive value.

Basically we look at positive predictive value of 98 percent of the group basically defined your disease by your definition. Because otherwise you need false positives, and that 98 percent (indiscernible) false positives, which is impossible. That's just now how (indiscernible) works.

Q Can you explain what you mean by that, by -- can you explain what you mean by missing the negatives, Dr. Mack?

A False positives or false negatives?

Q I'm sorry. If it's 96 percent I believe you testified, you said then you would be missing the false

negatives, or false positives.
MS. CRAVEIRO: At this point I'm going to object. She's here to testify as an expert in radiology, and I think we're getting off course as to what her expertise is, and I don't see any relevance to her testimony, either.
THE COURT: Are you saying that her testimony is exceeding the realm of her expertise?
MS. CRAVEIRO: Yes. And is not relevant.
THE COURT: Ms. Rue?
MS. RUE: Well, Judge, Dr. Mack is testifying as a pediatric radiologist, and specifically her knowledge of abusive head trauma and shaken baby syndrome, which was outlined pretty extensively in the voir dire process. Her knowledge of that, speaking on it, lecturing, teaching, this is related to the testimony that the State has proffered as proof that shaken baby syndrome exists with a 96 percent specificity of retinal hemorrhages in abusive head trauma -- children that have suffered that. So I'm asking this doctor whether she sees any problems with drawing such a specificity in her expertise.
MS. CRAVEIRO: That's also mischaracterizing the testimony. And that was a different witness, Judge.

THE COURT: I'm going to allow this question to stand. She can respond to it. I'll allow you the opportunity to address it or to reevaluate it in cross. So I'm going to overrule the objection for now.
MS. RUE: Thank you, Judge.
BY MS. RUE:
Q So, Dr. Mack, if you could just explain, you said if you hear that 96 percent predictive value of retinal hemorrhages in child abuse -- pardon me, abusive head trauma, shaken baby syndrome victims, that 96 percent demonstrated retinal hemorrhages, can you explain what you were referring to when you said that you're missing false positives, or you're missing the negative results I guess is another way to put it?
A Yeah. Basically if your positive predictive value is at high (indiscernible), when we're doing these positive predictive (indiscernible) in breast imaging all the time. If it's that high over any type of any disease process you're using -- the definition of the disease is -- is part of how you're putting the patients into buckets. So if you start with retinal hemorrhages equal child abuse, and then you go back and query how many times is child abuse found based on my definition of child abuse (indiscernible), the positive predictive value would be a hundred percent. So it's a

circular argument kind of thing.
Now, the false positives are basically where -- where we were wrong. We don't really have access to that data as a medical doctor. And you do in other areas. Like I have access to all my false positives, patients for whom I recommended biopsy who didn't have cancer. I know what my positive predictive already is. I know those numbers every year.
Q You described as a radiologist you read imaging, correct?
A That's correct.
Q If an E.R. doctor saw a subdural hemorrhage on an image is it appropriate for that doctor to pass that on -- I should say in an infant, is it appropriate for that doctor to pass that on as a concern for abuse?
A No. If he's a mandated reporter, which most physicians are mandated reporters, anything that that reaches the threshold of suspicion should be documented, or they should follow a (indiscernible) pattern that's set up in the hospital to contact Children and Youth, or whatever state agency is in charge of making investigation.
Q So it's fair to say that you are a mandated reporter, as well?
A I'm a mandated reporter. Yes.

Q Okay. And so when I say pass that on, as a mandated reporter, what does that mean to you?
A So, to me specifically as a radiologist I read the images, but I don't typically have access to the patient. So while I am a mandated reporter by law, what I would do in the setting of the E.R. is I would call the E.R. physician who is taking care of the patient, let them know that there's subdural hemorrhage, try to collect some history, and then an investigation would begin pending the clinical circumstances. So the E.R. physician would have to decide if the history provided by the parents was sufficient so that it didn't reach his threshold, his or her threshold of suspicion. Once it hits a threshold of suspicion, which is a low bar, then it should go on.
So radiologists rarely report directly to Children and Youth, or the state agencies, but we do -- we are mandated reporters, and it would be important that we would get the information, usually in verbal form, to the members who ordered the test.
Q And is it correct to say that for a non-ambulatory child seeing a subdural hemorrhage would raise some concern at that point?
A Well, that -- in many if not all (indiscernible),

whether or not they would be referred would depend on the clinical history and analysis (indiscernible). Because the threshold is different for each physician. But it wouldn't be uncommon for a subdural hemorrhage to be referred to Children and Youth.

Q Okay. So there would be an assumption of abuse at that point?

A Um -- so, well, you're opening a can of worms. Yes, they're not legal assumptions. You can't make a presumption of abuse from a legal standpoint, but from the safety of a child, that's where you come in -- as a physician I have to presume the worst possible scenario to keep any patient safe, so if I see a mass on a mammogram even though I'm not that suspicious, the safest thing to do is biopsy it in most cases, even though my suspicion may be low. It's still the safest thing to do because missing it would be -- you know, could cause harm. So that's where I -- that may help you understand, you know, what the threshold is. You want to make sure you're not missing something.

Q Right. So the -- so if I understand what you're saying correctly, it's not -- it is appropriate to investigate any possible concern that abuse caused such injury, is that fair to say?

A Right. Absolutely.

Q Okay. What about if the child also had retinal hemorrhages?

A Well, so -- so when you have a subdural hemorrhage that appears and nobody is exactly sure why, the next step is retinal hemorrhage. This gets into the circularity. And the next step is to look for retinal hemorrhages, whereas if the child came in with (indiscernible) they might not get an ophthalmology consult. There's nothing to treat, but the ophthalmology consult is ordered after the subdural. And not always, but sometimes retinal hemorrhages are seen in the context of subdurals.

Q So, what should happen at that point?

A In most cases the children are referred onto Children and Youth for investigation. And if there's a child abuse pediatrics program they are called in to help with the investigation.

Q But what would that child abuse pediatrician do? What would the appropriate, from your perspective, for that child abuse pediatrician to do with the data that they had?

A I think they should confer with -- would confer with the radiologist. And again, I'll speak from a radiology standpoint. I think direct verbal conversation, and review of the imaging studies would

be important. I can't testify to what else she might do, she or he might do. But I do know that radiology -- understanding of radiology, all of it, would be very important. There are things that could be on the scans that may not be reflected in the report.

Q Do you ever determine that injuries on -- that you see as a radiologist are as a result of trauma?

A You can see evidence of trauma on scans. Sure. I mean, you can see fractures. You can't tell whether or not they're intentional trauma. But you can say a fracture is the result of trauma. And you can't say (indiscernible). You can't say how it occurred, but -- scalp swelling is often (indiscernible) a reflection of trauma. Skull fractures are obviously a reflection of trauma. Subdural hemorrhage can be a reflection of trauma, but certainly not always, because it can occur without trauma.

Q Now, you just --

A But, so definitive trauma signature on a scan would be with a fracture or soft tissue swelling that's correlated with scalp hemorrhage that you can see visibly, you know, bleeding under the skin, that would be definitive evidence of an impact injury.

Q What about any other injuries to the brain?

A So, if you had -- well, sure, you could have penetrating injuries, where there's this, you know, scalp (indiscernible) and there's bleeding in the brain, and it looks like it was a penetrating injury. Whether or not you saw the bullet or the knife or whatever you'd say, well, that's traumatic.

The problem with brain swelling is -- it can -- certainly can occur in trauma, but it is not specific to trauma. You can see brain swelling without trauma. So it's -- so, yeah. So radiologists can confirm trauma, and can show trauma when, you know -- so, some of the cases I've been involved in they say, you know, parents deny any trauma, and imaging is sent to me and I've said, well, there's trauma here, there's a skull fracture, there's soft tissue swelling. I can't tell you exactly how old it is, but it's probably within the last week or two. So, talk to your client. They may not be aware of the trauma, but trauma did happen.

So I have seen those cases, that's why I can be definitive about trauma. Whether or not there's underlying subdural, I can be definitive about trauma in cases like that.

Q And you just testified that you do not qualify any images that you see as inflicted trauma as

opposed to you have diagnosed the injuries as relating to coming from trauma. Can you explain why you don't find inflicted trauma specifically?
A Well, because you can't determine intent from a radiologic image, but also I'm -- my role in court is much different than my role would be in the E.R. We are reading -- in an E.R. my role would be to, you know, if it met the threshold of possible trauma I would refer. Not that I could make a diagnosis of -- I mean, possible inflicted trauma I would refer. Not that I would make a diagnosis of inflicted trauma. I'm not saying -- I can't tell intent. There's nothing about CT or MRI that can tell you intent.

But my role in the courtroom is to tell (indiscernible) what evidence on the scan is specific for trauma, you really have to be careful. Why I can say the things I do based on anatomy, and while you can't say certain things based on anatomy, or imaging are basically the limitations of that study. And because no studies are perfect. So that's -- it's a different role than say, a child's pediatrician gets called to investigate. My role in court is to -- we already hit the threshold of suspicion. Nobody is arguing that that threshold wasn't met. I perform a different role now. And (indiscernible) can say look,

I'm not the trier of fact. I'm helping the Court understand what's there and what we can and cannot say.
Q So you know you've just testified that you have consulted with attorneys and courts before, right?
A I have consulted with attorneys before. Yes.
Q What do you do in your role as an expert in consultation in the legal realm as a doctor?
A I tell them what the imaging shows. I (indiscernible) review what you can and cannot say about it. Sometimes I tell them I'm not your expert. This really requires, you know, a surgeon or something. And so it's really just information. I'm not -- because attorneys are not physicians, they're not radiologists. They often need to know what the imaging shows and how to understand that imaging in the context of their case.
Q And what is -- do you review neurosonograms as a part of your consultation?
A Yes. Actually, I used to perform them all the time. They are so fun and so -- you have a probe basically right on the brain. They are just a great exam for an open fontanel. The fontanel is a soft spot.
Q I think we have a different --
A Because the probe is literally on the skin and

dura. So it's a beautiful exam limited to the space that the probe can see. But they're wonderful exams.
Q Okay. So I know a neurosonogram is done on an infant because they have that soft spot, is that right?
A Yeah. You can do them on other infants to look for (indiscernible) soft spots, or to look for different things. (Indiscernible) vasculature. But, yeah, in the context of a young infant with an open fontanel we put the transducer right on the soft spot and look -- peer into the brain that way.
Q Okay. And were you asked to consult on a finding of abusive head trauma related to Darryl Nieves, Jr., or also referred to as D.J.?
A Yes, I was.
Q Did you write a report about the findings that you made?
A Yes, I did.
Q What documents or what did you review in generating your report?
A So I had -- initially I had an ultrasound that was performed at the time that he was admitted for his VSD comparison back in July.
Q And VSD is --
A And then I had the MRI --

Q Sorry. To be clear, Dr. Mack, Doctor, VSD is what?
A Oh. Ventricular septal defect, a heart defect that we repaired.
Q Okay. Continue. I'm sorry.
A And then I had the MRI that was performed when he came in with a suspected seizure event and he was unresponsive. And then later on you provided me with additional ultrasounds that were performed earlier in his life, so those were all the things I -- I think within my report I outlined what I had.
Q So, where did you begin in your looking over this case?
A So, I always begin with imaging. So if you haven't -- if you have not saw the imaging I -- I'm not -- I've only had one case where I just opined generally about anatomy, because I didn't have imaging. That's where I start. I take a look at the imaging to see what I can and cannot say, and how much is there, and how much, you know, whether or not I can help interpret the imaging. So if it was a -- if they needed me to interpret a cardiac MRI I'm not your expert. When it comes to, you know, the head and meninges, I feel confident of my knowledge of the anatomy to talk about that, to help you understand it.

Q And there were no sonograms for D.J., correct?
A Yes. There was one. And again, that would be about 7/22. So I think his surgery was 7/20.
Q Do you want to pull that up, Dr. Mack? It's -- I know it's referenced in your report. I -- whatever you're comfortable --
A I believe -- you know what I think I'll do, since we have the report, I'm going to try to screen share my report. Let me see if I can do this. Because that will be easier to follow along with. So can you see my report directly?
Q Not yet.
A Does it fill your screen, or a part of your screen?
Q Yes. I believe it will fill the screen. We'll let you know as soon as we see it. There's a lag.
MS. CRAVEIRO: I couldn't get her report on. How is everything working for --
THE COURT: I can see it now, Doctor.
MS. RUE: Yes, Judge. Pardon me, Dr. Mack. It's smaller. It's not the full screen, the image.
THE WITNESS: The image isn't, but do you see the rest of my desktop in the background?

MS. RUE: We do.
THE WITNESS: Or do you just see the -- the document?
MS. RUE: We see the desktop.
THE WITNESS: Okay. So let me see if I can -- how about that?
MS. RUE: Oh. Pardon me. That made it smaller. Now we see the full Word heading for Microsoft.
THE WITNESS: So, that made it smaller?
MS. RUE: Right. Before we didn't --
THE WITNESS: It should --
MS. RUE: I'm sorry. Before we didn't see the full heading bar on Microsoft Word. Now we see the full toolbar I guess it's called. Is it possible to zoom in?
THE WITNESS: Yes. So let me do this. I think I -- I guess what I was asking is did you see -- could you see just my -- my Word document? Because I can make that bigger (indiscernible) see my desktop. Is that just the Word document you're seeing?
MS. RUE: Yes.
THE WITNESS: Okay. And I can make the images bigger for you. One second. Now I just zoomed the Word document so it's bigger.

MS. RUE: What page of your report are you on, Dr. Mack?
THE WITNESS: I am on Page 6.
MS. RUE: Okay. And again, this is S-11, I believe.
MS. BIELAK: Yes.
MS. RUE: S-11, D-8.
MS. BIELAK: Does the Court have a copy?
MS. RUE: Judge, you have the color copy, correct?
THE COURT: Yes.
MS. RUE: Okay.
BY MS. RUE:
Q Okay. So, do you want to just explain what we're looking at right now, Dr. Mack?
A Yes. So this is basically an information page provided by the technologist who did the scan. It's a (indiscernible) ultrasound portable, (indiscernible) portable. 4M, M means four month male. And the indication for the exam is dropping hematocrit, HCT, and platelet NP. I don't know what NP means. The (indiscernible) looks like it was (indiscernible). Platelets are platelets, but I'm not sure what she means by NP.
So that was the reason for the exam. Again,

the exam date is on the bottom 7/22. My understanding is the surgery was on 7/20. So some time after the surgery he had a drop in his hematocrit, and that can be a sign that internal bleeding occurred, so they did this quick and easy ultrasound. It doesn't require anything but an ultrasound probe, and they can do it in (indiscernible) in the ICU.
Q Okay. So --
A So this next -- now I'm on Page 6, there's the next image. It should say -- it should have something in the middle of the image. If you see that, let me know.
Q We see that.
A Okay. So this is -- the front -- the front (indiscernible) is at the top of the screen. That's where the probe is. The ultrasound probe is sitting right there. This gray stripe across there is a combination of skin, scalp, and dura. It's right under the -- so there's (indiscernible), and there's, you know, the structure of the scalp. But we're looking basically right on top of the dura. So these black spaces here are fluid. And this curved linear structure right here, that's the cortex of the brain. So that transducer is, you know, within an inch or so of the brain. It's just a beautiful window into it.

So what the technologist has done here is measure the space between the brain and the dura, which is pressure in the subarachnoid space. And if you look down on your left hand corner you'll see that the distance she's measuring between the little cursors that look like this, with the little dot in the middle, that distance is one centimeter, ten millimeters. It's 11 millimeters. And the distance on the other side is about nine millimeters. And then the distance between the hemispheres is about seven millimeters. So this, by definition, was expansion of the spaces around the brain, subarachnoid space.

Q Can you explain what you mean by that?

A I can speak -- what?

Q Can you explain what you mean by that? What the significance of those measurements are to you?

A So they're part of that variation of normal. I mean, it's -- normally fluid exists in the subarachnoid space. That's normal. But the distance between the thickness of that space, or the depth of the space between the brain and the dura is usually not four millimeters. Usually about four, most people would call that expansion. By the time it gets to ten I don't think there's anybody that would say that's not expanded. Some people argue whether it's four or five

that are, you know, not a variation of normal, that's just normal. So this falls into that subcategory of expanded. So, expanded subarachnoid space.

Q So it's --

A The limitations of this exam is I can't tell because I only have a small window, how much of this space is subarachnoid and whether or not any of the space actually is space in the subdural. I can't tell that for sure. So it's really good -- ultrasound is really good at seeing things next -- on the surface next to the brain, but it's not particularly good, unless they're finding small subdurals. And again, that's uncontested. That's been shown in the literature. It's not saying anything new there.

Q And, I'm sorry, again, that ultrasound was from July of 2016?

A Yeah. July 22nd, 2016.

Q And it's -- the fact that it was seven millimeters, is that something that would be considered abnormal?

A Well -- so, in terms of how you use the word normal. If it's all subarachnoid space it's variant normal. It's bigger than usual. It fits the criteria. And it's not seven, it's ten. You know, the distance between the cortex and the brain on this side in here

is eight millimeters. So between seven and ten would be fine. You could say that, because it is slightly variable depending on where you measure.

But if it's all subarachnoid then -- fluid belongs there. You haven't disrupted tissue. But it's clearly bigger than average. So it's within this normal variation. We categorize this variation as benign external -- a benign expansion of the subarachnoid space. It's not a disease. We don't treat it. You know, nobody is putting a tube in this space, subarachnoid space, to try to drain it. But it is --

Q And why would that be?

A It's not what we would accept as average. It's enlarged.

Q It's enlarged? And why would that not be treated, Dr. Mack?

A Well, generally it doesn't cause any symptoms. It can be associated, which we talked about, with subdurals that occur spontaneously or under trauma. But when it's asymptomatic -- I mean, we just found this because he had a drop in hematocrit. He didn't have symptoms (indiscernible) to his brain that -- at least that they noticed. So the image that (indiscernible) drop in hematocrit, they find this

variant of normal that puts him in a category of expanded fluid, but there's no real treatment. I mean, the treatment would be worse than the quote, unquote, disease. To put a tube in the baby's subarachnoid space, well that's, you know, surgery, that's injury. He's not acting off, so you wouldn't treat it. It's not a surgical condition.

Q Right.

A You might follow it, you know, make sure that it resolves, but you don't treat it.

Q Is that the only neurosonogram that you reviewed in relation to D.J.?

A Initially it's the only one. And then I asked you to provide -- to see if you had the other ones, because there were other ones. And I'm going to go to those so you can see -- and I think that's helpful when we look at this over time. So, here's -- I am on Page 10 of the report. And these -- I've listed the ultrasounds that I was provided after I issued the report. And they were really early on in his life, in March, April and June.

So these are fascinating for a couple of reasons. So, these -- this one is really shortly after birth. It's 3/22/16. And again, the same thing. It's a different probe, and this is the fontanel. And black

is fluid on ultrasound. So his brain is much less mature. This is an immature brain. And the distance between the brain and the dura is 2.5 millimeters, so well within that range of what we consider average or normal.

Q Okay.

A That's his initial one on March 22. And then in April it's starting to look a little bit more plump, which is four millimeters. The brain is starting to show some more advanced development. You've got more -- you can see the curves, and the sulci and gyri of the brain. And -- but the space is enlarged a little (indiscernible). They're still within the range that most would consider kind of average. However, by June of '16, now we're -- it's increasing. So now it's getting to the range, it's almost seven. Normal is (indiscernible). And it's been progressive.

So this -- these -- we know he's a premature -- a very premature baby. We would have to correlate with head size to know if he had a big head at this point, and then -- we could postulate he didn't have a big head, but he had too much fluid around his brain, that maybe his brain wasn't growing as rapidly as -- as a kid who wasn't premature. Because usually the brain grows, you know, matches the skull growth.

So the skull is out here, but the brain is down here, we've got that excess space occupying the place where usually the brain lives. So I don't think you can diagnose atrophy, but I know that (indiscernible) preemie that that's one of the things you consider is -- you know, the skull is growing a little too fast, and -- which we can tell by head circumference measurements.

If their head circumference is big, then the brain may not be small. But if the head circumference is still small, then the brain isn't growing as rapidly as the skull, because we've got this difference (indiscernible), and the brain (indiscernible) in fluid. So that was in June. And then, you know, about 20 days later -- less than 20 days later you have that one in July that I showed you. So it was a progressive increase over time.

Q And what --

A Not a sudden increase over time.

Q What does that mean to you, that progressive increase, as a radiologist?

A It's -- you know, I say it's fascinating because we don't -- because we often only get a chance to image these patients once, you know, when they come in with these expanded spaces (indiscernible) have subdural

collections. And we can postulate that it's something that happens slowly over time, but the only data we can use to support that would be, you know, slow head growth at the time. And here is a case where I actually have imaging. You know, he was being imaged as part of his prematurity.

So I have sequential images showing, oh, in this case benign expanded subarachnoid space developed over time, slowly over time. And that's just from a physiologic standpoint kind of fascinating, because we often don't get a window into the brain on multiple occasions. We see it -- you know, we just see it culminating in the symptoms.

So this kind of expansion is not uncommon in premature infants. And nobody is -- you know, we can postulate whether the brain is growing fast. We can postulate that maybe the brain is atrophying, that there was some kind of minor insult to the brain that was find, life that began too early outside the womb. But again, the data is very clear, it's expanding slowly over time.

Q And did you look at images from February of 2017?

A So those would be the images from the MRI. So he didn't have a CT, he had an MRI.

Q Right.

A So now I'm on Page 7. And this is -- the reason I chose these two images is they're -- MRI is a very powerful tool. It sees soft tissues really well. It's -- the images are not from using a -- from an x-ray. They're actually -- you put the child (indiscernible) large magnet, and you put these pulses in, and then you receive information via radio frequency waves. But depending on how you set up the protocol you can investigate issues.

So at the top of the scan on the left, just so we're on the same page, when you look at any kind of head imaging, and it's an axial, so it kind of slices the brain, you know, from the eyes straight back. That's what we call axial slices. By convention the patient's right is always on your left, and the patient's left is always on your right. So this is a T2 rated exam. And the reason we use T2 rated is to look for fluid. So these large -- the butterfly shaped thing in the middle, that's the ventricles of the brain, and they normally contain fluid. They contain cerebral spinal fluid.

So the T2 rated image shows that that fluid inside the ventricles. The ventricles are a little bit (indiscernible). That could go with atrophy, the brain

not growing as fast as you want it to. And then there's a lot of similar signal, the same color, outside the brain in the subdural compartment. Full size (indiscernible).

In addition, you have normal fluid in the subarachnoid space, so this space will look slightly more gray. That's subarachnoid. That fluid belongs there.

This fluid does not. So then the next question becomes, well, is it blood or is it fluid? When I say fluid, I don't mean that it's -- I'm describing fluid as something you look as (indiscernible), and this is bright red. And the reason why I know that is because of a sequence over on the right. It's called T2 (indiscernible). And the reason we use this sequence is to look specifically for blood products. And when I say blood products I mean red blood cells that contain the molecule hemoglobin, because hemoglobin has iron, and iron causes the magnetic field to change, to alter, so you can see it. But when you look at the T2 (indiscernible) sequence what you're looking for is evidence of red blood cells that have iron that change the magnetic field.

What I can say on this T2 (indiscernible) sequence is the majority of the fluid we're seeing, all

of this stuff at the top, is just fluid. If you had done it in a test tube it would not have red blood cells.

Towards the back is a little bit more gray, so it's possibly it's blood tinged. But it's -- remember I showed you that scan that shows you that big white blob on the side of the baby's brain that went to surgery?

Q Right.

A This would not be dense. It would not be. Because if it were dense on CT it would be just a horrible shade of black here because there's a lot of red blood cells in dense things. So the majority of what I'm looking at is fluid. There's a little bit of blood in it, probably. This could also be protein. But it's predominantly fluid, so expanded (indiscernible) fluid collection. So that's the diagnosis. And then you can talk about how they got there. (Indiscernible) --

Q Can I ask you one question?

A -- physiology, how they got there.

Q Before you get there, Dr. Mack, do you see subdural hemorrhages, or can you diagnose them from that scan?

A Well, it all depends on how you -- how you define

hemorrhage. So, this has a little -- probably a little bit of red tinge in it. If you want to call that a hemorrhage, then we say hemorrhage. But what I am trying to help you understand is this is not like the baby that I showed you where it was bridging vein rupture.

Q Right.

A So -- and that's where you go into well, what is it, how did it get there, could it be old, a remote hemorrhage from months ago? Yes. It could be. Because old hemorrhages eventually turn to white on this scan. Now, that takes -- it can take months. The problem is you can't look at the image and say, oh, that definitely is old hemorrhage. You can say it has a little bit of blood tinge in it, but what you can't say is that this is similar or the same as the true hemorrhage I showed you on that CT scan. It's not the same animal at all. It doesn't have (indiscernible) single characteristics. So --

Q Okay. And you were about to --

A -- (indiscernible), you would I guess call it a hemorrhage, well, it's not the kind of hemorrhage that you would say, oh, this acute bridging vein rupture. That's just not represented (indiscernible), be on a signal.

Q And you were going to say, before I interrupted you were going to testify about how they got there. If you want to get into that, please?

A Yes. So the answer is -- the best word to use is (indiscernible). Unless you know the mechanism, I was there when I saw it happen and (indiscernible) right after. You know, we have -- the data we have is slowly expanding subarachnoid fluid spaces, and now a scan that shows predominantly fluid in the subdural compartment with a little bit of blood. Well, how did they get there? Okay. Well, one of those possibilities is that there's some kind of trauma in the past, minor in the case of the subarachnoid (indiscernible). So go look for trauma. Was there any sign that he had bruises (indiscernible). And you'd look for evidence of trauma. Then you can look for evidence of trauma on the scan. Is there soft tissue swelling? Is there any evidence of skull fracture? But if the answer to those are no and no, then the correct answer is (indiscernible). But we see this sometimes.

Q So if you see --

A (Indiscernible).

Q I apologize.

A (Indiscernible).

Q Dr. Mack, if I may? As you look at this scan do you see any trauma evidenced on these images?
A Not direct trauma. No, there's no soft tissue swelling. It's not the best exam for skull fracture. A CT would be better. But I don't have any evidence of soft tissue swelling. (Indiscernible) with an acute skull fracture soft tissue swelling is almost always present. Not always, but almost always present. No direct evidence of trauma.

One thing you don't have is any abnormality within the brain itself. That's helpful. If you had some abnormality within the brain, those two things are likely related. And then you can hypothesize how they could be related. In this case I have other than the brain being a little -- it looks a little small, ventricles are too big, small cerebral (indiscernible), I don't have any evidence of direct injury or insult to the brain. The brain otherwise looks normal.

Q What is the significance of D.J.'s medical history to the way you view these images?
A I think -- you know, when you say what caused this? I use the word cause carefully, because we don't know exactly (indiscernible).

Q I'm sorry. I missed the last part of --
A But we have --

Q -- that.
A So we have data that the subarachnoid space was slowly expanding to the point where when he was hospitalized for his heart surgery it was up at ten millimeters. So I have data to support that these fluid collections occurred in the context of. It's not caused by, as it taught, but in the context of this very (indiscernible) called the benign expansion of subarachnoid space. And the reason I strongly favor that is because, number one, we have literature to support that association occurs, number two, I don't see any injury (indiscernible) soft tissue swelling, and number three, it's mostly fluid, which is what we see in that condition. But I have not been aware of a case of benign extra axial fluid that presented with findings that support bridging vein rupture. With the child I showed you that image is consistent with a bridging vein rupture, not a drying hemorrhage outside.

And this is fluid, a little bit of blood in it, probably, but not a lot. And these benign extra axial collections tend to give rise to subdural fluid collections, often (indiscernible), sometimes slightly muddy. And that's what I think these are. I mean, we have data to support that, sequential data saying, and

the -- remember the last scan was done in July, in the hospital. He didn't leave the hospital until October. And as far as I know he didn't have another scan between then. But if I -- if we do, we can take a look at it.

Q Do you have the measurement of the space? I apologize if I missed it, the measurement of that subarachnoid space in February? I recall in July it was ten millimeters. Was that measured in February?

A Okay. So the -- actually on Page -- this is another unique thing about this case, this doesn't always happen, this is Page 8. This is a different type of image, so on this image the cerebral spinal fluid is black. These are the ventricles, and this is (indiscernible), and I'm looking at the baby in the front. These are ears down here.

Q Right?

A So the slice is actually from top down. It's called coronal. When you have subdural collections, so on the patient's right there's all this gray is that subdural fluid. All the black is subarachnoid fluid. But on the patient's left the subdural fluid hasn't completely effaced, or compressed for lack of a better term, in the subarachnoid space. So I can still measure it. So existing in the background in this

child is a subarachnoid space that measures nine millimeters to me. I mean, that's -- that's what it measured in July. And now superimposed on top of that expanded arachnoid space I'm having these subdural fluid collections, (indiscernible) on the right than he left, not compressing the brain. But basically in place of subarachnoid fluid on one side I now have subdural fluid.

So that's what BEH looks like. Benign external hydrocephalus is the other name. And this is subdural fluid collections in the context of enlarged subarachnoid spaces. It's got a lot of different names. And it's mainly -- you know, sometimes a neurosurgical condition. And you image them because they've become symptomatic, often with seizures, but sometimes with non-specific, you know, lethargy, or sleepiness, or not eating well. So that's the only reason that we've imaged. As I said, the only images I usually see are symptomatic.

Q What --

A But this is a patient with no evidence of brain injury. Some evidence of brain atrophy, or a brain that's not growing as quickly as his skull. And the subdural fluid collections in the context of expanding subarachnoid space.

Q How does the fact that D.J. has seizures or presented with seizures affect your opinion?
A I know that's how he -- why he got imaged, he had symptoms that suggested something going on in or around the brain, so BEH or -- (indiscernible) the patient I guess (indiscernible). It doesn't change the anatomy. It doesn't change the findings. It doesn't change the sequence of events that you documented (indiscernible). It just helps understand how he presented. It's helpful that, you know, he's -- the only thing that I can say is (indiscernible) with. I don't see brain injury in his -- if they were even seizures to begin with they eventually stopped. Because they didn't (indiscernible). My understanding is that (indiscernible) seizures. So that's great. That means that the analysis, the things that we see on imaging in brain injury, that's evidence that there doesn't seem to be any long-term effects, the seizures were not ongoing.
Q And, Dr. Mack, I'm just going to ask you to keep your voice up. It's so hard when we can't actually see you in person. If you don't mind just -- just keeping your voice up so that we can hear you? What about the fact that D.J. had retinal hemorrhages, was diagnosed with having those? How does that affect

the opinion that you came to?
A Well, it doesn't change the data that we have. It doesn't change the fact that he had enlarged subarachnoid spaces. It doesn't change the fact that there were some fluid collections and not all hemorrhage. So none of that is changed for the retinal hemorrhages. I can point you to literature that shows that BEH was -- and again, I'm sorry for the problem with the language, because different authors call these different things. But in the literature retinal hemorrhages have been associated with this condition, sometimes severe. There's two -- I think I referenced both articles in my report that talk about the association.
Q Are you referring to the article by Dr. Piatt?
A Not (indiscernible). Those describe retinal hemorrhages. Piatt happened to describe severe ones. (Indiscernible) described retinal hemorrhages and he says we have some patients that they took out of his category -- he called it spontaneous subdurals -- spontaneous subdurals of infancy was his name for the condition. He said, yeah, those were severe retinal hemorrhages we took out of this bucket, and I'm going to acknowledge that that was a problem with circularity

with the paper. His -- his description was spontaneous subdurals that occurred in the context of -- he also had a different name, arachnoid (indiscernible), expanding (indiscernible) arachnoid (indiscernible). And he saw some retinal hemorrhages in the contact of this. So it's probably based on pressure. Again, the presence of retinal hemorrhage doesn't change the other data that I have.

Q And what about the article you referenced by Dr. Piatt? How does that relate to this -- this is an article that you read, I assume?

A Yes. So that article is interesting in that they have follow up. So this is a child who was young, and they were kind of bouncing the kid up, and he fell backwards in the presence of multiple (indiscernible). And they did a full social service investigation, and he passed a lie detector test, and he -- the reason he published it is because the assumption that severe retinal hemorrhages are specific for abuse have become, you know, kind of a sticking point. Some people said yes, some people said no. What he said is be very careful, because here I have this case that I think is very well documented, where the child had BEH, benign extra cerebral collections, had a minor trauma witnessed, and developed subdural collections,

seizures, these are (indiscernible), and they had severe (indiscernible). So he says, you know, we can't -- we can no longer make the claim that they're specific for abuse. And I think that -- when you start saying something is specific for, one -- one thing that doesn't fit, one example, one documented example disproves the hypothesis (indiscernible). (Indiscernible) any other, you know, data disprove -- if your hypothesis is these are specific for abuse (indiscernible).

Q And --

A And I think --

Q I apologize. This article that you said by Dr. Piatt, do you know the title of it? Or if I read it to you would it refresh your recollection?

A No. (Indiscernible). I would need to read it (indiscernible).

Q Is it "A pitfall in the diagnosis of child abuse external hydrocephalus, subdural hematoma and retinal hemorrhages"?

A Yes. That's it.

Q And that's the article you were just referencing?

A That's correct.

Q And that sounds correct to you as

relationship to your findings regarding retinal hemorrhages and suspected abuse of head trauma?
A Yeah. I mean, I can tell you how -- I mean, I look at the brain. I don't look into retinas, so (indiscernible). But I can tell you how I would respond to a pediatrician who had an infant (indiscernible) --
Q Can you repeat that? Can you repeat that, Dr. Mack? You're kind of falling out. Can you repeat your last answer? It was -- you were -- we couldn't hear you.
A Oh, sure. So I'm not an opthalmologist. I'm not a neurologist. So I'm never looking to the retina. That's why I'm hesitating answering too many questions on retinal hemorrhages. What I can -- I mean, I'm happy to share with you what I would tell the pediatrician who walked into the reading room where I had the scan and said to me, yes, that there are retinal hemorrhages, and I can tell you how he would respond to that. But I can't tell -- you know, I'm not an opthalmologist.
Q Oh, yes. No. I was just referring to the article. If that's -- that informs your practice, is that right?
A Well, it tells me that it can't be -- it tells me

retinal. I mean, it's not that we don't -- you know, because retinal hemorrhages are not specific (indiscernible) an intentional act. We see retinal hemorrhages, severe, in things that are not a result of shaking. And you don't know the -- we have to really understand the mechanism by which they occurred, so we can't use them to say I know what happened. (Indiscernible) to say I know what happened.
Q So what would you say to the pediatrician that came to you in scans such as this case and said, yes, but he had retinal hemorrhages?
A I would say that you cannot use that data and ignore the rest of the data, which is no brain injury, enlarging subarachnoid space over time, fluid collection that absolutely fit the criteria of ADH. If you throw this child into the abuse bucket you're using a completely circular argument and ignoring the data on the imaging and sequence of films. So that's how I would respond to that.
Q Thank you, Dr. Mack.
MS. RUE: I have no further questions.
THE COURT: Ms. Craveiro?
MS. CRAVEIRO: Judge, can we take a five-minute break? I really need to use the ladies' room.
THE COURT: Five minutes, and then we've got

to get back on because you'll have 55 minutes before --
MS. CRAVEIRO: Oh. Fifty-five? I thought we were ending at two. Okay. I just need --
THE COURT: No. Ending at one today.
MS. CRAVEIRO: -- to use the ladies' room real quick.
MS. RUE: Dr. Mack, if you need to take a -- step away for five minutes? Okay.
THE WITNESS: Thanks.
MS. RUE: Thank you.
(Recess from 12:01:14 p.m. to 12:07:55 p.m.)
THE COURT: Your witness, Ms. Craveiro.
MS. CRAVEIRO: Thank you, Judge.
CROSS EXAMINATION BY MS. CRAVEIRO:
Q Doctor, you've never conducted a forensic child abuse evaluation, have you?
A No, I haven't.
Q And in this case you weren't asked to do that either, were you?
A No.
Q And in fact, you've never actually treated a patient, isn't that correct?
A Radiologists don't treat patients. We --
Q So that's correct, then?
A Yes. No, I don't treat patients.

Q Okay. So that means you've never actually treated an infant either, correct?
A Correct.
Q I'm sorry?
A That's correct.
Q Okay. And you've never been on a pediatric child protection team, correct?
A No.
Q You have no subspecialty or board certification in child abuse, isn't that right?
A That's right.
Q And you haven't even worked at a pediatric hospital since that one year you spent in Children's Hospital in Dallas, correct?
A Two years at Children's Dallas, but that's correct.
Q Okay. And that was back in '96, correct?
A '96 through '98, I believe.
Q I'm sorry. If you could just speak up? I'm having trouble hearing you.
A Yes. It's on my C.V. Two years beginning in 1996.
Q Okay. And you also -- so your entire career has been radiology-based, correct?
A Yes.

Q And you're not a neurologist, correct?
A Yes.
Q And you don't have --
A No. No. That is correct.
Q Yes. Thank you. I just had to think about that for a second. Okay. You don't have any board certifications in neurology, correct?
A That's correct.
Q You're not an opthalmologist, correct?
A That's correct.
Q You don't have any board certifications in ophthalmology, correct?
A That's correct.
Q And you've never actually seen a child's brain in person either, other than an autopsy, right?
A I've never -- you said I've never seen a brain in person?
Q Yes. A child's brain in person other than that autopsy in 2007?
A No. I see -- so when you scan like with ultrasound you're actually in the room. I usually (indiscernible) scan --
Q Okay.
A -- so (indiscernible) right onto the brain. I don't hold the brain in my hand during surgery. Images

are obviously of the brain.
Q Okay.
A I'm physically present when the brain is being ultrasound.
Q Okay. And currently -- you say you're working part-time at Hershey, correct?
A That's correct.
Q And so how many hours do you put in there?
A So I -- technically I am at point seven. I'm there (indiscernible). So what that translates to is our day usually begins at about 7:30, so I arrive at about seven. And if I work all day I'm gone by five to 5:30. But some of my days are assigned academic, so on Tuesday mornings I teach in the medical school. And so I'm not in clinic. And then I have unassigned days where -- today is an unassigned day. I am not assigned to Hershey, I owe nothing to Hershey on this day. I have a day-and-a-half unassigned as a point seven.
Q Okay. So then five-and-a-half days you work there, correct?
A It would be three-and-a-half.
Q I'm sorry. Three-and-a-half?
A Yes.
Q Okay.
A Three-and-a-half.

Q Okay. And that time is spent in just cases involving breast disease, correct?
A Yes. Breast disease and intervention.
Q And so your patients in those cases are all adults and not infants, isn't that right?
A Very rarely an infant comes into breast imaging. We do see adolescents that come in. There's mainly those patients in their 30s and above.
Q And so, the consulting work that you're doing here today, you said that's outside of your work from Hershey?
A Yes, it is.
Q And you -- the reports you generate aren't on Hershey letterhead, isn't that right?
A That's right.
Q And that's done at the request of your supervisors, isn't that right?
A I've got to believe it's a hospital policy. My supervisors have no role in that, on that policy.
Q And so your opinions here today aren't backed by the hospital then, correct?
A The hospital wouldn't have any access to these images. I wouldn't give them to them, so -- I don't know what you mean by that. You know --
Q Okay. The consulting work you do, your --

every time you've testified has been for the defense, correct?
A As I mentioned in direct I had a few years where I was consulting with Children & Youth. But since 2009 the only attorneys who have reached out to me have been defense attorneys.
Q And you did mention two conferences that you spoke at. Those were way back in 2014 though, isn't that right?
A So I'll pull up my C.V. I haven't gone to -- I haven't spoke about (indiscernible) anatomy in the last year, except to (indiscernible) other physicians. And I don't (indiscernible). Do you want me to do that? I'm happy to do that.
Q So, wasn't -- so, wasn't the --
A In 2014 it was Illinois, and then also in Sweden.
Q Yes.
A That was the last time I spoke.
Q So, those were the last time you spoke were roughly six years ago, correct?
A Yes.
Q Okay. And speaking about this case, you were only asked to review those images that you were discussing, correct? Meaning you didn't --
A I think the request came, can you evaluate Dr.

Medina's conclusion in the context of the imaging? That's how the request was given to me.
Q Okay. So you weren't reviewing as far as it goes for whether or not the infant was actually -- whether he actually had abusive head trauma or not, correct?
A (Indiscernible) was I (indiscernible) to decide whether or not (indiscernible) him, or -- or a work up? Or -- I'm not sure I understand.
Q Well, you testified on direct that if you're a radiologist and you notice these types of abnormalities you would have referred him, isn't that right?
A I would call the E.R. and say, look, this kid has subdurals. Any history that I can help you with or that you can give me to further understand why? And then they would take it from there. A radiologist generally doesn't directly report. But I have no problem that this child's initial phase was reported as a potential abuse case. That was, I think, appropriate.
Q Okay. And abusive head trauma, to your knowledge, is generally accepted in the medical community, is it not?
A In the context of can children be abused, and

abused around their head, absolutely. I don't think anybody would argue with the notion that the statement does child abuse exist. Absolutely.
Q But I'm talking about abusive head trauma in and of itself. That is generally accepted in the medical community, correct?
A I'm not sure what you are -- what you mean. If you mean child abuse involving the head, yes, that is accepted. Absolutely.
Q Okay. And it's recognized by even your discipline of radiology, isn't that right?
A Well, I think all professionals recognize --
Q Along with --
A -- child abuse involving the head. (Indiscernible) --
Q Along with pediatrics, correct?
A -- sure.
Q Okay. And it's also been publicly recognized by several different medical societies, correct?
A Yeah. I don't know any society that wouldn't acknowledge child abuse exists in the form of abuse involving the head.
Q And even you agree that shaking is dangerous and can cause injuries, correct?
A Shaking, particularly (indiscernible) neck I think

would be very dangerous, and I would agree (indiscernible).
Q Okay. And so, in coming to your conclusions here did you review any of the medical records?
A I have a couple of pieces of medical records, but the history as provided by Dr. Medina, I relied on that.
Q Okay.
A I took that to be a true representation of the medical records. That's his report I reviewed.
Q What do you --
A I summarized the medical (indiscernible).
Q And what do you mean when you say you had a few pieces of the medical records?
A Let's see. I had -- her report was in the medical records, and then I was sent some medical records after the incident to briefly look at. And then I think I had a few isolated -- I have to go back and look in my files, I think I had a few isolated reports. But it wasn't the whole medical record file. And, you know, it may have been sent to me, but if it was sent without the images I wouldn't have downloaded it. I wouldn't (indiscernible) until I saw the images.
Q Okay. So in this case though what did you actually review to come up with your opinion here?

A Well, the imaging. That's what I -- that's how I reach my conclusion is based on the imaging.
Q Solely on the imaging, correct?
A In the context of the history provided by Dr. Medina.
Q And you --
A Not (indiscernible) historical collection of facts.
Q And you accepted all of Dr. Medina's other conclusions in her report, correct?
A I didn't accept her conclusions. I -- I accepted her outline of the facts and presentation of when the -- when the opthalmologist came, what happened next. But the conclusions are her own. I don't -- you'd have to ask me which specific conclusion and I can tell you whether or not I agree with (indiscernible).
Q And you didn't think it would be better for you to actually review all of the medical records in this case?
A Well, in the context of the question I was asked, for this (indiscernible) I thought it was sufficient. In the context, if I was asked to do more, for instance in the case of a criminal trial I would ask that those records be sent to me. If there were a specific question I was asked by counsel was an imaging

question.
Q Okay. So, you didn't go through a majority of his medical records? You didn't consult with Dr. Medina either, did you?
A No.
Q And you didn't consult with any of the radiologists that looked at his -- that looked at his eyes either, did you?
A I -- I didn't have access to any of their names, nor would they be able to talk to me under HIPAA rules. Unless you arrange that conversation they can't talk to me under HIPAA rules. (Indiscernible) institution, the studies were performed there, I'm allowed to talk to somebody else.
Q And you mentioned head circumference, and that if his head grew that would affect your opinion in this case?
A Well, it would be helpful to understand whether the space outside the brain was present because the skull was growing too fast versus whether the brain wasn't growing fast enough, because we have a discordant brain to skull ratio. The brain is too small relative to the skull, or the skull is too big relative to the brain. So it would have helped discern which one of those was present, maybe, but it doesn't

change the imaging data.
Q Okay. But you also didn't --
A Whether his head was big or not doesn't change the imaging data.
Q You also didn't ask for that data, did you?
A No. I don't -- I -- it typically doesn't change the appearance on imaging.
Q Okay. And so if that data --
A (Indiscernible). But I don't rely on head circumference to determine whether or not the space around the brain is (indiscernible).
Q You also didn't review any of the medical record from the hospital stay in February, correct, other than --
A I relied on Medina's summary.
THE COURT: I'm sorry, Doctor. What was that answer?
THE WITNESS: I relied on Dr. Medina's summary of the hospital stays.
BY MS. CRAVEIRO:
Q And the images that you looked at, the radiology images, you didn't attempt to consult with the radiologist who reviewed those scans, did you?
A Well, again, they wouldn't be able to talk to me. Those images would be found in their institution. And

unless they got granted permission or some (indiscernible) by the Court they can't discuss those with me. So I wouldn't have attempted to call them because I know that. I know that exists. And I don't, in most cases. I'm happy to talk to them. If you think that's important, then you can -- can arrange that.

Q Well, in direct --

A I'm always happy to talk to other radiologists.

Q In direct you said it would have been beneficial for Dr. Medina to talk to all of the radiologists to figure out if this infant did, in fact, have abusive head trauma, isn't that right?

A Well, it would have been important for Dr. Medina to talk specifically to the radiologists who reviewed the images with them since she is not a radiologist.

Q In making a determination, isn't that right?

A Did I make a determination that she is not a radiologist?

Q No. In making her conclusions in this case you testified on direct that it would be beneficial for her to speak to other radiologists. Not other radiologists, the radiologist.

A So, it has always been my opinion if your clinician, and you are -- you have a data set that

includes imaging, yes, you should speak to the radiologist, in my opinion.

Q And so you're not a clinician?

A I'm not a clinician. I'm a radiologist.

Q And because you're not a clinician you didn't think it was -- would be important to you to speak to any of the other radiologists in this case, correct?

A I don't see -- I mean, I'm always happy to talk to radiologists, but it's not going to change the imaging data. So I didn't need them to tell me how big the space is between the brain and the skull, or --

Q Well, you understand --

A -- (indiscernible). But I'm always happy to talk to other physicians.

Q You understand that there was at least four other radiologists who looked at these images, correct?

A I don't know. I don't know how many radiologists looked at the images, no. I don't have that data.

Q And you said that your findings were at least different than one of them, didn't you?

A No. I don't have the reports, so I don't know if it was different or the same as mine.

Q Okay. In the films that you saw in March 22nd, April 11th and June 9th there were no abnormal fluid collections that you observed, correct?

A So, in March -- I believe this is in the addendum to my report, the fluid collections were -- (indiscernible) there's always fluid around the brain, but in March they were very small, two millimeters, so within the range of average, acceptable, not considered enlarged. Yes.

Q I'm sorry. They were considered acceptable, or were not?

A Yes. Well, two millimeters is acceptable.

Q Okay.

A Below four millimeters is acceptable. So, two millimeters, absolutely. That would be probably not even commented upon.

Q And in June?

A The next one would be April. There were four. Then in June they were approaching what some would call abnormal. There were nearly seven, six to seven.

Q But not all would call them abnormal, correct?

A I think all would recognize that they were emerging over time. I mean, that's not self evident on images. But the spectrum of normal is obviously variable. Some who will -- pediatric, premature infants may consider it in the context of prematurity it's not uncommon to see (indiscernible). They would

say, well, at a 25-week preemie this is probably not bad. You know, the skull -- the brain is (indiscernible). It's (indiscernible). If you look at the articles that say what's normal, what's abnormal, you realize there can't be an abrupt cutoff. But six to seven in those articles would approach -- (indiscernible) about four. In sum, about five and others -- so in the context of prematurity not uncommon to see this level, but it's clearly increasing. I don't think you'd have a radiologist retrospectively look at this and say they're the same from March to April to June. They're clearly increasing.

Q And I believe you testified on direct that when you're looking at these images, even the February 13th image, you can't -- or I'm sorry, when you're looking at the February 13th image you can't tell whether or not what's occurring there is accidental or inflicted, correct?

A That' right. No image can determine intent. That's impossible.

Q And that would be asking too much of you, correct?

A For any radiologist.

Q And --

A You can't look at it and say, depending on what

the findings are, if it was a broken bone you could say, well, trauma occurred. But in this case I am looking at the same thing. Trauma is (indiscernible), and then this could all be natural disease.

Q And as a radiologist you also agree that hemorrhages in the subdural compartments are more common with trauma, correct?

A Well, it is one of the more common causes of hemorrhages, trauma.

Q And because you're not a retinal specialist you don't know the different types -- you haven't been taught about the different types or patterns of retinal hemorrhagings, correct?

A I have been taught that there are different types, but I would never diagnose retinal hemorrhages and say they are one type or another. So I am aware of the concept of different types, but I don't diagnose them.

Q And are you aware -- your view about the bridging veins is in the minority, correct?

A What part of my view of the bridging veins? What do you mean?

Q About the bridging vein rupture not being able to be occurred by shaking.

A I don't remember testifying to that, but I don't agree with that statement. I don't think that there

has been good evidence that shaking can cause bridging vein rupture. I know that's the hypothesis that's out there. But there's no good evidence that that occurs. (Indiscernible), or based on the -- you know, the biomedical mechanical events of the tolerance of those veins.

Q And -- but there's literature that suggests that it can, correct?

A There's literature that makes the presumption that it does. But I don't know any good literature that says that the experiment that they performed in an animal shows bridging vein rupture. I'm aware of two different animal studies (indiscernible), and none of them actually address the bridging veins --

Q Have you read the --

A -- (indiscernible).

Q I'm sorry. What did you say at the end?

A So I'm aware of two animal studies that attempt to mimic the shaking mechanism thought to occur in the head trauma or shaken baby syndrome, and those animal studies did not document bridging vein rupture. They don't talk about the bridging veins. There was one that showed small subdurals, but they don't address the bridging veins, or what the origin of those subdurals were. So the theory that shaking can produce bridging

vein rupture remains a theory. It's not that bridging veins can't be injured by trauma. A hundred percent agree with that. The theory that isolated shaking without impact can actually (indiscernible) the force that is required to rupture a bridging vein, that's the contested piece.

Q So have you read the Daubert analysis of abusive head trauma, shaken baby syndrome?

A Is that the one by Narang?

Q That is the one by -- yes.

A I'm aware of its existence. I haven't read it in a long time.

Q Okay. So if it says in there that in the event the acceleration/deceleration motion of the brain results in strain upon the cortical bridging vein which exceeds their tolerance levels and subsequently leads to rupture and hemorrhage, subarachnoid and/or subdural, that would go against what you're saying, correct?

A Well, I think that's a question for a biomechanical engineer because acceleration/deceleration can be impact, so there are certain impacts (indiscernible) can exceed the tolerance. But once you start talking about tolerance I'm going to give it over to the biomechanical

engineer.

Q Okay. And your article, you've also written -- you mentioned you wrote, "Anatomy and development of meninges, implications for subdural collections," correct?

A Yes.

Q That's also been criticized, isn't that right?

A What do you mean by criticized?

Q That article has been criticized.

A I -- I guess I (indiscernible).

Q Your belief that subdural bleeding wouldn't present -- does not precipitate abrupt onset of neurological decline such as found in subdural hemorrhages associated with inflicted trauma. Isn't that right?

A Say the sentence again?

Q Of the non-traumatic conditions suggested by this author, benign extra cerebral fluid collections do not commonly cause subdural hematomas, the other conditions noted may do so in association with decreased intracranial pressure. If these conditions cause subdural bleeding, however, it is slow bleeding, and it does not precipitate abrupt onset of neurological decline such as found with subdural

hematomas associated with inflicted traumatic head injuries.
A Well, two things that you mentioned, does BEH cause subdurals? Now, if that article is saying it doesn't, I would disagree with that statement. The second is -- is I'm not sure what the author is getting at, but does bridging vein rupture precipitate neurologic quick neurologic decline? I would agree with that. But does (indiscernible) hemorrhage from the dural plexus (indiscernible) result in abrupt neurologic decline? Probably not. In the context of seizures it can. I would -- I mean, there's so many different pieces to the -- what I think that author is getting at.
Q And a radiologist alone can't diagnose abusive head trauma, correct?
A (Indiscernible).
Q And that's why there's other specialists involved, correct?
A A radiologist (indiscernible) imaging studies in the context of a confirmation. We're not going to go investigate the home. That's not part of their work.
Q Okay. And so the abusive -- the child abuse pediatricians are the ones who actually diagnose that, isn't that right?

A In most hospitals that have those teams, the medical diagnosis (indiscernible) on the chart is child abuse, it's usually by a child abuse pediatrician.
Q And they use a thorough diagnostic process to do that, isn't that right?
A I wouldn't have access to that information (indiscernible), no, in general. Do all of them? I would hope so. My comment on the do all of them, actually? (Indiscernible).
Q Well, you read --
A I would hope so (indiscernible) in their evaluation.
Q You read Dr. Medina's report here, correct?
A Yes, I did.
Q And so you know there was several different subspecialties involved, correct?
A I mean, there were several different physicians who saw this child. I don't know how many participated in her final conclusion. I don't know that. She didn't say that in her report.
Q Well, if they all were involved in the evaluations, wouldn't they obviously be involved in making this conclusion?
A Well, I don't know if the opthalmologist was involved in reviewing the x-rays, and the x-ray

(indiscernible) would have been involved in analyzing the retina hemorrhages. So each had an independent role in pieces of the puzzle. But she is the one that's gathering all of the information, and it's her decision. I don't think the radiologist or the opthalmologist or even (indiscernible) -- they participate in parts of it, but she doesn't say she met with her team to make her final decision. My assumption was she made it on her own. (Indiscernible).

Q Well, does it --

A I was under the impression that she was operating based on her (indiscernible) information of others.

Q Doesn't her report list that she met -- she -- there was an ophthalmological consultation, correct?

A Yes.

Q A genetic consultation, correct?

A Yes.

Q A neurological consultation, correct?

A That's correct.

Q A genetics consultation, correct?

A I think you already said that one. Yes.

Q Did I already say that one? A hematological consultation, correct?

A Yes.

Q A radiology department was also consulted, correct?

A Did she use those words? I think she -- I believe imaging, but I don't remember her saying I consulted with radiologists.

Q The radiology department --

MS. RUE: Can we get a page number, Judge? I apologize.

MS. CRAVEIRO: Oh. I'm sorry.

MS. RUE: Yeah. I don't know where we are.

MS. CRAVEIRO: Page 9 of Medina's report.

BY MS. CRAVEIRO:

Q And you didn't ask her if she consulted with the radiologist, correct?

A I didn't talk to Medina at all.

Q And you didn't discuss your difference -- your opinion in this case with her, correct?

A No.

Q You didn't attempt to see if what you found would have changed her opinion in this case, did you?

A I never talked to Dr. Medina. No.

Q And you also never talked to any of the other radiologists, correct?

A Yup.

Q And subdural hemorrhages absolutely can be

caused by traumatic -- by trauma, correct?
A Yes.
MS. CRAVEIRO: Judge, if I could just have one minute, I think I'm done.
(Pause)
BY MS. CRAVEIRO:
Q And subdural hemorrhages also have differential diagnoses, correct?
A Yes.
Q And that means you have to rule out all of the other things that could cause the subdural hemorrhage, correct?
A In the ideal situation you would be able to rule out everything.
Q Okay.
A Fortunately one of the things on the differential is unknown (indiscernible). But that's the general role is you start to exclude possibilities based on testing.
Q But like you said, there are certain things that you can look for that help you in doing a differential diagnosis, correct?
A Yes.
Q And what makes -- and that can help make your differential diagnosis stronger or weaker, correct?

A It can help narrow the differential diagnosis.
Q And in abusive head trauma that would be findings of specific types of retinal hemorrhages, isn't that right?
A I think that's controversial in the literature right now, but again, I'm not the opthalmologist.
Q Okay. So there is literature out there that does say there are specific retinal hemorrhages, a specific pattern that's associated with abusive head trauma, correct?
A Yes. But literature on both sides of that subject.
Q And --
A (Indiscernible) it depends on somebody else -- (indiscernible) possible.
Q And that view is widely accepted within the ophthalmological community, isn't that correct?
A What do you mean? What is widely accepted?
Q The -- that there is a pattern of retinal hemorrhages that is commonly associated with abusive head trauma.
A I don't think that's widely accepted. And again, I don't know. I'm not an ophthalmologist. And (indiscernible) have ophthalmologists who don't agree with that, so I wouldn't say it's an acceptance of

that. I don't know (indiscernible) -- how wide (indiscernible) the ophthalmologist (indiscernible). It's been written about on both sides of the issue, (indiscernible) strongly that it isn't and others strongly that it is.

Q Okay. And you -- so even in your opinion you can't say one way or the other anything regarding the retinal hemorrhages, correct?

A The retinal hemorrhages no impact on what the imaging data is.

Q Okay.

A It doesn't change (indiscernible) --

Q And you wrote --

A -- (indiscernible).

Q I'm sorry.

A -- on that particular (indiscernible).

Q And you wrote a sentence here, retinal hemorrhages are known to be associated with a wide array of non-traumatic causes, including spontaneous subdural collections, hygromas. What medical literature has that? Did --

A (Indiscernible), we mentioned Piatt. That's the one where the short fall had severe. We mentioned Bin Chon, whose -- the title of his article is "Spontaneous subdural hemorrhaging, does it occur?" And

(indiscernible) several other (indiscernible), but those are the two that I referenced in my report.

Q Okay. And BESS is benign enlargement of the subarachnoid space, correct?

A That's what that acronym stands for. Yes.

Q And so as you were discussing, that's fluid collections around the subarachnoid space, correct?

A The acronym is specific for (indiscernible) in the subarachnoid space.

Q Okay.

A Benign enlargement subarachnoid space.

Q And when you reviewed the neurosonograms before February 13th, those were normal, correct?

A The (indiscernible) slowly enlarged over time, including the last neurosonogram that I had, which is 7/22/16. Now, I wouldn't call those normal because they have findings that pertain to what we saw in February, but they -- but you could reasonably characterize them within a variation of what can be seen in infants. It was benign external -- benign expansion of the subarachnoid space is a finding that's untreated. It's kind of -- it's we see it sometimes. If you want to call that variation of normal, sure. But the data on the films show that there's slow expansion of those cases up to and through 7/22.

Q I'm sorry, but there was no -- there was -- what you saw, there was nothing in the subdural spaces, correct?
A Yeah. The only one I couldn't -- I think on the first three, all of the -- all of the compartments looked like they had subarachnoid -- looked like they had veins in them, so (indiscernible) veins (indiscernible) in the subdural compartment. But the last one, 7/22, a couple of the images I couldn't be confident that the entire space was filled with vessels and trabeculae. So that's why I put that disclaimer, because I couldn't exclude a small component of subdural on that. It's just not the right test to look for small subdurals.
Q But the ones before that --
A That's a limitation of that test.
Q The ones before that were normal, right?
A Yeah. Again, normal meaning they're limited to the fontanel and a little bit either side. I -- I was pretty confident that those spaces looked like they were all filled with normal trabeculae and vessels, which you find in the subarachnoid.
MS. CRAVEIRO: No further questions.
MS. RUE: Thank you, Your Honor. I have some brief redirect.

REDIRECT EXAMINATION BY MS. RUE:
Q Just to clarify some things, Dr. Mack, the prosecutor just asked you whether you acknowledged that abuse can cause injury to infants, meaning abusive head trauma. I think she was referring to abusive head trauma. Do you accept that as a diagnosis?
A So, as a medical diagnosis it exists, because we have a CPT code for it. Patients would be in the hospital with that diagnosis. It exists. And do I accept in general the proposition that head trauma, in an abusive or intentional way, exists as a proposition? Absolutely. I believe that it exists.
Q Do you agree with the premise that shaking alone can cause the injuries that the -- that you saw outlined in Dr. Medina's report?
A That -- that's where the -- that go -- that's really heated controversy. How strong is the data? It's not the question of does abuse exist, and does abusive head trauma exist? The answer is (indiscernible) yes. I think the real problem is can you use these findings to infer that abuse exists? And that's where the controversy arises. So can abuse result in a brain hemorrhage? Absolutely. Can you infer abuse just by the presence (indiscernible)? Now, each finding is not specific, so (indiscernible).

Hemorrhages can occur with trauma or in non-traumatic conditions. Does combining the two make them any better? And the answer is no. That's where I would disagree that you could use any one or several findings to say, infer reliably that this child, this individual child, suffered a particular event (indiscernible). We have the issue of shaking (indiscernible) is about (indiscernible). And mine is more of an anatomic one.

Q Okay. But the State did ask you about -- it was qualified as a thorough diagnostic process that was outlined in Dr. Medina's report. Do you recall that question?

A Yes.

Q Would you, as an expert in the field of radiology, pediatric radiology, relating to that element of Dr. Medina's report, so I'll be in my question, relating to how Dr. Medina had or requested the images to be reviewed, would you describe that as a thorough diagnostic process?

MS. CRAVEIRO: Objection. Speculation.

MS. RUE: It's her opinion. It's not remotely speculative.

MS. CRAVEIRO: She didn't -- she said she didn't know what kind of consultations Dr. Medina had with any of the radiologists.

THE COURT: Doctor, are you able to answer that question?

THE WITNESS: So, if I understand the question to be --

THE COURT: Say the question again.

THE WITNESS: -- (indiscernible) Dr. Medina's report --

THE COURT: One second. Let me have the attorney repeat that question. Say it one more time.

BY MS. RUE:

Q So, looking specifically at -- relying upon Dr. Medina's report, which you established on cross examination you relied upon Dr. Medina's report as to the process that she undertook, is that right?

A Yes.

Q Okay. Referring to the radiology, the images --

A Yes.

Q -- would you, in assessing what is outlined in the report, would you call that a thorough diagnostic process?

A Well, in her report she only refers to the MRI, so because the ultrasounds provide data, that -- that portion of her report is incomplete. So if she did not seek information on the ultrasounds or reviewed them,

and then respond to this (indiscernible) of an increasing subarachnoid space over time. In that case (indiscernible). The report does not mention that, so the report is not (indiscernible). I can't speak to what she did outside the report.

Q Right. So what's documented in the report, would you qualify that as -- would you characterize that as thorough?

A Not in the radiology section, no.

Q Was it appropriate to have those prior scans examined in relationship, or neurosonograms, I should say, considered in relationship to the MRI that was done in February of 2017?

A We are (indiscernible) the evaluation (indiscernible) to have those available because -- because they were there, and, you know, many children don't have that, so we don't have that data. But that is data that needs to be reviewed before coming to a conclusion, (indiscernible) our findings are specific for anything.

Q And why would that be? Why is it crucial to review all of those together?

A Because it's data. This is a (indiscernible) to the child's head over time since he was a few weeks old, including (indiscernible) he was hospitalized

multiple times. And so we want to know what happened before (indiscernible) evaluate what's on the images (indiscernible). What did he look like before? How much of this is old? How much of it is new? So there's -- that's just -- we look at priors. That's how you -- you're a better radiologist if you looked at them prior. So prior relevant images should always be reviewed. Any actual radiology. That's not just confined to past imaging. Cross radiology, (indiscernible), and viewed prior relevant studies.

Q Thank you.

MS. RUE: No further questions, Judge.

THE COURT: Nothing else?

MS. CRAVEIRO: Very quickly, Judge.

THE COURT: Go ahead.

RECROSS EXAMINATION BY MS. CRAVEIRO:

Q You do agree that shaking can cause injury, correct?

A I -- I would agree wholeheartedly that shaking is dangerous, (indiscernible) shaking can be dangerous to a baby.

Q And if you were -- if you found out that Dr. Medina did consult with the other radiologists and did have the other radiologists review the ultra -- the prior head ultrasounds, would that make her report more

-- or her -- strike that. Would that make her assessment more thorough?
MS. RUE: Judge, I'm going to object. That is speculative.
THE COURT: Yes. Yes.
MS. CRAVEIRO: Judge, it's a hypothetical. I said if that happened.
THE COURT: Doctor?
THE WITNESS: Yes?
THE COURT: You said you relied on Dr. Medina's summary, correct?
THE WITNESS: Well, the historical presentation packs and --
THE COURT: Okay.
THE WITNESS: -- history of the child since birth. Yes.
THE COURT: But beyond what's contained within the four corners of that summary you don't know what, if anything, Dr. Medina left out of that report, or why she left it out, is that a pretty accurate statement?
THE WITNESS: Yes. That's a correct statement, actually.
THE COURT: Okay. And again, because the report is just a summary, not a blow-by-blow transcript

of what she did in reviewing the reports she had available to her, is that accurate?
THE WITNESS: I -- I don't know whether she considers it a summary or not, but it does --
THE COURT: No, no. Doctor, listen to my question. Her report you characterize as a summary, right, in your testimony.
THE WITNESS: The historical facts were summaries. Right.
THE COURT: Okay. It's not a transcript, a blow-by-blow transcript of every single thing that she did or every single thing that she reviewed in coming to --
THE WITNESS: Correct.
THE COURT: -- her opinion. Okay. That should be the answer to the hypothetical.
MS. CRAVEIRO: Judge, no further questions.
BY THE COURT:
Q Doctor, you indicated that you have only been contacted by defense attorneys over the course of your career, is that -- did I get that accurate?
A No. Since 2009.
Q Okay. So --
A Since I published that -- it was 2009.
Q Okay. All right. Have you ever provided a

response or an opinion contrary to the interests of the defense attorneys who have ever reached out to you for a consult?
A Yes.
Q Can you break it down percentage-wise, to the best of your ability, for or against? Who have you provided an opinion for, who you've provided an opinion against?
A Well, sometimes I won't know whether I'm helpful or not because I just tell them what I see. I can give you a breakdown of how many times I've testified versus how many times I've reviewed.
Q Okay.
A (Indiscernible).
Q How many times -- how many times have you testified as a result of a process where somebody has reached out to you for a consult and you've testified on their behalf versus how many times has someone consulted with you and you have not testified for that person?
A Well, I only know that data in terms of criminal trials because I don't keep a --
Q Which is perfect because this is a criminal trial, so it fits right in.
A Well, I have been consulted well over 300 times.

Q Okay.
A Probably in the four hundreds by now. And I have testified in criminal trials around 34 to 36 times.
Q Okay.
A You know, a small percentage of the cases of which I've consulted.
Q Okay. Doctor, you're familiar with the phrase beauty lies in the eye of the beholder, correct?
A Yes.
Q If I substituted the word diagnosis for the word beauty, would that statement still stand true? A diagnosis --
A A diagnosis would what?
Q So, the phrase would be a diagnosis lies in the eyes of the beholder.
A Yeah. If you -- if you preface that there was data underlying that diagnosis.
Q Right. Assuming. Yeah.
A I (indiscernible). Yes.
Q Yes. You have the data, just like you have the visual data of looking at someone to assess their beauty, in a diagnosis someone has data, and on some level, to make an assessment. So on some level a diagnosis lies in the eyes of the beholder, right?
A In terms of diagnosis that can't be confirmed.

Q Okay.
A So a pathologic diagnosis is -- is a confirmation, it's a gold standard. So if you're talking about a diagnosis of, you know, something that you can't really test for (indiscernible) syndrome --
Q Right.
A -- (indiscernible). There's no test to confirm it. Again, that would be in the eye of the beholder.
Q Okay. Thank you, Doctor. I appreciate it.
THE COURT: Are we over with -- is Dr. Mack released for now?
MS. CRAVEIRO: Can I just have one clarification, Judge? I'm sorry.
FURTHER RECROSS EXAMINATION BY MS. CRAVEIRO:
Q The times that -- the Judge asked you about the times that you testified for the defense. In those cases you didn't find that there was trauma, correct?
A Sometimes I found there was trauma.
Q Okay.
A Because the issue was is the -- are the findings reported (indiscernible) the history of trauma provided. And I would provide the neurologic data to show (indiscernible) papers. So sometimes there was trauma.
THE COURT: Doctor, I -- can I assume from

what you've just -- with regards to the number of times you've testified as you've indicated to us, since you only have testified on behalf of the defense, just to make clear, I'm assuming that the defense called you to testify, and you did testify on their behalf because your testimony was consistent with whatever position the defense was taking. Is that accurate?
THE WITNESS: That's accurate.
THE COURT: Okay. All right. Doctor, I just want to tell you that I think there are no more questions to ask of you, and so, you know, I probably won't see you again, but nice meeting you. But, you know --
THE WITNESS: Nice meeting you.
THE COURT: -- and on the chance that we might need to recall you for whatever reason in the future, as a follow up or something, please know that that remains a possibility. Okay? But we will give you way advance notice and accommodate you as best as we can.
THE WITNESS: Okay.
THE COURT: All right. Thank you very much.
THE WITNESS: Thanks.
MS. RUE: Thank you, Dr. Mack.
THE COURT: All right. So right now we are

going to be adjourned until December -- October when?
MS. RUE: 13th, Judge. And I don't believe the State has any objection --
THE COURT: Is that when Dr. Scheller is coming in?
MS. RUE: Dr. Van Ee. That was why we were saying maybe do -- finish Dr. Scheller before we do Van Ee, but --
THE COURT: No. Let's do Van Ee.
MS. RUE: Okay. And I don't believe the State had any objection to D-11, which was the article referenced by Dr. Mack --
THE COURT: Yeah. No.
MS. RUIZ: -- of the -- by Dr. Piatt.
THE COURT: It's -- I expect to see it. Dr. Van Ee. Yes. Is on research (indiscernible). Okay. 10/13. Okay, folks. At least on this we are adjourned until October 13th. Let me have -- let me make sure I have all the exhibits that you put out there.
MS. RUE: I think this -- and I gave the Court this --
MS. CRAVEIRO: I didn't do any today, so --
MS. RUE: -- the -- the C.V., and then the Court has --
THE COURT: No. I mean, hold on to

everything --
MS. RUE: -- S-11. I just gave a color copy, so it's a little bit -- matched what she was showing. But it's D-8 or S-11 --
THE COURT: As a matter of fact --
MS. RUE: -- which is Dr. Mack's report.
THE COURT: Is that the file? Let me have that. Let me have it all. Let me have all of it. Okay. Anyway, I think we're done for today, and I'll pick it up tomorrow, one last time.
MS. RUE: And Judge, when you have a moment I just want to ask a scheduling thing. Not on the record or any --
THE COURT: All right. What's your question?
MS. RUE: Oh. Judge, for -- just on scheduling we want to make sure -- with Dr. Van Ee, he is flying in and out on the 13th, so if we could possibly -- it's an off day. If we could get that full day, so that we get it in in time, and not deal with the --
THE COURT: Counsel, I try and provide -- I can tell you it's going to be a full day. Okay?
MS. RUE: Right.
THE COURT: But this is --
MS. RUE: Oh. There will be a calendar?

THE COURT: No, no, no.
MS. RUE: Oh. Okay.
THE COURT: But this is also a courtroom where -- which also serves as a first aid squad. Sometimes there are cases that are emergent in nature that need to come here.
MS. RUE: I understand.
THE COURT: Or somebody needs to have something on that day. So I can't also outright tell them no. I can balance it. So just -- but I'm apparently dedicating the whole day to -- now, that does not mean that you should lollygag with the questions. Just focused, firm, get in, get out, you know? Instead of a 15-round fight make it a seven-round knockout. Whoever wants to take an opportunity to do that. Okay? But I'm not rushing anybody. I just want to -- you know. Okay? I've got to cover all bases.
MS. RUE: We understand, Judge. Yes. Thank you. I appreciate it. Just so we can try to keep it understood that emergent things happen.
THE COURT: No, no. More information is better, but -- you know, we'll extract it as best as you can.
MS. RUE: Yes.

THE COURT: All right.
(Proceeding concluded at 1:03:29 p.m.)

CERTIFICATION

I, TAMMY DeRISI, the assigned transcriber, do hereby certify the foregoing transcript of proceedings on CourtSmart, Index No. from 10:01:00 to 12:07:00 and 12:08:03 to 1:03:29, is prepared to the best of my ability and in full compliance with the current Transcript Format for Judicial Proceedings and is a true and accurate compressed transcript of the proceedings, as recorded.

/s/ Tammy DeRisi	AD/T 518
Tammy DeRisi	AOC Number
KLJ Transcription Service	10/06/20
Agency Name	Date