Dr Marnerides Background

Q.Could we start by you telling the jury who you are, please?

A. Yes. I'm Dr Andreas Kyriacou Marnerides and I'm a consultant perinatal and paediatric pathologist based at St Thomas' Hospital in London.

Q. Thank you. That's a bit of a mouthful. Could you just explain -- I'll come to your qualifications in a moment, doctor, but could you explain to the jury what your day-to-day work involves, please?

A. So a pathologist is a medical doctor that has trained in a specialty called pathology. That's a specialty that means basically two things of expertise: one is interpreting specimens from the living, biopsies that you may have heard, so if somebody had an operation, they're being investigated for a tumour or any other disease, the pathologist will look at that specimen under the microscope and help the clinicians make the diagnosis. The other part of their expertise is when they perform post-mortem examinations, so people that have died.

A perinatal and paediatric pathologist has the sub-specialty of dealing with the paediatric population. The term perinatal refers to the time around a woman's pregnancy and the early time after the baby's delivered. So the perinatal pathologist has the expertise in examining the placentas in case there is a need for examination, foetuses that have died in utero, so before they were born, babies that are born alive and die very early in the neonatal period. And of course the paediatric, you can understand, is every age of a child.

Q. Thank you. In terms of your workload, doctor, how many cases of perinatal and paediatric people do you deal with a year?

A. So in terms of post-mortem examinations, at my department we do roughly 750 post-mortem perinatal/paediatric examinations. This includes both cases that are -- those that are called hospital cases, the doctors and the parents want to investigate further what has happened in the pregnancy or why there was a stillborn baby or the baby died early in their life. There is no coronial, so no judge involved, and no police involvement.

But we also do, which is a big number -- around half of these cases, the 750, are medico-legal cases, so there is a coronial request or a police request. I'm dealing with 99% of those requests that have come through the police, so the forensic cases where there's a suspected crime being investigated.

It's three pathologists that do the 750, three consultant pathologists, so I would be roughly doing one third. And on Fridays we go through the cases that we have seen and discuss all the cases, so even if one has not done the post-mortem examination, one has the experience of what the other colleagues have seen in that post-mortem examination, what were the findings, and then there is a discussion around that.

Q. So your figure of 750, is that a year?

A. Yes, that's a year.

Q. Okay. In very round terms, about two a day in very round terms?

A. Yes.

MR JOHNSON: Yes, thank you.
All right. So that's your day-to-day working life. Could we deal with your qualifications, please? Can we take these reasonably slowly, please?

A. Yes. So I have a medical degree from the Medical School of the University of Athens in Greece.

Q. In what year did you get your medical degree?

A. 2002.

Q. So 21 years ago?

A. Yes. Then I proceeded with training -- in Greece it's called forensic medicine, it's the equivalent of forensic pathology in the United Kingdom. I did a PhD as well in pathology: I studied the function of Hodgkin's lymphoma, which is a haematological malignancy, so a tumour of the blood in very simple terms. Then I proceeded and I went to the Karolinska Institute in Stockholm and did my training in paediatric and perinatal pathology.
I joined St Thomas' Hospital as a consultant perinatal and paediatric pathologist in January 2013, having worked for approximately a year as a consultant before that in Sweden. And since then I'm based at the St Thomas' -- since 2013 I'm based at St Thomas'. The everyday work is what I have described before that.
I became a fellow of the Royal College of Pathologists, I think it was 2021, and I also hold the diploma of medical jurisprudence, which is -- from the Royal Society of Apothecaries in London, which is specialising in forensic pathology.

Q. For anyone that doesn't know St Thomas' Hospital in London, is that one of the main teaching hospitals in the capital?

A. Yes.

Q. Could we move then, please, to your reports on [Baby A]?. So far as [Baby A]'s case was concerned, were you initially approached by Cheshire Police late in 2017?

A. That's correct.

Q. Was the first report that you wrote dated 21 January 2019?

A. That's correct, yes.

Q. Were you provided further material in 2021, which I will list in a moment, and did you write a statement confirming what it was you had received?

A. That's correct.

Q. That's 20 October 2021. Then finally, did you write a very short statement dated 5 September 2022, dealing with some further information that you had received from the police?

A. That's correct.

Q. I'd like, if you would, please, for us to use your first report as the basis for your evidence to the jury, so the report dated 21 January 2019. Were you told and did you reproduce in your report the fact that [Baby A] was born on 7 June 2015 at 20.31 hours?

A. Yes. That was the information received, yes.

Q. And that he died the following day at 20.58 hours?

A. Yes.

Q. His gestational age at birth was 31 plus 2?

A. That's correct.

Q. His weight, 1,660 grams?

A. That's correct.

Q. So far as the material that you received from the police was concerned, did you list that in your report?

A. I did.

Q. The initial material you received, did it include a witness statement made by Dr Evans, dated 31 May 2018?

A. That's correct.

Q. A 331-page PDF document, which was in effect medical records from the Countess of Chester Hospital?

A. That's correct.

Q. And then quite a lot of photographs that were taken by the pathologist Dr Shukla, at the post-mortem examination?

A. That's correct.

Q. A list of the photographs can be provided, but in essence were you given or shown the photographs that Dr Shukla took at that examination?

A. Yes.

Q. Did you also receive 78 pages of paperwork relating to Dr Shukla's examination?

A. Yes.

Q. The coroner's records, which ran to 100 pages?

A. Yes.

Q. And also the 25 histology slides that had been compiled consequent on the initial post-mortem examination?

A. Yes.

Q. Together with 23 paraffin blocks?

A. Yes.

Q. What is a paraffin block in this context?

A. You'll remember when I said a piece of tissue is put in a cassette and it's transferred to the lab, where they take the small, the very thin sections and stain them.

The tissue that is left from the thin section is retained in the lab in the form of a paraffin block. And people can go back if they see something and if they need to go deeper into the tissue or they need to do further tests, further stains, specific stains, they can always use those blocks. So that's standard practice.

Q. Later on, and I'm just looking at your report of 20 October 2021, did you receive another complete set of medical records for [Baby A]?

A. I did, yes.

Q. Did you receive the report of Professor Arthurs, dated 19 May 2020?

A. Yes.

Q. The report of Dr Bohin, dated 12 December 2020?

A. Yes.

Q. Four further statements made by Dr Evans, dated 7 November 2017, 24 March 2019, 24 June 2021 and 31 May 2018?

A. That's correct.

Q. A statement made by Professor Sally Kinsey, dated 4 March 2020?

A. Yes.

Q. Two further statements made by Professor Arthurs, dated 19 May 2020 and 25 January 2021?

A. Correct.

Q. Then a series of eight further statements made by Dr Bohin, all dated in 2021, various dates in April, June, July and indeed January 2021?

A. Yes, that's correct.

Q. Thank you. I want to go to the relevant findings or the findings that are relevant to your instructions and your response.

My Lord, I won't take long doing this, but I would like to go through some of this material just to remind the jury of the context of [Baby A]'s case.

MR JUSTICE GOSS: I was going to suggest that we did that in any event because it's a long time ago when we heard this evidence. We've heard an awful lot of other evidence since then, so let's just cast our minds back to [Baby A]'s case.

MR JOHNSON: Thank you. If Mr Murphy would help, please, by putting up the sequence for [Baby A], please.
Starting with tile 3, do we see that [Baby A] was born on 7 June at 20.31? If we click on the tile, please, we see the Apgar scores there for [Baby A].

Did you record, Dr Marnerides, the fact that [Baby A]'s mum had a known history of antiphospholipid syndrome and had been on long-term warfarin treatment because of the risk of blood clots, which was subsequently changed to a combination of different drugs including aspirin?

A. Yes, I recorded that.

Q. [Baby A] was born by C-section, as we can see recorded on that slide. His birth weight was as you have already told us, again recorded on that slide, and he was in poor condition initially but became stable following resuscitation.

It says:
"Minimal spontaneous respiratory effort, albeit he has good tone, blue/pink."

I think you refer to CPAP in your report but you have revisited the records in this respect, is that right, Dr Marnerides?

A. That's correct, yes.

Q. If we look at tile 84, for example, we can see that by the following morning, [Baby A] was on CPAP.

A. Yes.

Q. And that that continued, as we could see from tile 172,if anybody wanted to check that, at 8 pm that night.

If we can go to tile 134 next, please. If we click on that. Do we see here that the position of a UVC was being reported on by Dr MacCarrick from an X-ray at14.28 on the afternoon of 8 June and we know, as a matter of fact, that that UVC was removed because it ended up in the portal vein. I think you refer to thatin your report, don't you?

A. Yes.

Q. The portal vein, just to remind us, is where?

A. It's in the liver.

Q. Thank you. Was a second UVC inserted into [Baby A]'s belly button at 16.30, into the umbilicus, and that also ended up in the portal vein?

A. Yes.

Q. If we go to tile 154, please, do you refer next to the fact that Dr Harkness inserted a long line via the left antecubital fossa? And that's at 19.00 hours.

A. Yes.

Q. Do you refer next to what is our tile 185, which is [Baby A]'s sudden deterioration at 20.26 hours on 8 June?

And do you refer in your report to the attendance of Dr Jayaram, who noted the absence of respiratory effort or heart sounds or pulse, that resuscitation was futile and that was discontinued at 20.58, which we can see on tile 221? Just click on that, please.

I think you record the fact that Dr Harkness had removed the long line following [Baby A]'s collapse, albeit the UVC was still in place; is that right?

A. That's correct, yes.

Q. Did you refer next to Dr Jayaram's description of discolouration, which had been observed on [Baby A]?

A. Yes.

Q. To remind us, we heard that evidence on Monday, 24 October last year.
Did you turn then, Dr Marnerides, to Dr Shukla's findings at the post-mortem examination?

A. I did.

Q. We've seen those summarised in the agreed facts that we've already run through. Did you also summarise Dr Evans' witness statement --

A. I did.

Q. -- which in effect reviewed the medical records?

A. That's correct.

Q. Thank you. I'd like to go to your paragraph 15, please.

Having reviewed all that material, having reviewed the physical findings of Dr Shukla, and having looked at the slides, the histology slides of tissue taken from [Baby A], did you find anything unusual?

A. Yes.

Q. Let's take this slowly, if we can, please. From what part of the body, first of all, was the first unusual thing that you found?

A. The first unusual finding was from the lungs and I observed that on histology, so by looking at the sections under the microscope.

Q. So this is meat and drink and daily language to you, but the sections are the very thin slices, is that right --

A. Yes.

Q. -- taken from the samples of tissue from the lungs?

A. Yes.

Q. So they're in the paraffin block, they're then slicedvery thinly -- 1 micron did you say?

A. Four. It's the width of our hair, one hair.

Q. Four microns thick on a slide?

A. Yes.

Q. And then put under a microscope?

A. Stained and then put under a microscope so we can see the structure.

Q. What is the purpose of staining in this context?

A. Because there's no other way, using light, that you can see the structures differently. That's the physics of how light and...

Q. Do various things react differently to a stain?

A. Yes.

Q. And so by staining the tissue, you in effect produce a contrast between different structures?

A. Yes, that's how you can observe them.

Q. This is so thin that if you put a light under it, you can see through it?

A. Yes.

Q. What did you see?

A. So in two of those sections -- and I refer to what sub-numbering they had on the sections I received --
I could see occasional, very occasional, relatively large spherical empty spaces or globules.

Q. I'm sorry to break this down, but "spherical empty spaces or globules", what does that mean, what are you seeing?

A. So structures that resemble a grape that has been cut through and you only see one surface of that cut, so round or roughly round structures.

But I see them on two dimensions, so a section, not in three dimensions.
Imagine a grape, cutting through it, and that surface you get, looking on it from the top, that's a spherical structure.

Q. Where did you see those spherical empty spaces or globules?

A. Within the lumens of small -- of medium-sized veins. So the lungs, remember this big (indicating), cut on very thin layers. They have veins and arteries.

And the veins -- you can tell the difference most of the times within an artery and a vein on the microscopic level.

And those veins, imagine tubes, cut through them, you have a ring. So the inside of the ring is called the lumen. In those lumens, in the inside of the ring, the ring being the vein, on the inside of the ring I saw that cut surface that resembled the cut surface of a grape.

Q. If we think of a vein as being a tunnel, you're looking down the tunnel from end to end?

A. Yes.

Q. That view. And as you look down the tunnel, you see a round object in the tunnel?

A. Yes. But that's three-dimensional, I'm looking two dimensions. So I'm looking at a section like this (indicating) of the tunnel.

Q. Yes. And what was the significance of what you could see to your trained eye?

A. Those empty spaces, which meant that they stained for neither haematoxylin, which is the substance we use, or eosin, which is the other substance we use, had no colour, they were white.

Q. What does blood show up as in a vein if you stain it with haematoxylin or the other substance?

A. We stained the slide with both, haematoxylin and eosin.

The blood will look red and you see red blood cells and you see the other cellular components of the blood, for example neutrophils, which have a different -- they have a bluish multi-lobulated nucleus and a red surrounding.

You see lymphocytes, which have basically no surrounding but a very dark, round nucleus. You see the different structures. This was an empty structure, a white structure. And in practice, this can be two things: it can either be air or it can be fat. Okay?

Q. Yes.

A. Fat has a slightly different appearance from -- so the empty space we typically see when it's fat, it's different to the grape structure that I have described. It's much smaller, so it's not a grape, it's a small berry, if you compare the sizes, that has been cut.

It's typically round rather than oval or spherical or multi-lobulated, that could be air.

Plus when we see fat, we always look -- when we think it's fat and we see something, a small globule and we think it's fat, we look for further evidence of fat embolism because that's when you expect to see fat. When do we get fat embolus? We get it when we have a fractured bone. And when we have that, it's because small fragments of the bone will get into the circulation and go into the vessels.

When we see fat emboli, we will, with very careful observation, find next to those globules in other vessels or in capillaries, elements of bone marrow. In this case I didn't see the globules that I would expect to see if this was fat.

Q. So they were not typical of fat globules?

A. Yes, and I did not see the other elements of bone marrow embolism -- plus we had no fractures that would explain why we had these (inaudible).

Q. So what conclusion did you draw as to --

A. I need to say something else.

Q. Sorry, I beg your pardon.

A. So if these blocks were sent to me a decade ago, I would have requested from the lab to undertake a special stain, the single special stain we can on paraffin-embedded tissue called osmium stain, that specifically stains fat, and I would have excluded that possibility.

However, it's a very toxic substance, labs don't do it anymore, so we can't do that. What we do nowadays, not having the -- not being allowed to use that stain anymore, basically, because there are health risks for the lab staff, we take smaller pieces from the tissues of interest, routinely, we freeze them, and those can be stained with -- but it needs to be frozen tissue, which we didn't have here.

It needs to be stained with a stain called Oil Red O and that will give us the answer whether indeed it's fat or not.

So from what I had, my conclusion was that this would more likely than not -- these spaces represent air.

Q. Yes.

A. I saw a similar thing in a section from the brain, in that I could see that the lumen was surrounded by blood, which tells me, but I cannot be 100% sure, I cannot be categoric, it tells me that most likely this bubble of air went there while this baby was alive because there is a response to that. And the response is the haemorrhage.

Q. So in the brain, air in the brain or gas in the brain?

A. That's how it looked.

Q. And there was a response to the air, which suggested that that air went to the brain in life?

A. Yes. However, I need to make it clear to this court and to the jurors that those findings cannot be taken as an absolute proof.

Q. Yes.

A. They are in my eyes and my opinion suggestive, highly suggestive, but if I had no other history, no clinical information, no assessment by a clinician, and I only had those two findings, I would have said, "I cannot really tell you if it's air there and it's not an artefact explicable on the decomposition changes and all the artefacts we made".

Q. Does it come to this, that you cannot say, and you do not say, that your findings necessarily mean that there was an air embolism in this case?

A. That's correct.

Q. Would it be fair to say that one has to look at other evidence to make that determination, if there is any other evidence?

A. If there is any evidence, the pathologist needs to take that into account. We need to accept that a post-mortem examination is a snapshot, taken after the death of an individual, of the process of somebody dying.

So to interpret the snapshot, sometimes we are able to say without any clinical information, "Yes, this is what I see, this is what happened", but in many cases, and that's the bread and butter of paediatric pathology, we need the assessment of the course before that snapshot.

If that assessment tells me that the findings indicate towards air embolus being the case, my findings would be consistent with that. But my findings on their own would not say yes it is.

Q. We've heard from Professor Arthurs, the radiologist, about gas getting into the circulation after death.

Was there any evidence from what was seen at the post-mortem examination, the pathologist's examination, to suggest that decomposition likely played a part in any gas in the bloodstream?

A. No, there wasn't. It's highly unlikely.

Q. Highly unlikely. Why do you say that?

A. Because for decomposition to result in air into vessels, you need to have evidence of decomposition.

This evidence of decomposition is typically visible to the naked eye, so you see decomposing bowels, you see a greenish discolouration of the abdomen.

Most importantly, on histology, so looking under the microscope, the structures look autolysed and you can say, yes, there has been significant decomposition here or not; this was not the case here.

The other reason is that the brain -- there was a response to that finding that wouldn't -- the haemorrhage around that vessel. That wouldn't be expected if that was due to decomposition.

So although one cannot categorically say it wasn't, I think I would confidently say it's highly unlikely.

Q. There's one thing I have overlooked as we've gone through and that's the issue of a tamponade, which is to do with the long line perforating or agitating against the heart. You deal with this in your report, Dr Marnerides.

Was there any evidence from the findings of the post-mortem examination that that played any part in [Baby A]'s death?

A. If there was evidence of tamponade at post-mortem, one would have seen haemorrhage into the sac that surrounds the heart; that's called the pericardium. One would have seen blood there.

Dr Shukla did not see blood there and there was no such blood in the photographs.

Q. Yes. So what Dr Shukla recorded as the physical findings and what you have seen from the photographs do not support any suggestion that there was tamponade?

A. Yes.

Q. Thank you.
Can we go to the opinion section, please, of your report, Dr Marnerides. Was there any evidence of any natural disease in [Baby A] that could have contributed to his premature death?

A. My understanding from the clinical review is that there wasn't. From the pathology review, there is no evidence indicating to a natural disease. So overall, there is, in my opinion, no evidence that a natural disease would explain his death.

Q. So looking at the cause of [Baby A]'s death, what conclusion did you draw, please?

A. On the basis of the clinical information, the findings that I have explained and the caveats I have explained to this court in relation to how these findings can be interpreted, I took the view that the death would be explicable on the basis of air embolism.

Q. Thank you. And the means by which that air embolism came about, did you draw any conclusions from all the information?

A. From the information, it would appear this is injection, so insertion of air into a vascular access line.

MR JOHNSON: My Lord, that may be a good moment for a break.